PacificHydro

Environmental Impact Statement

Daroobalgie Solar Farm

March 2022

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Certification

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

EIS prepared by

Pacific Hydro Australia Developments Pty Ltd

Applicant

Pacific Hydro Australia Developments Australia Pty Ltd

Proposed Development

The Daroobalgie Solar Farm Project proposes the construction, operation and decommissioning of an ~100 MW solar farm, battery energy storage system, electricity transmission line and associated infrastructure near Forbes in the Central West region of New South Wales.

Land to be developed

The proposal would be located on Lot 77 DP 750183, Lot 1408 DP 750157, Vol 78 Folio 750183, Vol 2 Folio 220212, Vol 88 Folio 750183, DP 1272667, Vol 12 Folio 1046542, Vol 1340 Folio 750158, Vol 38 Folio 1242538, Vol 14 Folio 750158, Lot 1664 DP 750158, Lot 7003 DP 1060435, Lot 6402 DP 1257397

Certification

I certify that I have prepared the contents of this Environmental Impact Statement in accordance with Schedule 2 of the Environmental Planning and Assessment Regulations 2000. To the best of my knowledge, this assessment contains all available information that is relevant to the environmental assessment of the development, activity or infrastructure, and that information in the EIS is neither false nor misleading.

Name : Kate Munro, Manager Environment, Planning and Approvals

Signature: 

Kate Munro
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Date: 10 March 2022

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Acronyms and abbreviations

Acronym	Meaning
AC	Alternating current
AEP	annual exceedance probability
AHD	Australian Height Datum
AHIMS	Aboriginal Heritage Information Management System
ARTC	Australian Rail Track Corporation
ASS	Acid sulphate soils
BAM	Biodiversity assessment method
BDAR	Biodiversity Development Assessment Report
BESS	battery energy storage systems
BC Act	*Biodiversity Conservation Act 2016*
BSAL	biophysical strategic agricultural land
CEC	Clean Energy Council
CEMP	Construction Environmental Management Plan
CLM Act	*Crown Land Management Act 2016*
dB(A)	decibel (A-weighted)
DC	Direct current
DECCW	Department of Environment, Climate Change and Water NSW (agency preceding OEH and DPIE)
DIRN	defined interstate rail network
DoEE	Department of Environment and Energy
DPIE	Department of Planning, Industry and Environment
EEC	Endangered ecological community
EIS	environmental impact statement
EL	exploration lease
EMF	Electromagnetic Field
EMS	environmental management system
EPA	Environment Protection Authority
EP&A Act	*Environmental Planning and Assessment Act 1979*
EPBC	Environment Protection and Biodiversity Conservation
ETL	electricity transmission line
FIRB	Foreign Investment Review Board
FM Act	*Fisheries Management Act 1994*
GWh	Gigawatt hours
ha	hectare
ICNGS	Interim Construction Noise Guidelines
KL	kilolitre
km	kilometre

Acronym	Meaning
kV	kilovolts
L	litre
LALC	Local Area Land Council
LCT	landscape character type
LEP	Local Environmental Plan
LGA	local government area
LUCRA	Land Use Conflict Risk Assessment
LVIA	Landscape and visual impact assessment
m	metre
mG	milligauss
MNES	matters of national environmental significance
ML	megalitre
mm	millimetre
MNES	Matters of environmental significance
MP	Member of parliament
MW	Megawatt
NEM	National Electricity Market
NML	noise management limit
NPI	Noise policy for industry
NPW Act	*National Parks and Wildlife Act 1974*
NSW	New South Wales
OEH	Office of Environment and Heritage, NSW (agency preceding DPIE)
OD	over dimensional
O&M	operations and maintenance
OSOM	Oversize Overmass
PCT	plant community type
PCU	Power Conversion Units
PHA	preliminary hazard assessment
PHAD	Pacific Hydro Australia Developments Pty Ltd
PHPL	Pacific Hydro Pty Ltd
POEO Act	*Protection of the Environment Operations Act 1997*
PV	Photovoltaic
RET	Renewable Energy Target
REZ	Renewable Energy Zone
RMS	Roads and Maritime Service
RNP	Road noise policy
RU1	Rural Use 1
RF Act	*Rural Fires Act 1997*

Acronym	Meaning
SCADA	Supervisory Control and Data Acquisition
SEARs	Secretary's environmental assessment requirements
SEPP	State Environment Protection Policies
SEIA	socio-economic impact assessment
SIDRA	Signalised and unsignalized intersection design and research aid (traffic engineering software)
SISD	safe intersection sight distance
SP2	Special Purpose Zone 2
SPIC	State Power Investment Corporation
spp.	species
SSD	State significant development
SEPP 33	State Environment Planning Policy No. 33 Hazardous and Offensive Development
TfNSW	Transport for NSW
UCL	urban centre and locality
WM Act	*Water Management Act 2000*
ZTVI	zone of theoretical visual influence

Executive summary

Project summary

Pacific Hydro Australia Developments Pty Ltd (Pacific Hydro) is applying for development approval for the proposed Daroobalgie Solar Farm Project (the Project), located within the Forbes Shire Council local government area (LGA) in the Central West region of New South Wales (NSW).

The Project is proposed to comprise the installation of approximately 420,000 solar PV panels, and associated infrastructure including substation, battery energy storage system (BESS), inverters, underground cabling, site offices, car parking, new access tracks, an electricity transmission line (ETL) and switchyard to connect the solar farm to existing TransGrid infrastructure. The Project has a capacity of approximately 100 megawatts (MW AC) and is estimated to provide enough electricity to power up to the equivalent of 34,000 homes each year.

The Project seeks to generate electricity from renewable solar energy and connect into the National Electricity Market (NEM), assisting with greenhouse gas reduction targets in NSW and Australia.

A brief overview of the Project, location and assessment framework is provided in Table E.0.1.

Table E.0.1 Key Project details

Project details	
Name	Daroobalgie Solar Farm
Project description	Renewable energy facility (solar farm) and ancillary infrastructure, battery energy storage system, electricity transmission line and switchyard
Technology	• Photovoltaic (PV) panels mounted on single-axis-tracking structures • Battery energy storage system (technology most likely lithium-ion) • Single-circuit, 132 kV transmission line
Infrastructure on solar farm site	Access tracks, PV panels, electrical collector network (i.e., underground cabling), power conditioning units, substation, battery energy storage system, operations and maintenance building(s), water tanks, parking and washdown facilities, perimeter security fencing
Solar farm access	Solar farm site access point will be from Troubalgie Road Access will require upgrade of Back Yamma Road/Troubalgie Road intersection and sealing of Troubalgie Road to site access point
Electricity transmission line (ETL)	Single-circuit, 132 kV transmission line, approximately 8.5 km long. The ETL easement will be 45 m wide. Towers are likely to be monopole structures 25 to 30 m high
Capacity	~100 MW AC
Electricity generation	~250 GWh/year
GHG savings	197,500 tonnes CO_2-e/year
Lifespan of the Project	~30 years
Capital investment	$188 million
Workforce	Peak construction workforce ~320 people Operational workforce up to 6 people (full time equivalent)
Project location	
Project location	Approximately 11 km northeast of Forbes, Central West region NSW
Solar farm site location and access	Lot 77 in Deposited Plan 750183; Troubalgie Rd, Daroobalgie

Project details	
Switchyard site location and access	Lot 1408 in Deposited Plan 750157; Daroobalgie Rd, Daroobalgie
ETL location	**Private landholders**: Vol 78 Folio 750183, Vol 2 Folio 220212, Vol 88 Folio 750183, DP 1272667, Vol 12 Folio 1046542, Vol 1340 Folio 750158, Vol 38 Folio 1242538, Vol 14 Folio 750158 **Crown Land**: Lot 1664 DP 750158, Lot 7003 DP 1060435 **Rail Corridor**: Lot 6402 DP 1257397 **Newell Highway**
Local government area	Forbes Shire Council
Project area	Total area solar farm site: ~308 hectares Development footprint solar farm site: ~268 hectares Electricity transmission line easement: ~ 38 hectares Switchyard site: ~0.5 hectares Total development footprint = ~306.5 hectares
Applicant details	
Applicant	Pacific Hydro Australia Developments Pty Ltd ABN: 56 161 024 755 Level 13, 700 Collins St Docklands, VIC 3008
Contact	Kate Munro Environment, Planning and Approvals Manager E: kmunro@pacifichydro.com.au
Assessment framework	
Project classification	State significant development
Legislation	Part 4 of *Environmental Planning and Assessment Act 1979*
Responsible authority	Department of Planning, Industry and Environment (DPIE)

Stakeholder consultation

As a signatory to the Clean Energy Council's (CEC) Best Practice Charter for Renewable Energy Projects, Pacific Hydro is committed to respectful engagement with the communities in which they plan and operate projects.

Pacific Hydro, through their stakeholder engagement program, has developed positive relationships with all affected landholders, the local council, Aboriginal parties and the broader community. Feedback provided during the engagement program has been considered during Project design, in particular the alignment of the ETL to minimise social and amenity impacts.

Consultation during the environmental impact assessment phase and if approved, construction and operation phase of the Project will be ongoing and in accordance with the Project's Stakeholder Engagement Plan.

Impact assessment

Biodiversity

Biodiversity surveys of the solar farm site and ETL options were undertaken early in the design phase of the Project so that impacts could be avoided by refining the proposed location of Project infrastructure. A Biodiversity Development Assessment Report was prepared for the Project in accordance with the *Biodiversity Conservation Act 2016.*

Following location refinements that seek to avoid impacts, the Project will result in the unavoidable impact of 3.93 hectares of native vegetation. Offsets required, in accordance with the Biodiversity Assessment Method, are:

- PCT 76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions (planted vegetation) – 4 ecosystem credits
- PCT 76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions (good condition) – 10 ecosystem credits
- PCT 26 Weeping Myall open woodland of the Riverina Bioregion and NSW South Western Slopes Bioregion (good condition) – 16 ecosystem credits
- PCT 80 Western Grey Box – White Cypress Pine tall woodland on loam soil on alluvial plains of NSW South Western Slopes Bioregion and Riverina Bioregion (good condition) – 9 ecosystem credits
- PCT 80 Western Grey Box – White Cypress Pine tall woodland on loam soil on alluvial plains of NSW South Western Slopes Bioregion and Riverina Bioregion (derived scrub) – 26 ecosystem credits
- PCT 244 Poplar Box grassy woodland on alluvial clay-loam soils mainly in the temperate (hot summer) climate zone of central NSW (wheatbelt) (planted vegetation) – 9 ecosystem credits

In accordance with the offset rules established by the Biodiversity Conservation Regulation 2017, this residual impact 3.93 hectares will be offset by the purchase or retirement of biodiversity credits or payment to the Biodiversity Conservation Trust Fund.

Cultural heritage

The Aboriginal and historic cultural heritage assessments included desktop research, review of heritage databases, consultation with Aboriginal parties and a three-day site survey of the Project area.

Fifteen newly recorded Aboriginal archaeological sites were located during the survey of the Project area. Thirteen of the sites were assessed as having low archaeological significance. Two sites contained a less common artefact type in the form of an axe blank and partial axe respectively. These two sites were assessed as having low to moderate significance.

Due to the nature and low/moderate significance of the sites potentially impacted by the Project, salvage was identified, by the registered Aboriginal parties, as the most appropriate management measure for the sites. Salvage will involve the collection and documentation of artefacts, prior to disturbance. The salvage procedure is to be outlined in an Aboriginal Cultural Heritage Management Plan (ACHMP).

One potential historical heritage item was identified on the solar farm site during the site inspection – a relic horse/cattle drawn cart. This item was assessed to have low archaeological significance as it was in poor condition and not considered to contribute to an understanding of the archaeological context of the area.

Land

In relation to the existing condition, characteristics and use of the land, three separate technical assessments were undertaken. A soil and land resource assessment, erosion and sediment control assessment and land use conflict risk assessment were undertaken for the Project.

The land and soil capability of the solar farm site is mapped as class 4 land[1], which is considered to have moderate agricultural capability, however the capability assessments from across the solar

[1] Office of Environment and Heritage (OEH), 2012. The land and soil capability assessment scheme: second approximation – A general rural land evaluation system for NSW

farm site were classified as a mix of class 4 and class 6 due to the presence of sodic topsoil in some locations. Class 6 soil and land capability indicates low agricultural capability.

The Project is considered to present 'very low' erosion hazards due to its flat terrain and the relatively short duration of ground disturbance anticipated. With the implementation of standard erosion and sedimentation controls, impacts to soil can be further mitigated and are anticipated to be negligible/minor.

The land use surrounding the Project is predominately agricultural, including cropping and sheep grazing with associated rural dwellings. Other key land uses and features in the surrounding area include:

- Forbes Central West Livestock Exchange located on Back Yamma Road, approximately 2.5 km west of the solar farm site
- Central West Industrial Park located on the corner of Newell Highway and Back Yamma Road, approximately 3 km west of the solar farm site
- Lachlan River, situated approximately 3.5 km from the southern boundary of the solar farm site
- Newell Highway and the Stockinbingal - Parkes railway line which are crossed by the ETL
- A Crown land reserve which is crossed by the ETL

The Project will change the current land use of the solar farm site from agricultural to electricity generation however no discernable impact from the Project on any of the surrounding land uses has been identified. There is also the potential for sheep grazing to take place on the solar farm site once operational. Consultation with surrounding landholders has not indicated any significant concerns with the change in land use from agricultural land to solar farm.

Landscape and visual

The landscape and visual assessment included an assessment of potential impacts on the landscape and several public viewpoints as well as a glare assessment.

Landscape and visual impacts from the Project were determined to be negligible or minor from nine of the ten viewpoints assessed. The one viewpoint predicted to have a minor to moderate visual impact is located close to the northwest corner of the solar farm site on Troubalgie Road. Visual impact in this location will be mitigated by on-site screen planting as detailed in the Landscape Mitigation Plan.

The glare assessment predicted that the risk of glint and glare related impacts being experienced by receptors at neighbouring properties and public viewpoints as a result of this Project is nil.

Noise

The noise and vibration impact assessment identified potentially sensitive receivers, established appropriate noise management levels (NMLs) for the Project and predicted emissions from noise generating equipment and activities during construction and operations.

Noise levels associated with the construction of the solar farm are predicted to be within noise management levels (NMLs) at all surrounding receivers. Noise levels associated with the construction of the ETL have been predicted to exceed NMLs at receivers within approximately 1.5 km of the works. Noise impacts are not however anticipated to be significant as they will be very short term (< 2 days) and localised at pole locations which are spaced approximately 200 to 300 m apart. Noise levels associated with the construction of the switchyard have also been predicted to exceed NMLs at receivers within approximately 1.7 km of the site. These noise impacts are also anticipated to be short term and mostly associated with equipment and trucks used to install foundations and transport materials to the site. Mitigations will be implemented during construction in order to minimise the extent and nature of any inconvenience.

Traffic noise levels along local roads during construction are predicted to be below the Road Noise Policy base criteria meaning impacts are expected to be minimal.

Operational noise levels are predicted to comply at all nearby surrounding receivers.

A Noise and Vibration Management Plan will be prepared and implemented including mitigations to reduce noise impacts as much as practicable during construction.

Traffic and transport

The traffic and transportation impact assessment considered potential impacts on local roads and road-users from the proposed Project. The assessment focused on the construction phase which will generate the largest amount of traffic during the lifetime of the Project. Vehicle movements associated with operational activities are expected to be very low and are predicted to have negligible impacts on the existing road network.

Whilst the final transportation route for construction materials to the Project area is not yet known, it is likely that materials and equipment would be transported by rail or road from either the Port of Botany, Port of Newcastle or Port Kembla. Regardless of the transportation mode, Project-related traffic will access the solar farm site from the Newell Highway via Back Yamma Road and Troubalgie Road. Heavy vehicles required for the construction of the ETL and switchyard are likely to use Forest Road, Newell Highway and Daroobalgie Road.

The key potential impacts identified for the Project were:

- Lack of capacity for the Back Yamma Road/Troubalgie Road intersection to accommodate two truck turning movements simultaneously (i.e., right turn from Back Yamma Road to Troubalgie Road and left turn from Troubalgie Road to Back Yamma Road)
- Likely deterioration of Troubalgie and Forest roads (both unsealed roads) under increased traffic loads, particularly during wet weather conditions
- Interruption/delays for vehicles entering/exiting the Forbes Central West Livestock Exchange on sale days

To address these potential impacts, Pacific Hydro has committed to upgrading the Back Yamma Road/Troubalgie Road intersection and sealing Troubalgie Road from Back Yamma Road to the solar farm's main access point. Heavy vehicle traffic will be restricted from using Forest Road with only a small number of heavy vehicles permitted during the construction of the ETL. Light vehicle use of Forest Road will also be heavily restricted during construction and operations. Construction-related deliveries will also be scheduled to avoid peak operating times of the Forbes Central West Livestock Exchange, as much as possible.

With the implementation of these mitigation measures and the preparation and implementation of a Traffic Management Plan impacts on local roads are anticipated to be minimal.

Water

In relation to the Project area's hydrology, two separate technical assessments were undertaken, one focused on flooding and the other on groundwater. The flooding assessment undertaken for the Project assessed the likely extents of flooding across the Project area and used a 2D TUFLOW hydraulic model to assess potential flood impacts due to the proposed Project for 1%, 5% and 20% annual exceedance probability (AEP) storm events.

Potential impacts on surface water and flooding at the solar farm site have largely been avoided by excluding the southeastern corner of the site, which is subject to flooding, from development and retaining four of the six existing farm dams. Flood modelling for the proposed development shows that the major flow paths through the site are maintained and that the watercourse that runs through southeast corner will not be adversely impacted by the Project. At the switchyard site, overland flow is shallow in depth and very low in velocity and flood behaviours for the proposed Project will generally be retained compared to existing conditions. The proposed overhead ETL is not anticipated to change existing flood behaviour (flow path and flood levels).

The minor predicted afflux on neighbouring properties at the solar farm (<30mm) and switchyard (<55mm) sites, as a result of the Project, will be minimised through the use of shallow swales around Project infrastructure. Impacts post mitigation are anticipated to be negligible.

A groundwater assessment was based on a desktop review of available information and results of preliminary geotechnical testing undertaken on the solar fam site in 2019 (Golder, 2019). Construction water supplies are not anticipated to be sourced from groundwater, therefore there are no anticipated impacts due to extraction. The maximum depth for solar panel footings and ETL poles are unlikely to intercept the top of the water table. Therefore, installation of driven piles for the solar panels and ETL poles and associated changes to the impervious areas are not anticipated to have an identifiable impact on groundwater levels or quality.

Hazard and risks

A hazard and risk assessment undertaken for the Project assessed potential risks associated with dangerous goods, hazardous materials, electromagnetic fields (EMF) and bushfire.

The hazard risk screening process involved the identification of classes and quantities of all dangerous goods to be used, stored or produced on site with an indication of storage locations. The screening assessment found that storage thresholds for construction and operation were not exceeded and that the movement of dangerous goods, both during construction and operation, would be minimal given the storage and use requirements of the Project.

A preliminary hazard assessment (PHA) was undertaken to assess potential hazards associated with the BESS. The key hazard associated with battery systems was identified to be “thermal runaway”. Generic data on lithium-ion batteries was used to determine the consequence, likelihood and overall risk of a number of thermal runaway hazard scenarios. This risk was compared with the risk criteria for land use and safety planning in Hazardous Industry Planning Advisory Paper (HIPAP) 4 and shown to comply for all thermal runaway hazard scenarios. The assessment assumed that the BESS is installed and operated in accordance with a range of mitigation and management controls as outlined in section 6.8.4 and that it is located a minimum of 4.5 m from the site boundary.

Potential EMF risks from the Project were assessed to be low. EMF generated on the solar farm site were predicted to be close to background levels at the site boundary. The magnetic fields directly under and at the edge of the easement of the 132 kV transmission line were also predicted to be well below the levels contained within the interim guidelines on limits of exposure.

There is limited vegetation in the Project area resulting in a low bushfire risk. Grasslands, however, can be dry and although not mapped as bush fire prone area, there is a risk of grass fires, particularly on the solar farm site. Therefore, a 10 m wide Asset Protection Zone will be provided around the perimeter of the solar farm site and around the substation, BESS, and O&M facilities. Bushfire risk associated with the construction and operation of the Project can be managed and will be minimised through the implementation of a Bushfire Management Plan that will be prepared in consultation with the NSW Rural Fire Service.

Socio-economic

The socio-economic assessment undertaken for the Project predicts a range of social and economic benefits to the local community and region as a result of the Project.

The Project would involve a total estimated capital expenditure of approximately $188 million. This would be expended on a broad array of equipment, products and services, some of which are expected to be procured within the local and regional area. This injection of economic stimulus would serve to further sustain and stimulate local economic growth within the Forbes and Parkes LGAs and broader NSW. The Project is expected to create approximately 320 jobs during construction, 167 of which are anticipated to be sourced locally. Up to six full-time equivalent positions are anticipated to be created during the operation of the Project.

Indirect economic benefits are expected to flow throughout the broader community with sectors such as retail, hospitality, entertainment, accommodation, vehicle and fuel services, quarries, general labour and electrician services all likely to benefit from the Project.

Some short-term construction amenity and traffic impacts are predicted during construction however these can be appropriately managed with the mitigation and management measures detailed in section 7.

Discussions are well advanced between Pacific Hydro and Forbes Shire Council with regards to a voluntary planning agreement (VPA) for the Project. The aim of the VPA will be to establish a community benefit sharing program that makes a positive and long-lasting contribution to the local community and support projects that address community need and are aligned with the community priorities outlined in the Forbes Community Strategy Plan.

Waste

Waste generated by the Project will be managed in accordance with the following waste management hierarchy that underpins the objectives of the *Waste Avoidance and Resource Recovery Act 2001*:

- Avoidance including action to reduce the amount of waste generated
- Resource recovery including re-use, recycling, reprocessing and energy recovery
- Disposal including management of all disposal option in the most environmentally responsible manner

Waste separation and segregation will be promoted on site with dedicated bins provided for recyclable materials. Where waste cannot be avoided, reused or recycled it will be classified and disposed of at licenced waste management facilities. A Waste Management Plan will be developed, in consultation with Forbes Shire Council, prior to the construction of the Project.

Cumulative impacts

No cumulative visual or landuse impacts are anticipated from other existing solar farms in the region as they are some distance (greater than 30 km away) from the proposed Project. There are potential cumulative impacts from the proposed Quorn and Peninsula solar farms if construction schedules coincide with the Daroobalgie Solar Farm Project, as these projects could draw on the same local labour resources and the accommodation facilities in Parkes and Forbes. However, as neither of these projects have firm construction schedules, it is difficult to predict cumulative impacts at this stage. However, if the construction schedule of one or both of these solar farms coincides with the construction of the Daroobalgie Solar Farm, a Cumulative Impact Management Plan will be prepared in consultation with Forbes Shire Council.

There is the potential for cumulative traffic impacts associated with the existing Forbes Central West Livestock Exchange during peak operating hours. The performance of the Newell Highway/Back Yamma Rd intersection has been predicted to perform with acceptable level of service with the additional Project, construction related traffic however to mitigate potential traffic impacts on Back Yamma Road, construction-related traffic and deliveries will be minimized during the peak operating times of the Forbes Central West Livestock Exchange. It is considered that with careful scheduling of Project deliveries, any disruption to the normal operation of the Forbes Central West Livestock Exchange will be minor.

Management measures

Pacific Hydro's certified ISO14001:2004 Environmental Management System (EMS) applies to the management of all Project sites. To manage site specific environmental obligations, Pacific Hydro integrates the Environmental Management Plans approved as part of the planning/development application process, within its overarching EMS. Under the EMS, an Environmental Aspects Register is maintained and monitored by a full-time Environmental Compliance Coordinator employed by Pacific Hydro.

Environmental management and mitigation measures, including requirements to prepare and implement the following management plans have been identified to manage the potential environmental impacts arising from the Project:

- Construction Environment Management Plan

- Decommissioning and Rehabilitation Environmental Management Plan
- Aboriginal Cultural Heritage Management Plan
- Erosion and Sediment Control Management Plan
- Landscape Mitigation Plan
- Noise and Vibration Management Plan
- Traffic Management Plan
- Bushfire Management Plan
- Emergency Response Plan
- Community Engagement Plan
- Waste Management Plan

Project justification

The Daroobalgie Solar Farm Project will contribute to the sustainable transition of electricity generation in NSW by generating approximately 250 GWh of renewable energy each year and, through the inclusion of a BESS, will deliver rapid response, dispatchable power needed for grid security and reliability. The Project is well located, in a region where there are planned upgrades of existing transmission infrastructure and a strong regional energy demand growth forecast.

The Project is aligned with the NSW Government's renewable energy plan to reach zero net emissions by 2050 and Forbes Shire Council's Local Environmental Plan and Community Strategic Plan.

This EIS and the technical studies that support it, clearly demonstrate that the proposed Daroobalgie Solar Farm is an appropriately located development that can effectively operate with minimal environmental and social impacts. Residual impacts are predominately associated with construction and are therefore temporary and highly localised. These residual impacts are considered to be acceptable and outweighed by the Project's many anticipated benefits.

The direct economic benefits, in the form of employment, procurement and indirect benefits including increased demand for goods and services locally, from the Project are expected to make a positive contribution to the well-being of the local community, broader region and NSW. In addition to these benefits, Pacific Hydro's Community benefit sharing program will provide funding for local community enhancement projects and programs over the expected 30-year operating life of the Project.

Overall, the Project can be considered a sustainable development, consistent with local and State planning legislation and is in the public's best interest due to its positive social and economic benefits.

1. Introduction

1.1 Project overview

Pacific Hydro Australia Developments Pty Ltd (Pacific Hydro) seeks development approval for the proposed Daroobalgie Solar Farm Project (the Project), located within the Forbes Shire Council local government area (LGA) in the Central West region of New South Wales (NSW) (Figure 1.1).

The Project is proposed to comprise the installation of approximately 420,000 solar PV panels, associated infrastructure (including substation, battery energy storage system (BESS), inverters, underground cabling, site offices, car parking, and new access tracks) an electricity transmission line (ETL) and switchyard to connect the solar farm to existing TransGrid infrastructure. The Project has a capacity of approximately 100 megawatts (MW) and is estimated to provide enough electricity to power up to the equivalent of 34,000 homes each year.

The Project seeks to generate electricity from renewable solar energy and connect into the National Electricity Market (NEM), assisting with greenhouse gas reduction targets in NSW and Australia.

1.2 Applicant

1.2.1 Company history

Founded in Australia in 1992, Pacific Hydro was one of the pioneers of renewable energy development in Australia. Today Pacific Hydro is committed to powering Australia to a clean energy future.

Pacific Hydro operates a high quality, diversified portfolio of renewable energy assets in Australia, with over 660 MW of wind, solar and hydro operating assets. We also have a significant pipeline of renewable energy projects, with over 750 MW of potential installed capacity in development, as well as over 250 MW of energy storage solutions. Pacific Hydro also has a growing electricity and gas retail arm, Tango Energy, with over 100,000 customers.

Pacific Hydro continues to own every project it has developed in Australia and, as a long term owner of renewable assets, we prioritise quality engineering, equipment selection and construction methodology to ensure our projects are delivered on schedule and achieve optimal operating performance over the asset's life.

After a highly competitive international sale process, Pacific Hydro was acquired by the State Power Investment Corporation (SPIC) through its subsidiary, State Power Investment Overseas of China (SPIC Overseas) in January 2016, following approval from the Australian Government's Foreign Investment Review Board (FIRB) and participating in a highly competitive international sale process. As such, Pacific Hydro is now part of the SPIC-Pacific Hydro group.

This application is made by Pacific Hydro Australia Developments Pty Ltd (PHAD), a wholly-owned subsidiary of Pacific Hydro Pty Ltd (PHPL) in the PHPL group of companies. As is customary for projects of this nature, PHAD is the development vehicle for PHPL, through which PHPL conducts all of its initial project development, design and land acquisition activities. The Project may ultimately be transferred to another wholly-owned member of the PHPL group at a future point in time (such as a special purpose vehicle with dedicated funding), in order to commence construction. Any such transfer would be conducted in full compliance with all relevant legislation, including the *Corporations Act 2001* and *the Foreign Acquisitions and Takeovers Act 1975*.

1.2.2 Approach to development

As a signatory to the Clean Energy Council's (CEC) Best Practice Charter for Renewable Energy Projects[2], Pacific Hydro is committed to sensitive development that avoids areas of high biodiversity, cultural, landscape and agricultural value. We seek to ensure that whilst the wider benefits of renewable energy are realised that local environment impacts are minimised and appropriate throughout.

[2] https://www.cleanenergycouncil.org.au/advocacy-initiatives/community-engagement/best-practice-charter

In addition to providing sustainable sources of electricity, Pacific Hydro implements the following environmental principles during the planning, design and construction phases of development. Firstly, impacts are avoided where possible; secondly, impacts are minimised, for example with use of appropriate management techniques; and finally, negative impacts will be mitigated or compensated wherever possible.

Pacific Hydro is committed to respectful engagement with the communities in which they plan and operate projects. Through its Sustainable Community Fund, Pacific Hydro has built a strong reputation for engaging with communities and has a track record of collaborating with local communities to deliver lasting and sustainable benefits.

Pacific Hydro's commitment to engaging with Traditional Owners across all phases of development is demonstrated through the company's recent development of a Reflect Reconciliation Action Plan (Reflect RAP) which is due for release in December 2021. This plan sets out the actions Pacific Hydro will take to:

- Achieve inclusive employment and procurement opportunities for Aboriginal and Torres Strait Islanders
- Strengthen relationships with Aboriginal and Torres Strait Islander stakeholders
- Raise awareness of their rich cultures within the organisation
- Promote and celebrate Aboriginal and Torres Strait Islander peoples enduring connection to Country

1.3 Structure and content of the environmental impact statement

This environmental impact statement (EIS) has been prepared in accordance with the Secretary Environmental Assessment Requirements (SEARs) issued for the Project on 17 December 2019. Appendix A lists the assessment requirements and where each requirement has been addressed in the EIS.

The structure of the EIS is as follows:

Chapter One	Provides an overview of the Project and Proponent
Chapter Two	Outlines the strategic context of the Project, the site selection process and the alternatives considered during Project development
Chapter Three	Provides a detailed description of the Project and construction and operation activities
Chapter Four	Details the regulatory context for the Project
Chapter Five	Provides a detailed description of stakeholder engagement activities
Chapter Six	For each environmental aspect this chapter outlines the methodology of the assessment, describes the existing environment, identifies potential impacts and proposes mitigation and management measures to minimise any impacts identified. Environmental aspects include biodiversity, cultural heritage, land, landscape and visual, noise, traffic and transport, water, hazards and risks, socio-economic and waste
Chapter Seven	Outlines the environmental management framework for the Project and provides a summary of proposed environmental mitigation and management measures
Chapter Eight	Evaluates the social, environmental and economic impacts and benefits of the Project

PROJECT
Daroobalgie Solar Farm, Australia

TITLE
Figure 1.1: Project Overview

DRAWING NO
AU-3015-ENG-PHA-GN-MAP-00002

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REV	A

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0 750 1,500 3,000 m

PacificHydro

FOR EXTERNAL DISTRIBUTION

- Solar Farm Site
- Electricity Transmission Line (ETL)
- Switchyard
- Forbes Central West Livestock Exchange
- Daroobalgie Industrial Precinct
- Urban Area
- State Forest
- Public Road
- Railway
- Watercourse

Daroobalgie Solar Farm Site

Switchyard

Back Yamma State Forest

Forbes

Lachlan River

Site Location

Daroobalgie Solar Farm

Sydney

0 150 300 Km

2. Strategic context and alternatives considered

2.1 Strategic context

2.1.1 International context

Australia is party to the Paris Agreement which came into force in 2016. The Paris Agreement builds on international efforts to address climate change under the United Nations Framework Convention on Climate Change and the Kyoto Protocol (DISER, 2021). Under the Paris Agreement, Australia has committed to reduce greenhouse gas emissions by 26 to 28% below 2005 levels by 2030.

The 26th Conference of the Parties to the United Nations Framework Convention on Climate Change (COP26) was held in Glasgow in November 2021. The Australian Government, at this meeting committed to cut Australia's greenhouse gas emissions to net-zero by 2050.

2.1.2 National context

The Federal Government's key policy to encourage the development of renewable energy projects is the Renewable Energy Target (RET). The scheme requires high-energy users to acquire a proportion of their electricity from renewable sources. While the 33,000-gigawatt hours (GWh) large-scale renewable energy target was met in September 2019, the scheme will continue until 2030. The Daroobalgie Solar Farm Project will generate large-scale generation certificates that will be sold to high-energy users to allow them to meet their obligation under the policy.

2.1.3 State context

In recent years, the NSW Government has released a suite of policies to support renewable energy development and is now leading Australia with regards to its ambitious renewable energy plan. In September 2021, the NSW Government further strengthened its position as Australia's leading State with regards to climate change policy by announcing it would lift its 2030 emission reduction target from 35% to 50% compared with 2005 levels. This adds pressure to the Commonwealth Government to increase Australia's short-term greenhouse reduction goal before the COP26 summit in Glasgow in November.

Renewable energy/greenhouse gas reduction polices, and plans in NSW include:

- Net Zero Plan Stage 1: 2020 - 2030. This plan is the foundation for NSW's action on climate change and goal to reach net zero emissions by 2050
- NSW Transmission Infrastructure Strategy (2018). This strategy supports the transition of the energy sector by increasing transmission capacity and prioritising energy zones
- NSW Electricity Strategy (2019). This strategy supports an affordable and sustainable electricity future
- Electricity Infrastructure Roadmap. Enabled by the *Electricity Infrastructure Investment Act 2020,* the roadmap outlines support for four Renewable Energy Zones (REZs) by 2030 and aims to see the development of 12 gigawatts of new renewable energy in NSW. In June 2021, the NSW Government committed $380 million over four years to the roadmap and planned REZs.

The first renewable energy zone in NSW, the Central West Orana REZ, is currently in development and expected to be shovel-ready by the end of 2022. The Daroobalgie Solar Farm Project is located just south of this zone. Whilst outside the REZ, the Project is located in a region with increasing energy demands and has strong community and local council support.

NSW's Large-Scale Solar Energy Guideline for State Significant Development (NSW Government, 2018) acknowledges that NSW is an attractive location for solar energy development due to its excellent solar resources and established electricity infrastructure. The guideline establishes the strategic context for large-scale solar energy projects, such as Daroobalgie Solar Farm, stating that they provide an opportunity to:

- Contribute to NSW achieving net-zero emissions by 2050 and deliver on commitments as set out in the NSW Renewable Energy Action Plan

- Supports Australia's commitments to reduce greenhouse gas emissions
- Contributes to Commonwealth renewable energy targets
- Assist in meeting energy demand and improving energy security in NSW

2.1.4 Regional context

The Central West and Orana Regional Plan 2036 is prepared by the NSW Department of Planning, Industry and Environment and provides a 20-year blueprint for the future of the Central West and Orana region. The Plan covers 19 municipalities including the Forbes Shire and promotes the development of renewable energy to unlock economic potential and drive diversification across the Central West and Orana. The Plan states that growth in wind energy, solar energy, and bioenergy generation will promote local jobs in smaller communities and development opportunities for associated industries and that the large open plains of the region are complimentary to solar energy generation.

2.1.5 Local land use planning context

Forbes Local Environmental Plan

Forbes Shire Council Local Environmental Plan 2013 (LEP) is the primary statutory planning instrument for the municipality.

Figure 2.1 shows land zoning in the Project area. The solar farm and switchyard sites are zoned as Rural Use 1 Primary Production under the LEP. The 'electricity generating works' land-use is not listed as permitted for land zone RU1 Primary Production however, electricity generating works are classified as 'permitted with consent' in the RU1 zone in accordance with Clause 34 of the State Environmental Planning Policy (Infrastructure) 2007.

Solar developments are not inconsistent with the objectives and principles of the RU1 Primary Production. The development will impact the availability of the land for primary production; however, it will also sustainably harness a natural resource, namely solar energy, and will provide for a diversified economic stream and stimulus which will support the surrounding rural community.

The ETL traverses three planning zones:

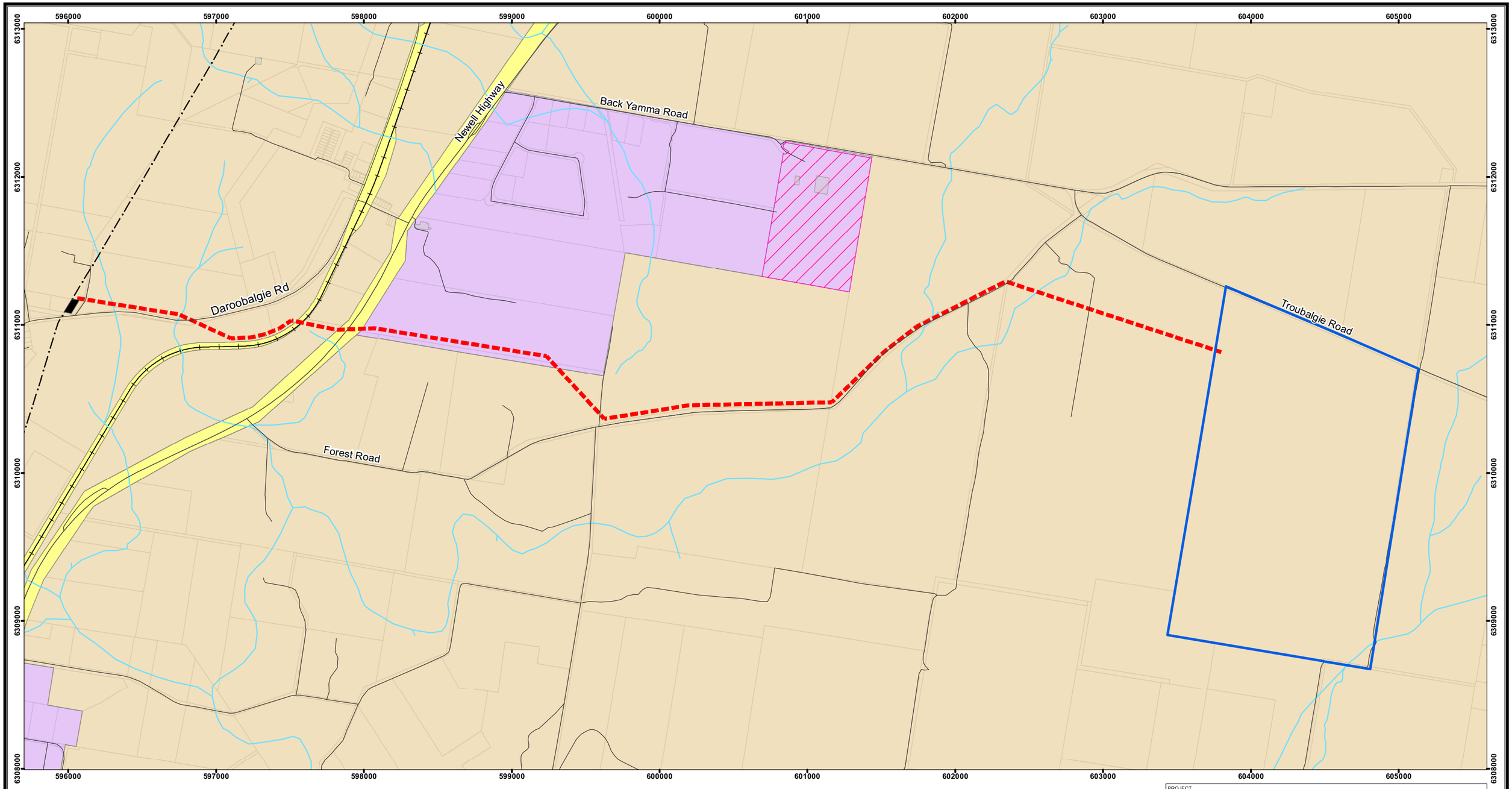
- Rural Use (RU1) Primary Production
- Industrial 1 Zone (IN1) General Industrial
- Special Purpose Zone 2 (SP2) Classified Road and Rail Infrastructure Facilities

The NSW ePlanning Spatial Viewer tool[3] shows that there is no hazardous land within or in close proximity the Project area. The closest land at risk of flood is the area around Forbes township approximately five kilometres south of the switchyard site. The closest bush fire prone land is Back Yamma State Forest, approximately seven kilometres east of the solar farm site.

Forbes Community Strategic Plan

Under the *NSW Local Government Act 2020*, all councils are required to develop a suite of plans and implement progress reporting which together forms the State's Integrated Planning and Reporting framework. The Forbes Community Strategic Plan (2018 - 2028) seeks to provide a statement of vision, long term goals and community priorities which will guide the future transformation of the region. The Plan has been developed based on six key directions:

[3] https://www.planningportal.nsw.gov.au/spatialviewer/#/find-a-property/address



- Solar Farm Site
- Switchyard
- Electricity Transmission Line (ETL)
- Existing Transmission Line (132kV)
- Cadastral Boundary*
- Public Road
- Railway
- Watercourse
- Forbes Central West Livestock Exchange

Land Zones **

- IN1 General Industrial
- SP2 Infrastructure
- RU1 Primary Production

Data Source:
* NSW Government, 15/07/2020
** https://www.planningportal.nsw.gov.au/spatialviewer/#/find-a-property/address [Accessed 10/10/2021]

PROJECT: Daroobalgie Solar Farm, Australia
TITLE: Figure 2.1: Land Zones
DRAWING NO: AU-3015-ENG-PHA-GN-MAP-00007

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SCALE: 1:25,000 A3
COORDINATE SYSTEM: MGA94 (55S)
REV: A

FOR EXTERNAL DISTRIBUTION

PacificHydro

- Community and culture
- Local economy
- Natural environment
- Rural and urban land use
- Infrastructure and services
- Government and representation.

The Project is closely aligned with the following strategy outlined under Direction 3 - Natural Environment (Strategy NE7):

'*Identify and develop appropriate sustainable energy supply options, such as wind and solar power generation'*.

2.1.6 Voluntary planning agreement

Discussions are well advanced between Pacific Hydro and Forbes Shire Council with regards to a voluntary planning agreement for the Project. The aim of the agreement will be to establish a community benefit sharing program that makes a positive and long-lasting contribution to the local community and support projects that address community need and are aligned with the community priorities outlined in the Forbes Community Strategy Plan.

2.2 Connection to the National Electricity Network (NEM)

2.2.1 Current network capacity

A connection enquiry for the Daroobalgie Solar Farm Project was submitted to TransGrid in November 2020 in accordance with clause 5.3.2 of the National Electricity Rules. The preliminary impact assessment conducted by TransGrid indicated that the Project, based on current network conditions, was likely to be constrained by thermal network limitations and that network augmentations would be required.

This is not an uncommon response for renewable projects in Australia in response to preliminary connection enquiries, with almost all projects currently experiencing challenges due to the state of the existing transmission network.

Pacific Hydro engaged Power System Consultants to undertake further modelling to quantify possible grid constraints. This modelling did not incorporate the BESS proposed for Daroobalgie Solar Farm in order to predict a "worse-case" scenario result. The modelling predicted a curtailment of 4.9% in system normal conditions and 13.1% in N-1[4] contingency conditions.

These results are encouraging as the addition of the BESS, constraints would be mitigated by the BESS charging during network overloads and dispatching at a later point (e.g. during night-time hours when solar generation is not occurring). This type of flexibility can assist with grid constraints and provide additional flexibility which supports grid stability. As such, the current network constraints associated with the Project are anticipated to be manageable and the Project is only likely to experience minor constraints under current network conditions.

2.2.2 Planned network upgrades

In March 2021, TransGrid released a Project Specification Consultation Report (PSCR) titled '*Maintaining reliable supply to the Bathurst, Orange and Parkes areas*' (TransGrid, 2021). The report states that electricity demand is expected to increase substantially in the Bathurst, Orange and Parkes areas (which includes the proposed Daroobalgie Solar Farm)(Figure 2.2). The expected demand increase is due to:

- Demand growth of some existing large mine loads in the area

[4] The N-1 criterion states that a system that is able to withstand at all times an unexpected failure or outage of a single system component, has an acceptable reliability level

- Planned connection of new mine/industrial loads such as McPhillamy's gold mine and CleanTeQ Sunrise Nickel-Cobalt-Scandium mine
- General demand load growth around Parkes including the Parkes Special Activation Precinct.

TransGrid have identified that the current Central West network will not be capable of supplying the combined increases in load in the area if action is not taken. Therefore, they have identified the need for a new 330/132 kV substation near Orange and a 132 kV line to Orange North and have proposed four network upgrade options as follows:

- A new 132 kV line between Orange and Parkes
- A new 330 kV line between Orange and Parkes
- Dynamic reactive support at Orange and Parkes
- Batteries to provide both load reduction and dynamic reactive support and a new 132 kV line between Orange and Parkes

TransGrid has also outlined possible non-network possible solutions including:

- Generation (both embedded and grid-connected)
- Configuration of existing or expected renewable generators in the area to provide fast-acting reactive support
- Bulk or aggregated energy storage system

The expected timing for the options outlined range from 2022 - 2027 with the new 330/132 kV substation near Orange proposed for 2024/25. These planned upgrades to the transmission infrastructure are expected to benefit the Project and reduce potential grid constraints. The demand growth forecast for the region also presents future opportunities for a direct power purchase agreement for the Project.

Further transmission upgrades planned by TransGrid in the region include 500 kV and 330 kV transmission lines, substation and related infrastructure to support the development of the Central-West Orana REZ. This infrastructure has been declared critical state infrastructure under Section 5.13 of the *Environmental Planning and Assessment Act 1979,* which means the Minister for Planning is of the opinion that it is essential for the State for economic, environmental or social reasons.

Figure 2.2 Central West NSW transmission network

Source: TransGrid, 2021 pp 12

2.3 Alternatives considered

2.3.1 Do nothing

The 'do nothing' scenario would lead to a missed opportunity for supplying ~250 GWh of renewable energy annually to NSW national electricity market annually, saving approximately 197,500 tonnes CO_2-e of greenhouse gas annually.

The 'do nothing' scenario would also result in missed opportunities for economic benefits to the local and regional economy including:

- Generation of up to 167 local employment opportunities during construction and up to six full time equivalent jobs during operations
- Indirect benefits from an approximate $188 million capital investment including procurement of construction supplies and construction related services in the local area and an increase of trade for a broad range of local businesses (food, accommodation providers, retail etc.)
- Direct benefits from a community benefit sharing program provided by Pacific Hydro over the lifespan of the Project

2.3.2 Site location

The Central West region of NSW was targeted for solar farm prospecting by Pacific Hydro in 2018 due to its strong solar irradiance and extensive, existing transmission infrastructure. Alternative locations were considered in the region as part of these prospecting activities however the Project's proposed site was identified as an ideal location for a solar farm due to the following key characteristics:

- The site has very flat topography
- The site has been largely cleared of native vegetation and has been assessed to have low ecological value
- The site is not classified as high-quality agricultural land. The solar farm site is part of a larger landholding and the site is considered to be the least productive land in the holding
- There are relatively few dwellings and other sensitive uses nearby, with only two dwellings within one kilometre, seven dwellings within three kilometres and 29 dwellings within five kilometres of the site
- The solar farm site is generally screened from view from nearby dwellings and public viewpoints
- The site enjoys good road access to and from the surrounding arterial network (i.e., Newell Highway) and the traffic volumes on the surrounding arterial and local roads are relatively low

Since the Project's initial identification and during the Project's planning and environmental assessment it has received strong landholder, community and local council support, further underpinning its suitability.

2.3.3 Alternative configurations

The solar farm site design and ETL route have been informed by stakeholder engagement and technical studies completed for the EIS. A number of potential transmission line alignments were identified and assessed as part of the environmental/social impact assessment. The final alignment is supported by the affected landholders and has been designed to minimise environmental impacts, specifically impacts to woodland vegetation.

The design response to these key environmental constraints are outlined in Table 2.1.

Table 2.1 Design response to key constraints

Project area	Key constraints and design response
Solar farm site (Figure 2.3)	Two areas of remnant Grey Box Woodland, a threatened ecological community listed under both the *Biodiversity Conservation Act 2016* and the *Environment Protection and Biodiversity Conservation Act 1999*, on the solar farm site have been avoided.

Project area	Key constraints and design response
	The gilgai wetland habitat in the southeastern corner of the solar farm site has been avoided and four (of six) farm dams will be retained. Both the gilgai wetland and farm dams provide habitat and a source of water for birds, microbats and macropods. A buffer has been provided along the boundary of the site to allow existing vegetation to be retained. In addition to avoiding biodiversity impacts, the retained vegetation will provide for visual screening for the solar farm from some directions. An area in the southeast corner that has a high hazard classification under 1% AEP storm events has been avoided
ETL	A number of alternative ETL alignments were investigated during the design of the Project. The first stage of the route selection process was to use desktop information to map known environmental, social, and technical constraints including: – Native vegetation – Waterways and wetlands – Registered aboriginal and historical cultural heritage sites – High quality agricultural lands – Dwellings and towns – Existing infrastructure and roads – Topography – Hazardous areas (such as bushfire prone land, land subject to flooding etc.) Three potential ETL alignments were identified that avoided the above constraints and maximised the opportunity to use existing infrastructure corridors (Figure 2.3): – Route A followed Troubalgie Road and Forest Road to the Newell Highway, from where it was planned to run alongside an existing infrastructure corridor down the eastern side of the Newell Highway to the Forbes substation – Route B was an optimised version of route A, crossing into private land near to the solar farm site to reduce the length of the line – Route C followed Troubalgie Road and Back Yamma Road to the Newell Highway, then cut across private property, a Crown land reserve and the Stockinbingal to Parkes railway line to connect into the existing 132 kV transmission line The second stage of the route selection process was to consult with key stakeholders and private landholders that would be impacted. Essential Energy identified a major constraint along the Newell Highway eastern infrastructure corridor which made routes A and B unfeasible. Route C also was found to be unfeasible due to private landholder concerns with the proposed route. Broader consultation with landholders between the solar farm site and the existing 132kV Parkes – Forbes transmission line was undertaken to identify landholders interested in hosting a transmission line easement on their property. This information was then combined with the above listed desktop constraints to identify a new potential ETL route option. A preliminary engineering design of the potential ETL route was undertaken which considered a range of design criteria such as span length, pole locations, clearance requirements and crossing locations. With broad landholder support and a technically feasible route option identified, environmental and cultural heritage assessments were undertaken on a wide study corridor. The final ETL alignment, shown in Figure 2.4, avoids woodland vegetation wherever possible and avoids fragmentation of a large woodland patch within the Crown land reserve west of the Newell Highway.
Switchyard site	The switchyard site location is largely dictated by the location of the existing 132kV Parkes – Forbes transmission line and the identification of a suitable ETL route from the solar farm site. Nevertheless the site is located on cleared flat agricultural land which is suitable for a switchyard. No environmental constraints were identified on the site

PROJECT
Daroobalgie Solar Farm, Australia

TITLE
Figure 2.3: Solar Farm - Key Constraints

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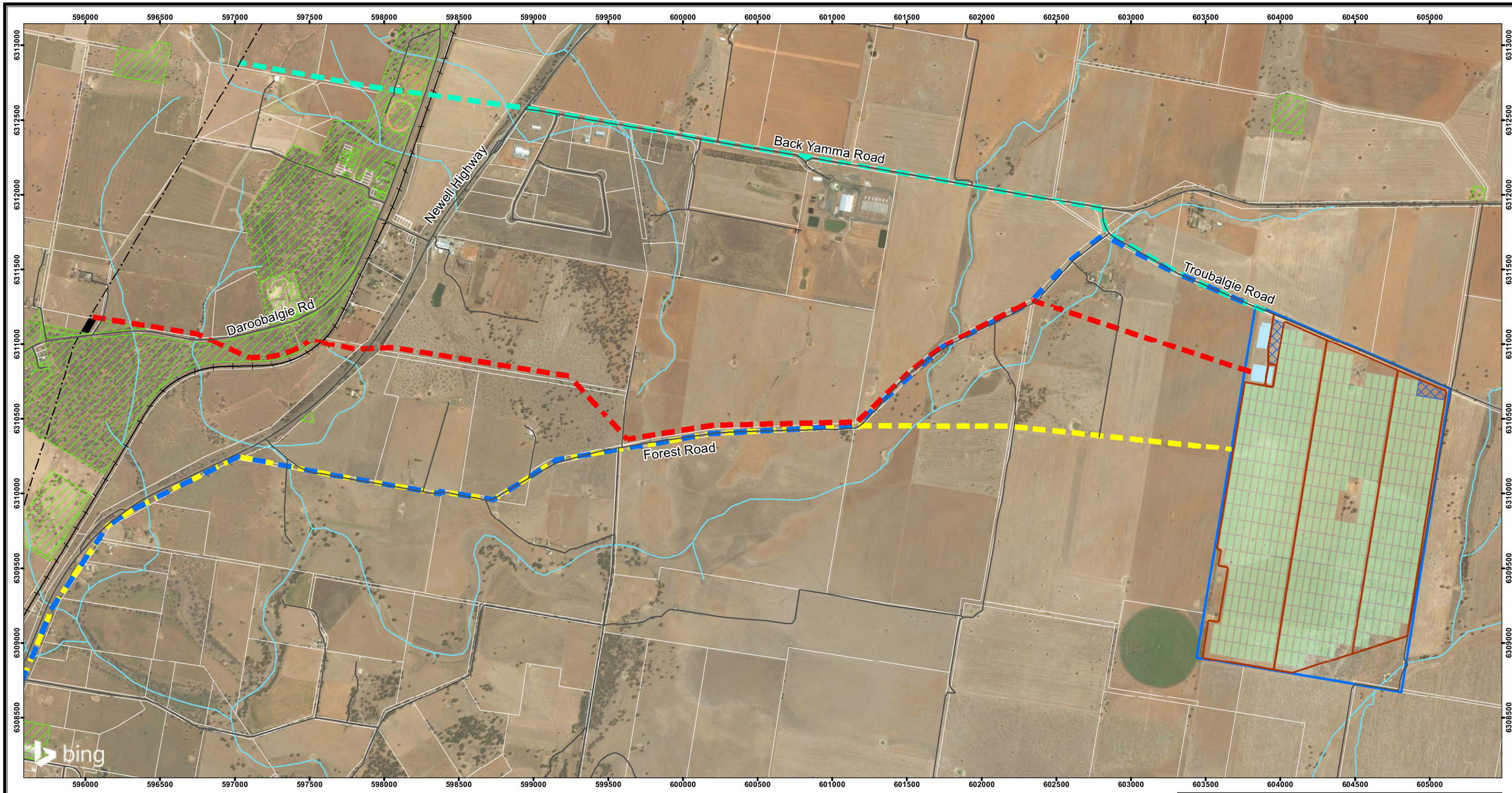
- Key Constraints
- Disturbance Area
- Solar Farm Site
- Electricity Transmission Line (ETL)
- Main Access Tracks
- Public Road
- Watercourse
- Cadastral boundary



Solar Farm Site
Proposed Solar PV arrays
Proposed O&M compound (including substation and BESS)
Proposed Construction Laydown Area
Proposed Switchyard

Electricity Transmission Line (ETL) Route Options
Final
C
B
A
Existing Transmission Line (132kV)

Main Access Tracks
Railway
Waterway
Public Road
Crown land
Cadastral boundary

PROJECT
Daroobalgie Solar Farm, Australia

TITLE
Figure 2.4: ETL Alternatives

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COORDINATE SYSTEM: MGA94 (55S)

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3. Project description

3.1 Project location

The Project is in the Forbes Shire Council LGA of central western NSW. The Project area encompasses the solar farm site, electricity transmission line (ETL) easement and switchyard site (Figure 3.1).

The proposed solar farm site is located approximately 11 km northeast of Forbes. The solar farm site is approximately 300 hectares (ha) on land legally described as Lot 77 in Deposited Plan 750183. The solar farm site will be accessed from the northern boundary via Troubalgie Road.

The topography of the proposed solar farm site is generally uniform with an average elevation of 245 m above the Australian Height Datum (AHD). The land is largely cleared, having been highly modified by past disturbances associated with land clearing, cropping, and livestock grazing. Six farm dams are present within the solar farm site and a natural watercourse runs to the east of the property boundary, intersecting the site in the southeast corner. Small ephemeral waterholes, known locally as gilgai, are present in some paddocks, predominately in the south-eastern section of the site. These have been progressively ploughed and levelled by farming activities over time.

The surrounding land use is predominately agricultural. The Central West Livestock Exchange is located within the Central West Industrial Park on Back Yamma Road, 2.5 km to the west of the site. Back Yamma State Forest is situated 7 km to the east at an elevation of 340 m AHD, and the closest National Park is Goobang National Park, 30 km to the northeast. The Lachlan River runs approximately 3.5 km from the southern boundary of the site.

The ETL connects the substation on the solar farm site to a switchyard near the existing Forbes-Parkes 132 kV transmission line. The ETL is approximately 8.5 km long and traverses six private properties, road and rail reserves and Crown land. The average elevation along the ETL is 245 m above AHD.

The switchyard site (250 m above AHD) is located approximately 5.5 km north of Forbes on Lot 14 in Deposited Plan 750158. The switchyard site is adjacent to the existing Forbes-Parkes 132 kV transmission line located approximately 500 m west of the Newell Highway. It will be accessed from Daroobalgie Road.

3.2 Land

3.2.1 Landholders

Landholders in the Project area are summarised in Table 3.1.

Table 3.1 Land ownership details

Landholder (refer Figure 3.2)	Project component	Land description
1	Solar farm site	Lot 77 DP 750183
2	ETL	Vol 78 Folio 750183
3	ETL	Vol 2 Folio 220212
4	ETL	Vol 88 Folio 750183 DP 1272667
5	ETL	Vol 12 Folio 1046542
6	ETL	Vol 1340 Folio 750158
7	ETL Switchyard site	Vol 38 Folio 1242538 Vol 14 Folio 750158 Lot 1408 DP 750157
Transport for NSW (TfNSW)	ETL	Crossing of Newell Highway

Landholder (refer Figure 3.2)	Project component	Land description
Forbes Shire Council	ETL	Forest Road – road reserve
Australian Rail Track Corporation (ARTC) /TfNSW	ETL	Lot 6402 DP 1257397 Crossing of Stockinbingal – Parkes railway line
Crown land - Travelling Stock Reserve (managed by Local Land Services)	ETL	Lot 1664 DP 750158 Lot 7003 DP 1060435

3.2.2 Surrounding dwellings

There are no residential dwellings within the proposed site. The nearest dwelling (an associated dwelling[5]) is located approximately 600 m to the northwest of the western boundary. There are 29 existing dwellings within 5 km of the site (Figure 3.2). Table 3.2 provides the elevation and distance to the proposed Project for the dwellings closest to proposed infrastructure. The Newell Highway runs north-south, approximately 5.5 km to the west of the proposed solar farm site.

Table 3.2 Surrounding dwellings

House number	Associated/non associated	Elevation (m)*	Distance to solar farm site (closest point) (m)**	Distance to ETL (m)***	Distance to Switchyard (m)****
10	Associated	255	3975	2590	4720
11	Associated	245	600	830	7481
12	Associated	243	906	197	6850
13	Associated	257	2915	4163	11800
14	Associated	257	2806	3992	11558
15	Non associated	260	3154	3739	10440
16	Non associated	255	2499	3837	11571
17	Associated	240	4022	425	3631
18	Associated	240	4635	445	3016
19	Non associated	240	4472	916	3315
35	Non associated	240	1816	3947	9309
47	Non associated	240	5187	306	2454
48	Associated	253	7739	267	271
49	Non associated	250	8096	432	388
50	Non associated	247	7979	422	306
51	Non associated	247	8046	561	441
52	Non associated	247	8213	679	567
53	Non associated	250	5967	249	1705
54	Non associated	243	5867	299	1782
55	Non associated	250	5848	420	1864
56	Non associated	255	5741	759	2097

[5] An associated dwelling is owned by a landholder in the Project area who is receiving monetary benefits as a result of the Project

House number	Associated/non associated	Elevation (m)*	Distance to solar farm site (closest point) (m)**	Distance to ETL (m)***	Distance to Switchyard (m)****
57	Non associated	253	5662	742	2164
58	Non associated	253	5641	735	2180
59	Non associated	253	5625	732	2194

.* Elevations estimated from 10m contour data

.**Distance to site boundary

.***Distance to ETL alignment

.****Distance to switchyard boundary

3.2.3 Mineral, coal and petroleum resources

There are no existing petroleum or coal leases or exploration licences in the Project area. Three mineral exploration licences (EL) cover the Project area as shown in Figure 3.3.

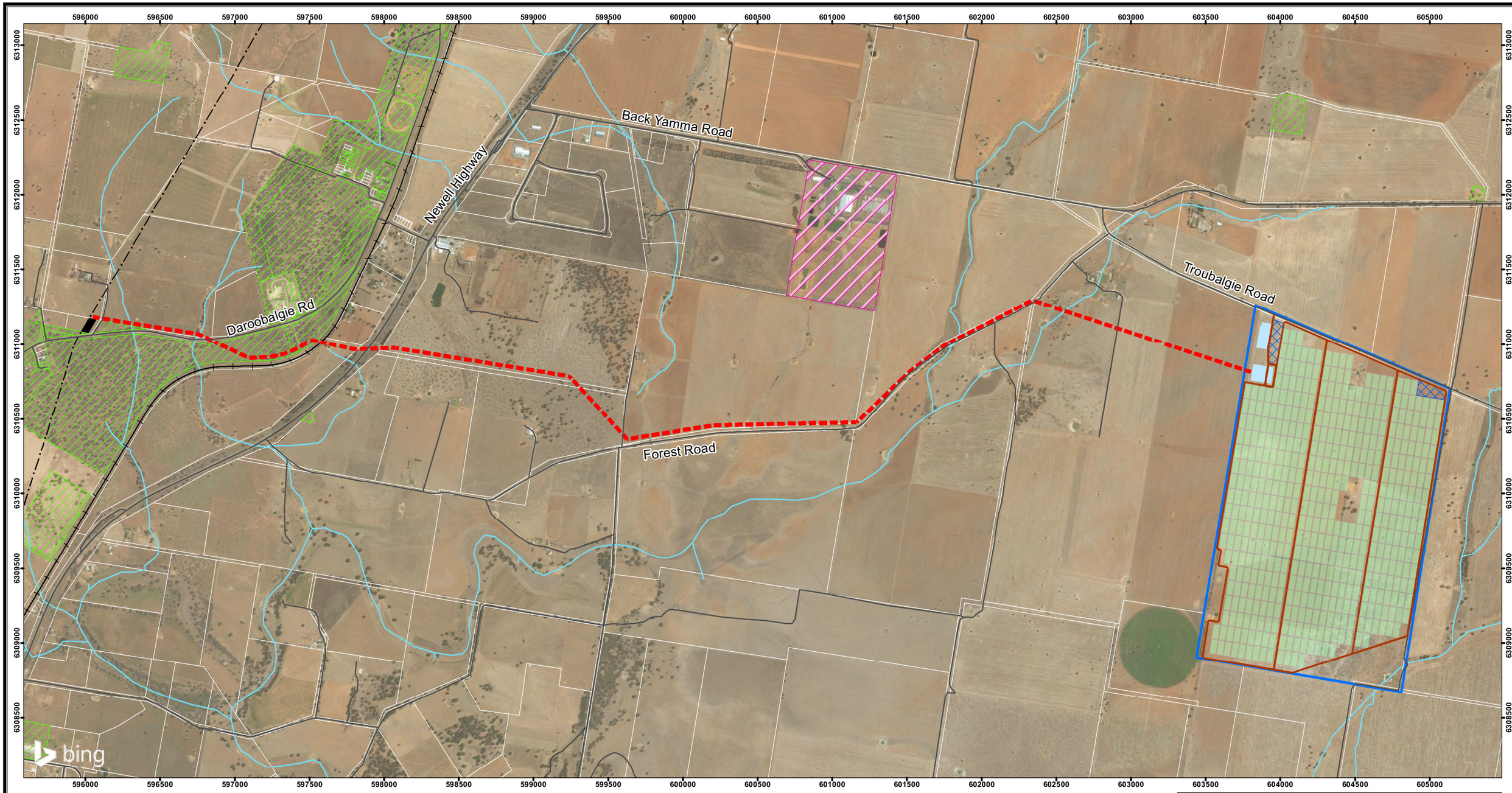
- EL 8990 held by FMG Resources Pty Ltd. This licence was first granted on 25th June 2020 and expires on 25 June 2023. The EL applies to group 1 metallic minerals. The EL covers the solar farm site and the eastern section of the ETL
- EL 8555 held by Godolphin Tenements Pty Ltd (previously held by Ardea Exploration Pty Ltd). This licence was first granted on 5 May 2017, was renewed on 21 July 2020 and is due to expire on 5 May 2023. The EL applies to group 1 metallic minerals. The EL covers a small section of the ETL
- EL 8580 held by Godolphin Tenements Pty Ltd (previously held by Ardea Exploration Pty Ltd). This licence was first granted on 26 May 2017 and is due to expire on 26 May 2023. The EL applies to group 1 metallic minerals. The EL covers the western section of the ETL and switchyard site

There is a mining lease (ML 739) held by TriAusMin Pty Ltd (a wholly owned subsidiary of Godolphin Resources Pty Ltd) approximately one kilometre southwest of the switchyard site. The lease was granted on 23 May 1979 and was last renewed on 23 May 2021. It expires 22 May 2031. The title area is 53.41 ha and the resource targets are gold, platinum and silver.

Details of consultation with mineral exploration licence holders is provided in section 5.3.2.

3.2.4 Subdivision for the switchyard

Negotiations with TransGrid to understand their requirements with respect to how the switchyard infrastructure is to be owned and operated are ongoing. Therefore, the area of land to be subdivided, at the switchyard site is yet to be determined. A map showing the indicative subdivision plan is provided in Figure 3.4. The land is zoned RU1 Primary Production with a minimum lot size of 200 ha therefore any proposed subdivision will require the approval of the Minster for Planning under the provisions of section 4.38 of the EP&A Act.



- Solar Farm Site
- Proposed Solar PV arrays
- Proposed O&M compound (including substation and BESS)
- Proposed Construction Laydown Area
- Switchyard Site
- Electricity Transmission Line (ETL)
- Existing Transmission Line (132kV)
- Main Access Tracks
- Railway
- Waterway
- Public Road
- Forbes Central West Livestock Exchange
- Crown land
- Cadastral boundary

PROJECT: Daroobalgie Solar Farm, Australia

TITLE: Figure 3.1: Project Area

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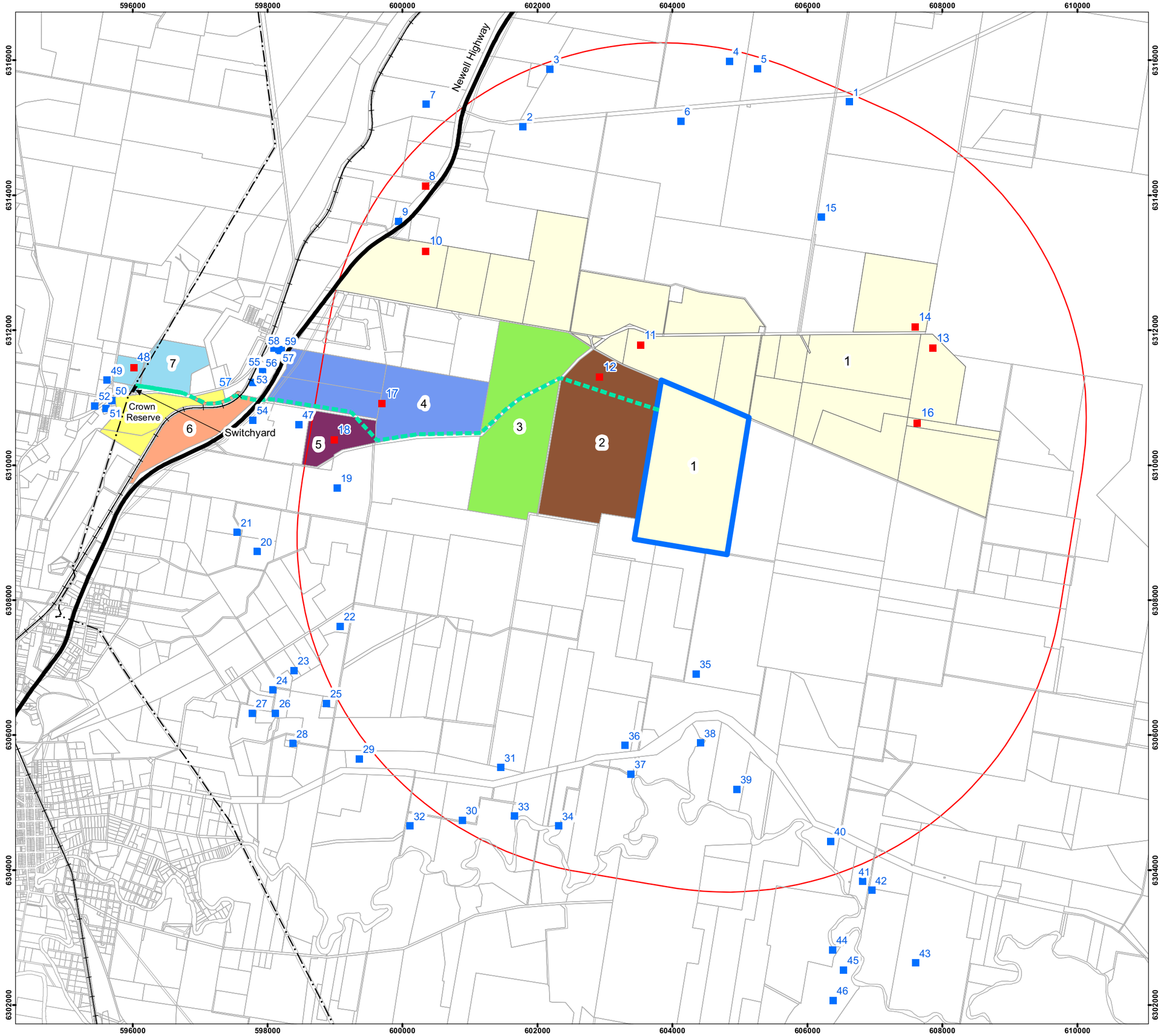

PROJECT
Daroobalgie Australia

TITLE
Figure 3.2: Nearest Sensitive Receptors

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N

0 500 1,000 2,000 m

PacificHydro

FOR EXTERNAL DISTRIBUTION

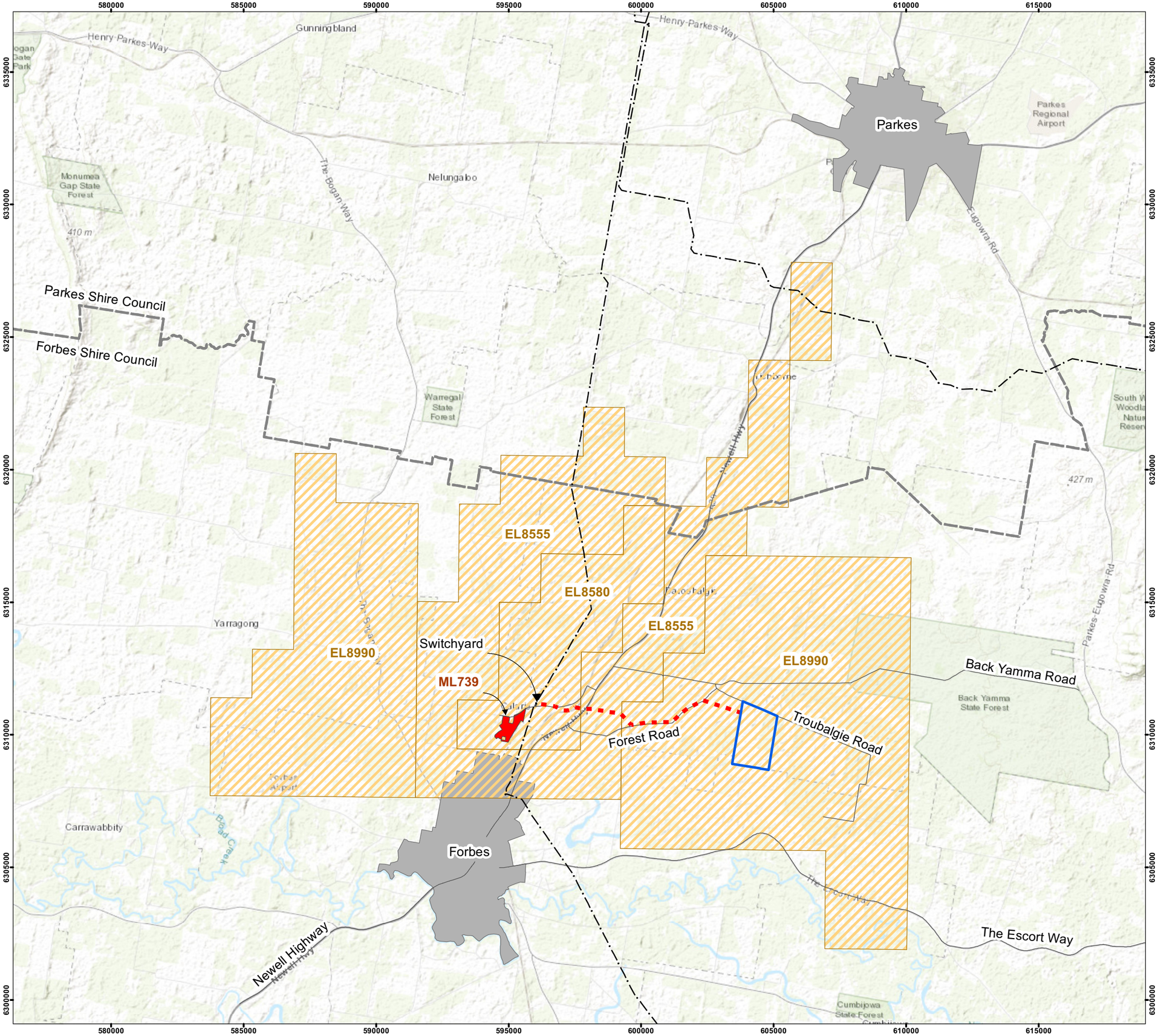
- Solar Farm Site
- ETL
- Existing Transmission Line (132kV)
- Switchyard Site

Dwelling
- Associated
- Non-Associated

Participating Landholders
- 1
- 2
- 3
- 4
- 5
- 6
- 7

- Crown Reserve
- 5km Distance from Solar Farm Site
- Cadastral Boundary *
- Main Road
- Rail Line

Data Source:
* NSW Gov, 15/07/20



PROJECT
Daroobalgie Solar Farm, Australia

TITLE
Figure 3.3: Exploration and Mining Titles

DRAWING NO
AU-3017-ENG-PHA-GN-MAP-00010

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CLEARED	K. Munro
APPROVED	K. Derriman
DATE	16/11/21
SCALE	1:140,000 A3
DATUM	MGA94 (z55)
REV	B

N

0 1,000 2,000 4,000 6,000 m

PacificHydro

FOR EXTERNAL DISTRIBUTION

- Solar Farm Site
- Electricity Transmission Line (ETL)
- Existing Transmission Line (132kV)
- Switchyard
- Mining Exploration Licence*
- Mining Lease*
- Urban Centres and Localities (UCL)
- Local Government Area (LGA) Boundary
- Public Road

Data Source:
* Geological Survey of NSW, 20/05/2021, https;//minview.geoscience.nsw.gov.au/

PROJECT
Daroobalgie Solar Farm, Australia

TITLE
Figure 3.4: Indicative Subdivision Plan

DRAWING NO
AU-3015-ENG-PHA-GN-MAP-00025

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APPROVED	K. Munro
DATE	14/02/22
SCALE	1:10,000 A3
DATUM	MGA94 (z55)
REV	A

N

0 10 20 40 m

PacificHydro

FOR EXTERNAL DISTRIBUTION

- Switchyard Site/Potential Subdivision Area (~0.5ha)
- Existing Transmission Line (132kV)
- Cadastral boundary
- Crown land

3.3 Key Project components

The key components of the Daroobalgie Solar Farm are detailed below and shown in Figure 3.5.

Solar arrays and PV modules

The Project proposes the installation PV panels mounted on single-axis-tracking structures that will be configured in rows and columns so that PV panels are oriented to the north to optimise power generation achieved at the site.

The PV panels will be elevated on the mounting system to ensure the minimum flood level freeboard[6] requirements at the site are achieved. PV panels are expected to have a maximum height of up to 4.0 m when fully tilted at 60 degrees. Initial investigations indicate approximately 420,000 PV panels could be installed for the Project however the final design will depend on a range of factors including available technologies, PV panel selection, available grid capacity and economies of scale.

Image 3-1 Solar photovoltaic panel tracking system

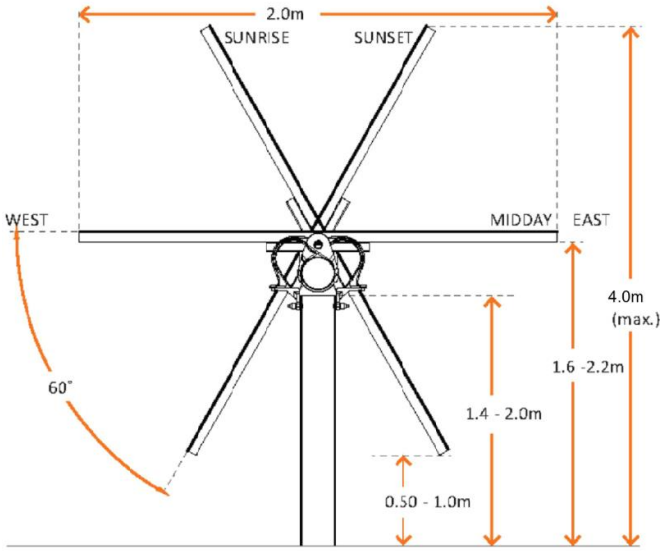


Image 3-2 Solar photovoltaic panels installed at Haughton Solar Farm

Source: Pacific Hydro

[6] Freeboard is a factor of safety expressed as the height above the flood used to determine the design floor level or ground level (Forbes Development Control Plan, 2013)

Collector network and substation

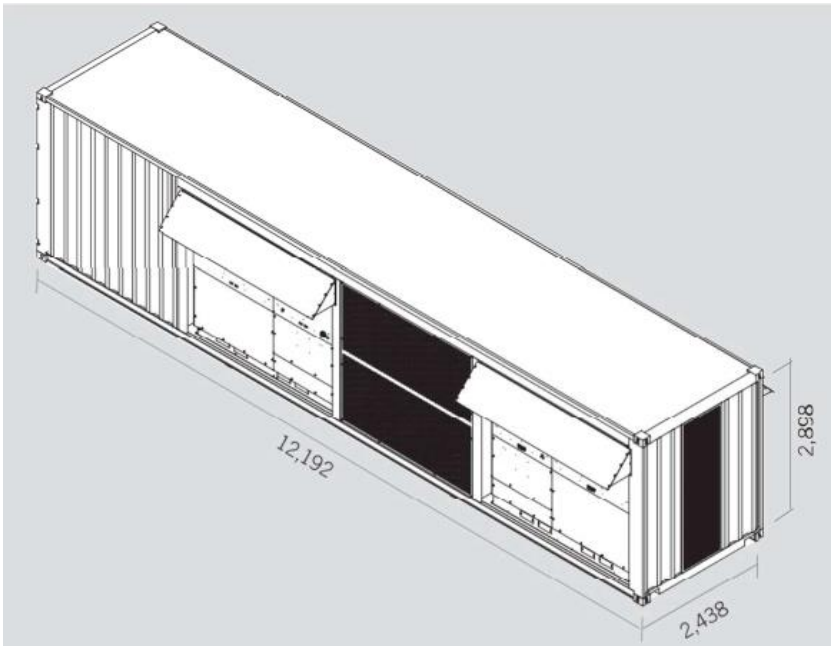
PV panels are wired in a string array with each group feeding a DC-AC inverter, which converts DC current generated from the PV panels into 33 kV AC current (i.e., DC-AC inversion) that can then be stepped up to 132 kV at the substation and subsequently exported to the national electricity grid.

Power Conversion Units (PCUs) will contain the DC-AC inverters, medium-voltage transformers, switchgear, Supervisory Control and Data Acquisition (SCADA) and communications equipment. They are normally housed within 40-foot shipping container-like structures that measure approximately 12 m long x 2.5 m wide x 2.9 m high. There will be approximately 26 PCUs required to support the ~420,000 PV panels proposed for the solar farm.

Underground electrical cabling is proposed to be installed between the PV panels, PCUs and the substation.

A new 33 kV/132 kV electrical substation will be constructed to enable a connection of the solar farm to the national electricity grid. The proposed 132 kV substation is designed to allow flexible upgrades and occupies approximately a footprint of 140 m long by 40 m wide. Its tallest component is the landing gantry that can reach approximately 12 to 14 m.

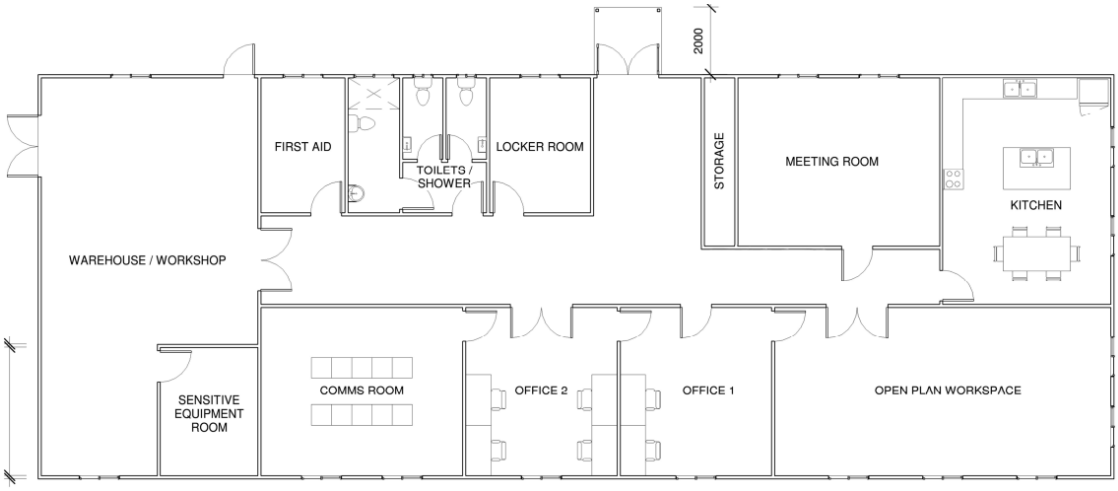
Image 3-3 Power conversion unit schematic



Operation and maintenance facilities

The Operation and Maintenance (O&M) facilities are proposed to be co-located with the proposed substation and BESS. Structures will include offices, staff amenities, equipment storage sheds and at-grade car parking

Image 3-4 O&M building example layout

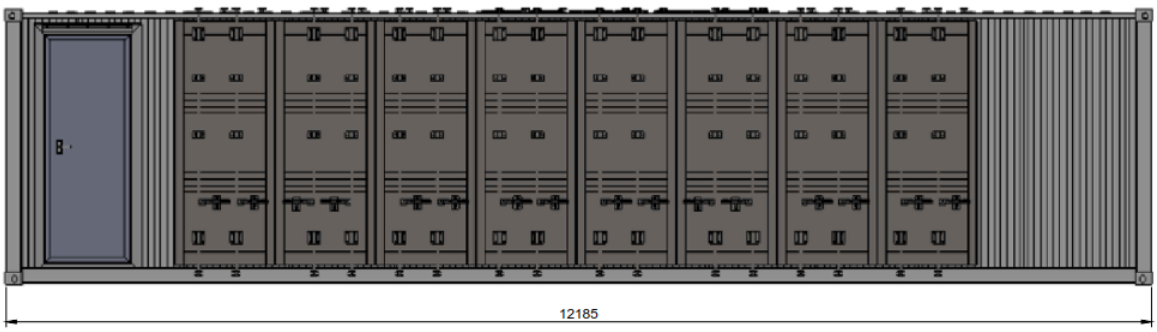


Battery Energy Storage System (BESS)

The BESS storage capacity is proposed to be 40 MW and 160 MWh, however the final sizing and design of the BESS will be determined during the detailed design process. The preferred size of the battery will be influenced by the network conditions and network security/ stability requirements applicable at the time of the grid connection application / agreement process. The most likely technology for the BESS is lithium-ion. The BESS compound will be approximately 150 m by 75 m, fully fenced and secured. The compound components will include:

- Battery container with external metal construction, generally in the form of shipping containers or similar sized custom containerised units with approximate dimensions of 12 m long by 2.5 m wide by 3.0 m high.
- Bidirectional inverters that converts power from DC to AC and allow charging of the batteries via AC to DC rectifiers
- Protection devices and circuit controls such as:
  - integrated circuit control systems to avoid voltage drift
  - current sensing circuits to avoid short circuiting
  - built-in positive temperature coefficient to protect against current surges
  - circuit interrupt device that opens at excess pressure
  - safety vent to release gases on excessive pressure build-up
  - an active fire suppression system
  - separator that inhibits ion-flow when exceeding a certain temperature threshold
  - a Battery Management System to properly manage the batteries state of change, including battery balancing devices, to avoid deterioration and individual cell over/ under voltage

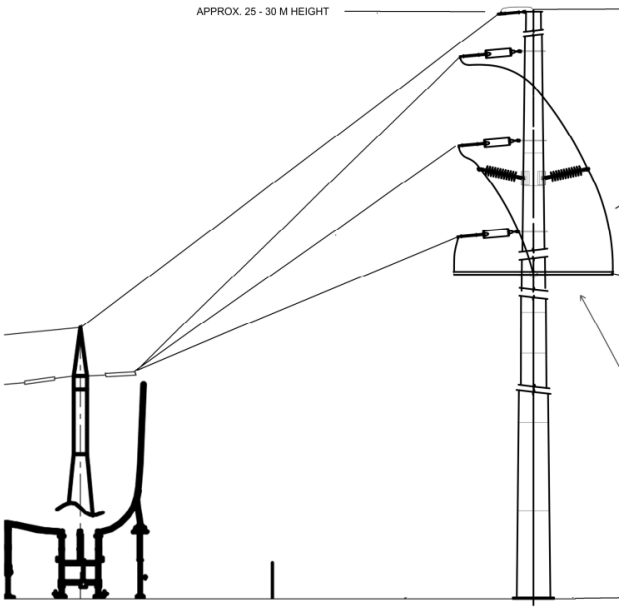
Image 3-5 Indicative external view of battery container



Electricity transmission line (ETL)

A new, single-circuit, 132 kV transmission line is proposed from the substation to a switchyard near the existing Forbes-Parkes 132 kV transmission line located approximately 500 m west of the Newell Highway. The ETL is approximately 8.5 km long and traverses a number of private properties, road reserves and Crown land. The ETL easement will be 45 m wide. Towers are likely to be monopole structures 25 to 30 m high.

Image 3-6 Monopole 132 KV single circuit single strain drawing



Switchyard

The 132 kV switchyard to connect to the existing TransGrid Transmission Line, is expected to occupy a footprint of approximately 90 m long x 55 m wide. Its tallest components are the landing gantries that can reach approximately 12 to14 m.

Image 3-7 132 kV switchyard at Clements Gap Wind Farm

Source: Pacific Hydro

PROJECT
Daroobalgie Solar Farm, Australia

TITLE
Figure 3.5: Solar Farm Site - Key Project Components

DRAWING NO
AU-3015-ENG-PHA-GN-MAP-00006

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CLEARED	K. Munro
APPROVED	K. Munro
DATE	15/02/22
SCALE	1:10,000 A3
DATUM	MGA94 (z55)
REV	A

N

0 100 200 400 m

PacificHydro

FOR EXTERNAL DISTRIBUTION

- Solar Farm Site
- Solar PV arrays
- Substation Bench
- Battery Energy Storage System (BESS)
- O&M Compound
- Construction Laydown Area
- Power Conversion Unit (PCU)
- Substation
- Electricity Transmission Line
- Main Access Tracks
- Public Road
- Waterway
- Cadastral boundary

PROJECT
Daroobalgie Solar Farm, Australia

TITLE
Figure 3.6: Site Layout and Environmental/Cultural Constraints

DRAWING NO
AU-3015-ENG-PHA-GN-MAP-00024

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APPROVED	K. Munro
DATE	11/02/22
SCALE	1:20,000 A3
DATUM	MGA94 (z55)
REV	A

N

0 250 500 1,000 m

PacificHydro

FOR EXTERNAL DISTRIBUTION

- Solar Farm Site (including security fence)
- Solar PV arrays
- Substation Bench
- Battery Energy Storage System (BESS)
- O&M Compound
- Construction Laydown
- Power Conversion Unit (PCU)
- Substation
- Electricity Transmission Line
- Main Access Tracks
- Associated Dwelling
- Key Constraints
- Artefact Scatter Centre*
- Isolated Find*
- Artefact Scatter Extent**
- Proposed Screen Planting
- Public Road
- Waterway
- Cadastral boundary

* Umwelt, 20/08/21
** Umwelt, 24/09/21

Main Map Extent

bing

3.4 Construction

Construction of the Project will take approximately 12 to 18 months from commencement of site works. The exact timing for the commencement of construction will be determined post Project approval, and once the preferred engineering, procurement and construction contractor is selected, and Project financing is in place. The timeframes used as part of this EIS assume a commencement of construction no earlier than 2024.

Minor earthworks would be required for the preparation of the site, including clearing and “grubbing”, minimal site levelling, laying of access track and site drainage works. Due to the relatively flat terrain of the Project area, minimal site preparation and civil works are anticipated prior to construction. Most of the infrastructure will be pre-fabricated off-site, delivered and then assembled and installed on site. Access to the site would be from Troubalgie Road.

Construction activities would be undertaken during the standard construction hours of:

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

Exceptions to these standard working hours may arise from staff arriving and leaving site and the delivery of large solar farm components. Any activity outside normal construction hours will only be undertaken in accordance with approvals from relevant authorities. In general, construction activity will not take place on Sundays or public holidays.

3.4.1 Construction activities

3.4.1.1 Solar farm site

Site establishment works at the solar farm site would include:

- Removal of selected farm fences and other incidental structures to enable construction of access points, access tracks and other infrastructure required by the Project
- Site clearing and grubbing to prepare for levelling works including draining and placing clean engineered fill into the existing on-site farm dams that are not being retained
- Engineered soil treatment as needed to minimise reactive soil impacts
- Drainage and sediment control works (as required) and installation of other sediment control measures (e.g., temporary silt fencing)
- Construction of temporary site offices, material stockpile and laydown areas to accommodate the laydown of construction materials and infrastructure, and temporary car parking during the construction phase
- Construction of a new site access point off Troubalgie Road into the site and internal access tracks. The main access track will be approximately 6 m wide with crushed rock (or similar) and internal access tracks (i.e., between rows of PV panels) approximately 4 m wide constructed with compacted soil (or similar), engineered to withstand light traffic all year round after construction has finished
- Upgrade of Troubalgie Road between Back Yamma Road and the site access point to a sealed road
- Widening of the Back Yamma Road/Troubalgie Road intersection, to accommodate two-way heavy vehicle movements, including Oversize Overmass (OSOM) vehicles
- Establishment of foundations and hardstands for the BESS, substation and switchyard
- Installation of security fencing

Following site establishment works, construction activities at the solar farm site would include:

- DC and AC cable trenching, laying and backfilling
- Installation of framing piles, PV mounting structures and trackers

- Installation of PV panels
- Creation of engineered benches (substation, BESS and O&M compound)
- Installation of PCUs
- Erection of steelwork, equipment, buildings and transformers with the substation and BESS compound(s)

3.4.1.2 Electricity transmission line

Construction activities would include:

- Establishment of the easement including site surveys of pole locations, clearing of vegetation (where required) and installation of sediment control measures (as required)
- Establishment of construction work and a temporary laydown area at each pole location
- Excavation and installation of pole foundations. Footings for the poles will vary depending on soil conditions however a 3 to 4 m direct embedment with stays is anticipated. There are approximately 38 poles proposed approximately 300 m apart
- Erection of poles using a mobile crane. Poles proposed are single-circuit, suspension or tension poles
- Stringing of conductors along the new transmission line
- Connection into new substation and switchyard

3.4.1.3 Switchyard

Construction activities will include:

- Site establishment works including site clearing, grubbing and levelling
- Creation of engineered bench
- Drainage and installation of sediment control measures (as required)
- Establishment of foundation and erection of steelwork and equipment

3.4.2 Construction plant

The primary plant and equipment required for the construction of the Project will include:

- Delivery trucks
- Cement trucks
- Earthmoving machinery and equipment for site preparation
- Cable trenching and laying equipment
- Pile-driving equipment
- Assisted material handling equipment (forklifts and cranes)
- Machinery and equipment for connection infrastructure establishment (cherry-pickers, mobile cranes and other lifting equipment)
- Water trucks for dust suppression

3.4.3 Delivery of construction materials and infrastructure

It is likely that either the Port of Botany, Port of Newcastle or Port Kembla will be used to deliver manufactured equipment and materials to site (e.g., PV panels, steelwork, transformers etc). Raw materials and materials required for site establishment and civil works are also likely to come from the surrounding region. Construction materials are most likely be transported to the solar farm site via road, however rail is another option to transport equipment and materials that will be explored during detail design.

Rail is a safe and efficient choice for transporting the many intermodal shipping containers that will be used to deliver solar panels and other components. The Stockinbingal-Parkes railway line which is managed by the Australian Rail Track Corporation (ARTC) is located close to the Project. Parkes, which is approximately 25 km north of the solar farm site, has access to all major cities in Australia and rail connections to all major seaports.

There are two primary road options available for the transportation of construction materials:

- The Newell Highway (A39) and/or Henry Parkes Way via Parkes from the north
- The Escort Way and Newell Highway via Forbes from the south

Both these options are designated heavy vehicle routes and would be able to accommodate additional heavy vehicle movements associated with the Project. Access to the solar farm site from the Newell Highway would be via local roads. Further discussion regarding traffic and transport impacts is provided in section 6.6.

3.5 Commissioning activities

Commissioning or testing is often staged as equipment is installed and undertaken to ensure all components are operating safely and within their design parameters.

3.6 Operational activities

Once operational, the primary activities conducted on site would include day-to-day routine operations, maintenance of infrastructure, general site maintenance and security. Operation of the solar farm will also likely be supported by local contractors for tasks such as repairs, minor works, weed/vegetation management, fencing and cleaning.

The operational lifespan of the facility is expected to be approximately 30 years, depending on the nature of solar PV technology and energy markets.

3.7 Workforce

During the construction phase, it is expected that the Project will require a peak of approximately 320 construction workers and site support staff. The construction workforce comprises a range of skilled and semi-skilled positions as presented in Table 3.3. Once operational, the Project would require up to six full-time employees.

Table 3.3 Peak construction workforce

	Trade assistant /labourers	Civil construction/ operators/ riggers	Sub-contractors	Electricians	Project management and delivery	Total
Proportion of workforce	30%	10%	15%	25%	20%	100%
Number of positions	96	32	48	80	64	320

3.8 Electricity, water use and wastewater

During construction, diesel generators will be utilised to provide power. Once operational the Project will be grid connected and able to draw power as required but primarily utilise renewable power generated from the solar farm.

It is estimated that up to 18 megalitres (ML) of non-potable water for dust suppression, revegetation and construction of roads and hardstand areas may be required. Approximately 250 kilolitres (KL) of potable water may be required during the construction period for drinking water. It is anticipated that bulk water tankers would be used to supply non-potable water to site and potable water will also be imported to the site.

During operations, water requirements are approximately two ML/year of non-potable water for cleaning panels, firefighting and other maintenance activities. This water is likely to be supplied

from rainwater harvesting or water cartage. Approximately 20 KL/year of potable drinking water would be required.

Portable toilets would be provided for workers during construction. Portable toilets would be emptied by a licenced contractor as required. During operations, a septic tank system would be installed to treat and dispose of sewage. The septic tank would be maintained by a liquid waste licensed contractor.

3.9 Fire management

The Project has been designed with a 10 m Asset Protection Zone around both the perimeter of the site and around the substation, BESS and O&M compound. This zone will have a low fuel load (e.g., mown grass) and allow access for emergency vehicles. The Asset Protection Zone would include a minimum 4 m-wide access track around the perimeter of the site that allows for safe access for emergency vehicles.

All buildings and infrastructure would have fully compliant fire safety systems. A 20,000 L steel or concrete water storage tank fitted with a 65 mm Storz fitting would be located near to the site entrance on the main access track. Further mitigation and management measures to reduce risks of bushfire are detailed in section 6.8.

Vegetation will be cleared along the ETL in accordance with TransGrid easement guidelines. A bushfire risk management plan will be prepared that provides details of the inspection and maintenance activities along the ETL during the lifespan of the Project.

3.10 Security

The perimeter of the solar farm and switchyard sites would be fenced with a security fence. The security fencing would be 2.1 m high and made from a 1.8 m high chain-wire mesh and strainer wire and 0.3 m high barbed wire.

3.11 Lighting

Lighting is proposed in each PCU and at the substation, O&M facility and switchyard for maintenance purposes. Motion-activated security lighting will also be positioned around the perimeter of the site. Lighting would be managed and operated in accordance with *AS4282-1997 - Control of Obtrusive Effects of Outdoor Lighting* to ensure negligible light spill to adjoining properties.

3.12 End of life management

Once the Project reaches the end of its operational life, if the Project is decommissioned, all above-ground structures built as part of the Project will be removed and the site rehabilitated, generally to its pre-existing condition and land use, as far as practicable. The disposal and recycling of project infrastructure will be done in accordance with current waste management legislation and contemporary practice at the time of decommissioning. Wherever possible, efforts will be made to reduce the amount going to landfill in line with best practice sustainability principles.

If re-powering the Project is proposed, an appropriate stakeholder consultation process will be undertaken, and all necessary development approvals will be sought. In any repowering project, the same waste management and sustainability principles will be applied to order to minimise the extent of material going to landfill.

4. Statutory context

4.1 Commonwealth legislation

4.1.1 Environment Protection and Biodiversity Conservation Act 1999

The Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) administered by the Commonwealth Department of the Environment and Energy (DoEE), aims to protect matters of national environmental significance (MNES). The biodiversity assessment undertaken for the Project considered MNES through:

- A desktop review to determine the listed biodiversity matters that are predicted to occur within the locality of the proposal and hence could occur, subject to the presence of suitable habitat
- Targeted field surveys for listed threatened biota and migratory species
- Assessment of potential impacts on threatened and migratory biota, including assessments of significance in accordance with the EPBC Act significant impact guidelines

The assessment found that the Project is likely to have direct impacts to two endangered ecological communities and one vulnerable species listed under the EPBC Act. However, given the relatively small area of the impact, the assessment concluded that the Project is unlikely to constitute a significant impact on these MNES.

An EPBC Act referral was submitted to the DoEE in August 2021. The referral decision – *that the project is not a controlled action* - was received on 7th September 2021.

4.1.2 Native Title Act 1993

The Commonwealth *Native Title Act 1993* provides for the recognition and protection of native title rights (i.e., the rights and interests, recognised by common law, possessed under traditional laws and customs of Aboriginal and Torres Strait Islander people).

The Act recognises the ownership (or set of rights and interest) of land or waters by Aboriginal and Torres Strait Island groups prior to European settlement; provides a mechanism for determining where native title exists and who holds it; and provides for compensation for actions affecting it. The Act establishes ways in which future actions affecting native title may proceeds and sets standards for those actions.

People who hold native title have a right to practice their traditional laws and customs, whilst respecting Australian laws, and have a right to be consulted regarding any proposed action on their land and receive compensation for that action.

A search of the National Native Title Tribunal website did not indicate any native title claims, land use agreements, applications or determinations associated with the Project area.

Native title however has not been extinguished on the crown land traversed by the ETL and a suitable pathway for approval under the *Native Title Act 1993* will be required prior to obtaining an easement/licence under the *Crown Land Acts 1989* for the proposed ETL.

4.2 State legislation

4.2.1 Environmental Planning and Assessment Act 1979

Under the *Environmental Planning and Assessment Act 1979* (EP&A Act) and the State Environmental Planning Policy (State and Regional Development) 2011, solar energy projects are considered State significant development (SSD) if they have a:

- Capital investment value of more than $30 million or
- Capital investment value of more than $10 million and is in an environmentally sensitive area of state significance

The Daroobalgie Solar Farm Project has an estimated capital investment value of $188m (Appendix B). It is therefore classified as SSD and requires approval under Part 4 of the EP&A Act.

The EP&A Act and EP&A Regulation 2000 set out the environmental planning and assessment process for SSD development. In accordance with the EP&A regulations an EIS must accompany a development application for SSD. The consent authority for SSD is typically the NSW Minister for Planning however this responsibility will be delegated to the Independent Planning Commission if:

- 25 or more people object to the application
- Forbes Shire Council objects to the application
- Pacific Hydro discloses a reportable political donation

The objectives of the EP&A Act, relevant to this proposal, are 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
- Facilitate ecologically sustainable development by integrating relevant economic, environmental and social considerations in decision-making about environmental planning and assessment
- Promote the orderly and economic use and development of land
- Protect the environment, including the conservation of threatened and other species of native animals and plants, ecological communities and their habitats
- Promote good design and amenity of the built environment
- Provide increased opportunity for public involvement and participation in environmental planning and assessment

These objectives have been considered throughout the development and assessment of the Project. The Project is anticipated to contribute to the local economy significantly through employment and business opportunities and the solar farm site layout and ETL alignment have been selected to minimise environmental and social impacts. Community consultation commenced early in Project development and ongoing opportunities have been provided for participation throughout the assessment process.

Matters for consideration (in accordance with part 4.15 of the EP&A Act), in determining a development application relevant to this Project are outlined in Table 4.1.

Table 4.1 Matters for consideration (part 4.15 of EP&A Act)

Matters for consideration	Project response
The provisions of:	
– Any environmental planning instruments	Relevant environmental planning instruments are discussed in sections 4.2.2 and 4.3.
– Any proposed instrument that is or has been the subject of public consultation under this Act	There are no proposed instruments relevant to the Project
– Any development control plan	In accordance with Clause 11 of State Environment Protection Policy (State and Regional Development) 2011, development control plans do not apply to SSD
– Any planning agreement that has been entered into under section 7.4	A voluntary planning agreement under section 7.4 has been drafted with Forbes Shire Council (refer section 2.1.5)
– The regulations	Refer section 4.2.1
The likely impacts of that development, including environmental impacts on both the natural and built environments, and social and economic impacts in the locality	This EIS and the technical studies that support it, clearly demonstrate that the proposed Daroobalgie Solar Farm is an appropriately located development that can effectively operate with minimal environmental and social impacts. Residual impacts are predominately associated with construction and are temporary and highly localised amenity

Matters for consideration	Project response
	and traffic impacts resulting from these activities (refer section 6)
The suitability of the site for the development	The Project is situated on land that is relatively flat, has limited ecological value and low cultural significance. The Project avoids high-quality agricultural land, which is one of key community concerns about large scale solar developments in rural areas. Importantly, the main solar farm site is sparsely populated, with only two associated residential dwellings within one kilometre of the site. The relatively flat terrain also minimises the potential of nearby residences overlooking the solar farm area and being exposed to visual and/or glare impacts (refer section 2.3.2)
Any submissions made in accordance with this Act or the regulations	Pacific Hydro will respond to any submissions received following the public exhibition period of this EIS
The public interest	The Project will: – Contribute to the sustainable transition of electricity generation in NSW – Significantly contribute to the local economy through employment and business opportunities – Make a positive and long-lasting contribution to the local community by contributing funding over the life of the Project to community projects/initiatives

4.2.2 Other State legislation and planning policies

Table 4.2 Project response to applicable NSW legislation and planning policies

Legislation	Purpose	Project applicability and response
State legislation		
Biodiversity Conservation Act 2016 (BC Act)	The purpose of the BC Act is to maintain a healthy, productive, and resilient environment for the greatest well-being of the community, now and into the future, consistent with the principles of ecologically sustainable development. The BC Act establishes a framework for assessing and offsetting biodiversity impacts from proposed developments through: - A biodiversity offsets scheme - A biodiversity assessment method	Section 7.9 of the BC Act sets out the biodiversity assessment requirements for SSD. An application for development consent must be accompanied by a biodiversity assessment report (BDAR) which contains an assessment of the potential biodiversity impacts associated with the proposed development. The BDAR is presented in Appendix C and findings summarised in section 6.1.
Heritage Act 1977 (Heritage Act)	The Heritage Act provides for the conservation of items of environmental heritage in NSW. Environmental heritage includes places, buildings, works, relics, moveable objects and precincts of State or local heritage significance	As the Project is classified SSD, the provisions of the Heritage Act do not apply. However, in accordance with the SEARs, a Historic Heritage Assessment has been undertaken for the Project. The findings are presented in section 6.2 and Appendix E
National Parks and Wildlife Act 1974 (NPW Act)	The NPW Act provides for the conservation of objects, places or features (including biological diversity) of cultural value within the landscape significance to Aboriginal people responsible for regulating the management of Aboriginal cultural heritage in NSW under the NPW Act.	Under section 4.41 of the EP&A Act, an Aboriginal Heritage Impact Permit under section 90 of the NPW Act is not required for SSD that is authorised by a development consent. However, in accordance with the SEARs, an Aboriginal Cultural Heritage Assessment has been undertaken for the

Legislation	Purpose	Project applicability and response
		Project. The findings are presented in section 6.2 and Appendix D
Crown Land Management Act 2016 (CLM Act)	The CLM Act came into effect on 1 July 2018. The objects of this Act are: – To provide for the ownership, use and management of the Crown land of NSW – To provide clarity concerning the law applicable to Crown land – To require environmental, social, cultural heritage and economic considerations to be taken into account in decision-making about Crown land – To provide for the consistent, efficient, fair and transparent management of Crown land for the benefit of the people of NSW – To facilitate the use of Crown land by the Aboriginal people of New South Wales because of the spiritual, social, cultural and economic importance of land to Aboriginal people and, where appropriate, to enable the co-management of dedicated or reserved Crown land – To provide for the management of Crown land having regard to the principles of Crown land management	The ETL proposed alignment crosses a Travelling Stock Reserve which is classified as Crown land. Approval from the NSW Crown Land Division is required under the CLM Act for the proposed works through this Travelling Stock Reserve. The use of the Crown land will need to be authorised by an easement or licence.
Aboriginal Land Rights Act 1983 (ALR Act)	The ALR Act establishes a network of democratically elected Aboriginal Land Councils across the State to acquire and manage land as an economic base for Aboriginal communities, as compensation for historic dispossession and in recognition of the ongoing disadvantage suffered by Aboriginal communities. Under the ALR Act Aboriginal Land Councils can make Aboriginal Land Claims or negotiate Aboriginal Land Agreements. The NSW Minister administering the CLM Act is responsible for granting or refusing an Aboriginal Land Claims or entering into an Aboriginal Land Agreement.	Crown land (Lot 7003 DP1060435) has a current Aboriginal Land Claim #19651 lodged by the NSW Aboriginal Land Council (NSWALC) on behalf of the Peak Hill Local Aboriginal Land Council (Peak Hill LALC) on the 27 August 2009. Pacific Hydro has undertaken consultation with NSWALC and Peak Hill LALC regarding the Project. Consent from these parties has been obtained for lodgement of the development application and the parties intend to seek a 'deed of agreement' in the future to allow for future works on the crown land subject to the claim.
Protection of the Environment Operations Act 1997 (POEO Act)	The POEO Act is administered by the Environmental Protection Authority (EPA) and provides for a system of environmental protection licences for scheduled development work and activities, as well as the ability to issue environmental protection notices for pollution and waste management. Environmental offences are also described under the POEO Act	Section 48 of the POEO Act requires an environmental protection licence to undertake scheduled activities at a premise. Solar energy generation does not fall within the definition of electricity generation under Schedule 1 of the POEO Act and therefore does not require an environment protection licence However, it is anticipated that at the time of construction and operation of this Project the BESS will require an environmental protection licence under the POEO Act as changes to 'designated developments' are currently proposed

Legislation	Purpose	Project applicability and response
		under the new EP&A Regulation 2021. These changes include a new category for emerging technologies including large scale battery storage facilities
Fisheries Management Act 1994 (FM Act)	The FM Act aims to conserve native fish stocks and key habitats to conserve the biological diversity of aquatic fauna and flora	Under section 4.41 of the EP&A Act, a permit under section 219 of the FM Act is not required for SSD that is authorised by a development consent
Roads Act 1993 (Roads Act)	The Roads Act provides for the classification of roads and for the declaration of the Roads and Maritime Services (RMS) and other public authorities as roads authorities for both classified and unclassified roads. It also regulates the carrying out of various activities in, on and over public roads	Approval is required under section 138 of the Roads Act to carry out works associated with the construction of the ETL over the Newell Highway and within the Forest Road reserve. Under section 4.42 of the EP&A Act however, an approval under Section 138 of the Roads Act cannot be refused if it is necessary for carrying out SSD authorised by development consent
Rural Fires Act 1997 (RF Act)	The RF Act aims to prevent, mitigate and supress bush and other fires in local government areas of the State. Section 63(2) of the RF Act requires the owners of land to prevent the ignition and spread of bushfires on their land	Under section 4.41 of the EP&A Act, a bush fire safety authority under section 100B of the RF Act is not required for SSD that is authorised by development consent. A preliminary hazard assessment, including bushfire risk, has been undertaken for the Project. The findings are presented in section 6.8 and Appendix N
Water Management Act 2000 (WM Act)	The WM Act regulates the use and interference with surface and groundwater in NSW where a water sharing plan has been implemented. The Water Sharing Plan for the Lachlan Unregulated and Alluvial Water Sources applies to the region in which the Daroobalgie Solar Farm is proposed	Under section 4.7 of the EP&A Act, groundwater extraction activities that are assessed and approved as part of SSDs are exempt from water use approvals under the WM Act. There is no groundwater extraction activity associated with the Project. A Hydrogeological assessment has been undertaken for the Project. The findings are presented in section 6.7 and Appendix N
State Environmental Planning Polices (SEPPs)		
SEPP (State and Regional Development) 2011	This SEPP identifies development that is SSD.	The Daroobalgie Solar Farm has an estimated capital investment value of $188 million; therefore, the proposal is classified as SSD
SEPP (Infrastructure) 2007	The aim of this SEPP is to facilitate the effective delivery of infrastructure across the State. Clause 34 (1) states: "*Development for the purpose of electricity generating works may be carried out by any person with consent on any land in a prescribed rural, industrial or special use zone"* Clause 34 (7) states: "Development *for the purpose of a solar energy system may be carried out by any person with consent on any land*"	The Project area crosses land zoned: – RU1 Primary Production – IN1 General Industrial – SP2 Classified Road and Rail Infrastructure Facilities The Project is therefore is 'permitted with consent' in accordance with Clause 34 of this SEPP

Legislation	Purpose	Project applicability and response
SEPP No. 33 Hazardous and Offensive Development (SEPP 33)	SEPP 33 provides the process for assessing if developments are potentially hazardous or offensive, including threshold levels that trigger the potentially hazardous or offensive status	As State significant infrastructure, SEPP 33 is required to be considered as part of the EIS. A preliminary hazard assessment in accordance with SEPP 33 is provided in section 6.8 and Appendix N
SEPP (Mining, Petroleum Production and Extractive Industries) 2007	This SEPP provides for the proper management and development of mineral, petroleum and extractive material resources within NSW. The SEPP identifies and maps Biophysical Strategic Agricultural Land (BSAL) across the State (this is land with high quality soil and water resources capable of sustaining high levels of productivity)	The Project area does not intersect land mapped as BSAL.
SEPP (Primary Production and Rural Development) 2019	This SEPP was introduced in February 2019 to consolidate and simplify five former agriculture-themed SEPPs. One of the aims of the policy is to identify State significant agricultural land for the purpose of ensuring the ongoing viability of agriculture on the land, having regard to social, economic and environmental considerations. However, the Agriculture Commissioner is currently consulting over the definition and identification of State Significant Agricultural Land and schedule 1 of the policy (map of significant agricultural land) is yet to be released.	The Project area is not classified as high-quality agriculture land (refer section 6.3) or mapped as BSAL

4.3 Forbes Local Environmental Plan

The Forbes Shire Council Local Environmental Plan (LEP) is the primary statutory planning instrument for the Forbes Shire Council. The Project area is predominately zoned as RU1 Primary Production under the LEP however the ETL also traverses IN1 General Industrial and SP2 Infrastructure zones. The objectives of the zones are presented in Table 4.3.

Table 4.3 Zone objectives

RU1 Primary Production	SP2 Infrastructure	IN1 General Industrial
– Encourage sustainable primary industry production by maintaining and enhancing the natural resource base – Encourage diversity in primary industry enterprises and systems appropriate for the area – Minimise the fragmentation and alienation of resource lands – Minimise conflict between land uses within this zone and land uses within adjoining zones – Provide opportunities for intensive and extensive agriculture in appropriate locations consistent with the environmental capability of the land	– To provide for infrastructure and related uses – To prevent development that is not compatible with or that may detract from the provision of infrastructure	– To provide a wide range of industrial and warehouse land uses – To encourage employment opportunities – To minimise any adverse effect of industry on other land uses – To support and protect industrial land for industrial uses

'Electricity generating works' is not listed as permitted for land zones RU1 Primary Production, SP2 Infrastructure and IN1 General Industrial, however, electricity generating works are classified

as ‘permitted with consent’ in these zones in accordance with Clause 34 of the State Environmental Planning Policy (Infrastructure) 2007.

The proposed Project is not inconsistent with the objectives of any of the zones. The development will impact the availability of the land for primary production; however, it will also sustainably harness a natural resource, namely solar energy, and will provide for a diversified economic stimulus and support to rural communities. The land affected by the development is not considered to be high quality agricultural land and is not mapped as BSAL i.e., land with high quality soil and water resources capable of sustaining high levels of productivity.

4.4 Summary of permits/licences

The following permits/licences are required for the Project.

- Approval under Part 4 of the EP&A Act
- Consent under section 138 of the *Roads Act 1993* for ETL works within Forest Road reserve and the crossing of Newell Highway and Daroobalgie Road. Forbes Shire Council is the roads authority for all local roads and the Newell Highway. Consent in relation to the Newell Highway (classified road) will be referred to TfNSW for concurrence
- Infrastructure licence with ARTC for ETL easement over Stockinbingal-Parkes railway line
- An easement/licence under the *Crown Land Management Act 2016* for the proposed ETL easement through the Crown land. Consent from native title holders and the Peak Hill LALC, to ensure compliance with *Native Title Act 1993* and *Aboriginal Land Rights Act 1983*, is required prior to grant of the easement/licence by Crown Lands.
- Environmental protection licence under the POEO Act for the BESS *(anticipated)*

5. Stakeholder engagement

Pacific Hydro's approach to engagement is based on the International Association of Public Participation methodology and principles. Key documents that outline Pacific Hydro's consultation approach include:

- Pacific Hydro's Community Charter (Box 5.1)
- Pacific Hydro's Reflect Reconciliation Action Plan
- Daroobalgie Solar Farm Community Engagement Plan
- Clean Energy Council's Best Practice Charter for Renewable Energy Developments (CEC, 2021)

Box 5.1 Pacific Hydro's Community Charter

Pacific Hydro's Community Charter

Pacific Hydro aims to establish and maintain respectful and collaborative relationships with the communities in which it operates or seeks to operate in. Recognising that community support is as critical to project success as technical and financial factors, Pacific Hydro endeavours to develop, maintain and continually improve our relationships and support for our projects.

We aim to develop mutual trust and respect within our host communities through adopting appropriate levels of transparent, open engagement and communication at all stages of our projects. We are committed to delivering respectful, positive and lasting social, environmental and economic benefits to our host communities by supporting community initiatives and seeking mutually agreed solutions to potential issues.

Our Purpose, Vision, Values and Behaviours guide the interactions we have with all stakeholders, including local communities, and we recognise and respect people's rights, local laws, customs and cultures. Pacific Hydro is committed to working with local communities in ways that are inclusive and collaborative to identify and mitigate potential impacts resulting from our activities, including social, cultural, health, safety or environmental, responding to the needs of each community.

As a member of your community, Pacific Hydro will also strive for best possible outcomes in response to enquiries, complaints and feedback from our stakeholders

5.1 Engagement objectives

The objectives of the stakeholder engagement program are to:

- Establish respectful and collaborative relationships with the local community
- Provide Project neighbours and key stakeholders with an opportunity to meaningfully participate in the development of the Project
- Identify local considerations and context to assist to mitigate any community, environment and stakeholder risks
- Build local support for the Project
- Ensure NSW government requirements in relation to community and stakeholder engagement are met

5.2 Consultation methods

Preliminary consultation with the Forbes Shire Council and project neighbours commenced in January 2019. Although face-to-face consultation was preferred where possible, due to persistent restrictions from COVID-19 lockdowns throughout 2020 and 2021, Pacific Hydro has employed a mix of engagement methods to provide information about the Project and seek feedback. This has included:

- Door knock: Visits to all dwellings within five kilometres of the solar farm site to introduce the Project and obtain contact details of nearby landholders (January 2019)
- Face-to-face: In-person meetings to provide information or updates; introduce the Project; seek feedback or facilitate varied in-depth discussion about the Project with a range of key stakeholders
- Video conference: Where face-to-face meetings were not possible, video conferences were the preferable method for consulting with regulatory and statutory bodies, key landholders, community organisations and other stakeholders as requested
- Phone call and email: Phone and/or email was utilised for consistent and ongoing contact with stakeholders to provide regular updates, request information, obtain feedback and discuss issues
- Letterbox drop (newsletters): A Project information fact sheet was mailed to a total of 3,389 local residences and businesses in December 2020. A Project update newsletter was mailed to 3,389 households and businesses in April 2021. This newsletter advised the dates and times of the upcoming community engagement sessions
- Public information sessions: Two face-to-face, local information sessions were held at the Rotary Ipomoea Market, Lions Park and Forbes Youth and Community Centre in Forbes in May 2021
- Fact sheets: Six fact sheets were developed for the public information sessions and published online. These provided a Project overview as well as information about potential environmental impact and mitigations, flooding, social and economic impacts and benefits, traffic and transport impacts and visual impacts
- Website and online platform: A Project page *https://pacifichydro.engagementhub.com.au* was developed to disseminate information on the Project, obtain feedback from stakeholders and provide additional options for making enquiries. The Project page had 725-page views between 1 July 2020 and 1 September 2021 and 431 documents were downloaded from the site, including fact sheets and newsletters. General information on the Project was also displayed and updated on the proponent's main website
- Advertisement: Prior to the May 2021 public information sessions, advertisements and articles were published in the local newspaper, The Forbes Advocate

5.3 Engagement activities

5.3.1 Government, State agencies and local businesses engagement

Engagement activities with local, state and commonwealth government authorities, State agencies and local business are detailed in Table 5.1.

Table 5.1 Government, State agencies, and local business engagement

Stakeholder	Consultation Method	Discussion topics	Project response
Office of the Federal Member for Riverina, The Hon. Michael McCormack, Deputy Prime Minister	Video conference Newsletter	Economic and social benefits of the Project Potential visual and glare impacts Impact on landholders from the transmission line	Socio-economic and visual impacts (including glare) are addressed in section 6 Extensive consultation with landholders in proximity of transmission line to ensure potential impacts understood and mitigated during route selection process
NSW Department of Planning, Industry and Environment (DPIE)	Phone and email	Visual impacts, road upgrades and transport routes, soil suitability Bushfire risk especially in relation to battery storage aspects Recommendation that the 'Large Scale Solar Energy Guideline' be consulted to help guide the Project	Visual, traffic and soil impacts addressed in section 6 Bushfire risk as a result of the Project has been assessed to be low however a bushfire management plan will be prepared to outline management of fuels on site, storage and maintenance of firefighting equipment, adequate water supplies etc
State Member for Orange, Phillip Donato, MP	Video conference Newsletter	Community engagement and support for the Project Decommissioning requirements Flooding risk Spread of weeds and pests	Consultation activities indicate a high level of Project support from landholders, neighbours, businesses, and the broader Forbes community. The solar farm site has been designed to avoid areas subject to flooding. All electrical equipment including PV modules will be installed 300 mm above 1% AEP flood levels. Flooding impact assessment included in section 6 Management of weeds and pests will be outlined in construction and operation environmental management plans (section 6)
State Minister of Energy and Environment, Matt Kean, MP	Video conference Newsletter	Indicated support for the proposed community benefit sharing program	Draft voluntary planning agreement well advanced between Pacific Hydro and Forbes Shire Council that outlines arrangements and commitment to a community benefit sharing program (section 5.4)
Forbes Shire Council	Face-to-face Video conference Phone and email	*Preliminary consultation* The importance of the Central West Livestock Exchange to the local economy Transmission line over the railway to consider plan for double stacked containers and inland rail Stockinbingal to Parkes upgrade project (a new 2.3 km crossing loop inside rail corridor located north of Daroobalgie Road) Availability of rental accommodation especially during the Parkes Elvis festival	Extensive consultation with Central West Livestock Exchange during Project planning to ensure potential impacts are assessed and mitigated in the Traffic impact assessment (section 6) Consultation with ARTC and transmission line designed in accordance with ARTC requirements to avoid impacts on railway line Availability of accommodation considered in socio-economic assessment, particularly around key events of festivals in Forbes and Parkes

Stakeholder	Consultation Method	Discussion topics	Project response
		Traffic and transport assessment to consider potential dust generation from Troubalgie Road, school bus route down Back Yamma road and intersection at Forest Rd/Newell Highway Visual Impact to assess view from Ashburnham Road and consider glare impacts on local aircraft Bushfire risk and availability of water *Traffic and Transport Impact Assessment* Need for road upgrade of Troubalgie Road to the site access point Need for upgrade of Back Yamma Road/Troubalige Road intersection Use of Forest Road and need for a safety assessment of the Forest Road/Newell Highway intersection Use of group transport for workers during construction *Voluntary planning agreement* Scope, structure and monetary commitment to a community benefit sharing program for the Project	Commitment to seal Troubalgie Road and upgrade Back Yamma Road/Troubalgie Road intersection to mitigate impacts on these roads Commitment to prohibit heavy vehicle traffic and restrict light vehicle traffic on Forest Road Ashburnham Road included in visual assessment. Potential impact assessed to be low Bushfire risk as a result of the Project has been assessed to be low however a bushfire management plan will be prepared to outline management of fuels on site, storage and maintenance of firefighting equipment, adequate water supplies etc. Draft voluntary planning agreement well advanced between Pacific Hydro and Forbes Shire Council that outlines arrangements and commitment to a community benefit sharing program (section 5.4)
Roads and Maritime Service (RMS) now Traffic for NSW (TfNSW)	Face-to-face Video conference Phone and email	Traffic generated on Central West Livestock Exchange sale days Use of rail for delivery access to site, noting proximity of Parkes rail interchange/ Inland Rail project Health and safety and consideration of high accident rates associated with construction workers/ traffic Pre, mid and post road dilapidation reports	Extensive consultation with Central West Livestock Exchange during Project planning to ensure issues were incorporated into traffic impact assessment Consideration of a transport pool for construction workers to minimise traffic volumes and associated safety risks associated with construction traffic Commitment to pre, mid and post road dilapidation reports in traffic impact assessment
Australian Rail and Track Corporation (ARTC)	Phone and email	Approval required for crossing the Stockinbingal-Parkes railway line Cumulative impacts from Inland Rail's Stockinbingal-Parkes Project and Daroobalgie Solar Farm Project	Consultation with ARTC and transmission line designed in accordance with ARTC requirements to avoid impacts on railway line Third party works application submitted in September 2021 order to receive 'landholder consent' for submission of the EIS Feedback received from ARTC in October 2021 resulted in minor revision to transmission line alignment to avoid the rail corridor

Stakeholder	Consultation Method	Discussion topics	Project response
APA Group	Phone and email	Approval requirements for crossing high pressure gas pipeline corridor that runs adjacent to the Newell Highway. APA Group require a Third party works approval and an electrical hazard study in accordance with requirements of AS 4853-2012 (Low frequency induction and earth potential rise) prior to any works within the APA easement.	Electrical hazard study and third party works application will be undertaken post Project approval and prior to the commencement of works.
Central West Local Land Services	Face-to-face Video conference Phone and email	Potential impacts to current land use	Land use impacts assessed in section 6
NSW Rural Fire Service and NSW Police Service - Forbes	Video conference Phone and email	Bush fire risk and the need for a water tank on site. Back Yamma State Forest was not considered to be located close enough to pose substantial bushfire risk Vegetation management and weed and pest management plan Management of contractors. Some local projects have utilised breath-testing to ensure contractor staff are not a risk to themselves or community With other local significant projects, police have observed that most security issues can be mitigated and managed by on site security measures	Bushfire risk as a result of the Project has been assessed to be low however a bushfire management plan will be prepared to outline management of fuels on site, storage and maintenance of fire fighting equipment, adequate water supplies etc Management of contractors and safety issues have been assessed in the socio-economic impact assessment (refer section 6.9)
Essential Energy	Phone and email	Potential ETL routes and connection capacity into 66 kV network	Potential ETL route alongside existing 66 kV network along the Newell Highway not pursued due to constraints in the existing easement
Central West Livestock Exchange	Video conference Phone and email Newsletter	Dust from traffic movements. Mitigation measures such as sealing road and dampening with water to be considered. Many neighbours in the area would be supportive of the road being sealed Traffic impact during construction on Livestock Exchange operations (Sunday, Monday and Tuesday are considered to be high-traffic days)	Commitment to seal Troubalgie Road and upgrade Back Yamma Road/Troubalgie Road intersection to mitigate impacts on these roads Commitment to prohibit heavy vehicle traffic (except to the extent required to gain access to and construct the ETL) and restrict light vehicle traffic on Forest Road Traffic management measures to avoid impacts on sale days detailed in section 6
Forbes Chamber of Commerce	Video conference Phone and email Newsletter	Employment opportunities Forbes and Parkes chambers confirm that Forbes and Parkes are well resourced from a labour perspective to support the Project due to recent solar developments in the	It is anticipated that approximately 50% of the construction workforce will be able to be sourced from the surrounding region. Employment opportunities are outlined in the socio-economic assessment (section 6)

Stakeholder	Consultation Method	Discussion topics	Project response
		region and a suitably skilled workforce. The Chamber had a positive response to the proposed community benefit scheme associated with the Project	
Parkes Business Chamber	Phone and email Newsletter	Glare impact from Project on Parkes LGA Interested in community benefit program	Socio-economic and visual impacts (including glare) addressed in section 6 Draft voluntary planning agreement well advanced between Pacific Hydro and Forbes Shire Council that outlines arrangements and commitment to a community benefit sharing program (section 5.4)
Central West Lachlan Landcare	Phone and email Newsletter	Flood risk of Project site as the area can receive large amounts of rain in short timeframes	The solar farm site has been designed to avoid areas subject to flooding. All electrical equipment including PV modules will be installed 300 mm above 1% AEP flood levels. Flooding impact assessment included in section 6
Parkes Elvis Festival Committee	Phone and email	Community benefit program Availability of accommodation during festival times especially, over the weekend, all accommodation is booked within Forbes and Parkes due to the Festival Potential traffic impact from construction. There are shuttle buses running every half-hour from Forbes to Parkes across the festival period. Throughout this time, contractor movement and deliveries may need to be managed	Draft voluntary planning agreement well advanced between Pacific Hydro and Forbes Shire Council that outlines arrangements and commitment to a community benefit sharing program (section 5.4) Socio-economic and traffic impacts addressed in section 6

5.3.2 Mineral resource companies

Godolphin Resources Pty Ltd and FMG Ltd have exploration licences over the Project area.

A meeting was held between Godolphin Resources and Pacific Hydro on 11 October 2021. Pacific Hydro provided information on the proposed location of Project infrastructure within the mining exploration activities and likely timing of the Project. Godolphin discussed the objectives of their exploration program. Godolphin provided a letter to Pacific Hydro on 3 November 2021 stating that their EL areas were highly prospective for mineral resources and that they have concerns about the proximity of the proposed Project area to their Mining Lease (ML739). Godolphin have a planned drilling program for November/December 2021 to verify and firm up resources within ML739. Pacific Hydro and Godolphin Resources have agreed to continue consultation regarding the co-existence of both parties' interests over the Project area.

Pacific Hydro provided information about the proposed Project to FMG Ltd via email on 4 October 2021 and offered a meeting to discuss how the Project and proposed exploration activities may interact. FMG Ltd have advised that they are currently reviewing the information provided.

Pacific Hydro will continue to engage with Godolphin Resources and FMG Ltd as required during the assessment phase of the EIS and ongoing over the life of the Project, as required.

5.3.3 Landholder and neighbour engagement

Pacific Hydro has had ongoing engagement with the landholders participating in and neighbouring the Project.

During the ETL route selection stage, letters were sent to landholders along the three alternative routes being investigated advising of Pacific Hydro's route selection activities in the local area. Feedback obtained from this exercise was that landholders were generally indifferent to the proposed transmission line route, with only two landholders voicing their concern about the potential visual impact of the transmission line. The two landholders with concerns accepted a proposal to host the transmission line on their property (via a new easement). Minor adjustments have also been made to the ETL route at the request of landholders. These have included moving the proposed ETL route/easement to a property boundary and a road reserve. The easement was also adjusted, at the request of Forbes Shire Council, to avoid impacting on a property proposed for expansion of the existing landfill site near Daroobalgie Road.

In 2021, nine participating and neighbouring landholders participated in a questionnaire on potential land use conflicts from the proposed Project. Two potential conflicts, traffic during construction and visual impact, were identified during this consultation. The overall response, however, clearly indicated that surrounding landholders were generally positive about the Project and believed any potential land use conflicts would be manageable.

5.3.4 Community engagement

Scoping phase (SEARs)

Following a stakeholder mapping exercise to identify all dwellings within a five-kilometre radius of the Project site, a door knocking campaign provided for initial introductions with nearby neighbours in January 2019. Where meetings did not take place, calling cards and letters were left at the residence to introduce the Project and provide contact information. Sentiment from initial contact with the surrounding community was either positive or indifferent.

EIS phase

As the project layout, planning and ETL route for Project was refined throughout 2020, engagement with the surrounding community increased to inform the broader community about the Project and obtain feedback for the EIS. As noted above, due to COVID-19 restrictions throughout 2020 and 2021, the extent of face to face consultation was constrained at certain times and a variety of consultation methods were adopted.

A Project information fact sheet was mailed to the surrounding community within 20 km of the solar farm site (a total of 3,389 local residences and businesses) in December 2020 and via email to a stakeholder mail list.

A Project update newsletter was also mailed to 3,389 households and businesses in April 2021. This newsletter advised the dates and times of in-person community engagement sessions conducted on 4th and 6th of May 2021 at the Forbes Youth and Community Centre and Rotary Ipomoea Market, Lions Park respectively. The in-person community information sessions were also advertised in the Forbes Advocate and via social media (Facebook, LinkedIn and Twitter).

The community engagement sessions provided an opportunity for the community to engage directly with representatives from Pacific Hydro. Displays and fact sheets were presented that provided information about the Project and the findings of the impact assessment studies and proposed mitigation measures. Sixty-three people in total attended the sessions. Matters raised by the community at the sessions are summarised in Table 5.2.

Table 5.2 Matters raised during community consultation

Matter	Number of times matter was raised	Project response
General questions associated with how solar farms work? Technology proposed, location and timing of Project etc.	8	Information/fact sheets provided to community members
Use of Forest Road for construction traffic during wet periods	2	Forest Road will not be utilised by heavy vehicles during construction. Use by light vehicles will also be heavily restricted to avoid impacts on this road
Local opportunities for employment	4	Approximately 50% of construction jobs (~167 jobs during peak construction) are anticipated to be sourced locally. During operations the solar farm will be staffed by up to six full-time employees
Impact on agricultural land	2	Solar farm site specifically chosen on a site not classified as 'high quality' agricultural of BSAL land. There is potential to graze sheep on the solar farm site once the site is operational.
Potential flooding of solar farm site during times of heavy rainfall	3	Flood modelling has been used to inform the solar farm site design. The south-eastern area corner of the site in the vicinity of an existing watercourse will be avoided. Therefore, there will not be any impact on the main surface water flow path through the site. Four of the six existing farm dams will be retained, which will further assist with retaining water on the site during heavy rainfall events and mitigating sedimentation during construction
Ownership of Pacific Hydro	7	Pacific Hydro is owned by State Power Investment Corporation (SPIC) one of the top five power generation groups in China. Pacific Hydro operates a high quality, diversified portfolio of wind, solar and hydro renewable assets in Australia and has a growing electricity and gas retail business, Tango Energy. Due to Pacific Hydro's overseas ownership, lease of the land for the period proposed by Pacific Hydro requires approval of Australia's Foreign Investment Review Board (FIRB).

Image 5-1 Community engagement session - Rotary market Forbes (6 May 2021)

5.3.5 Engagement with Aboriginal parties

Consultation with Aboriginal parties was undertaken in accordance with the relevant aspects of Part 5, Division 2 Clause 60 of the NPW Regulation and the Aboriginal Cultural Heritage Consultation Requirements for Proponents (DECCW, 2010). As a result of notification, the following five Aboriginal parties registered an interest in the Project:

- Peak Hill Local LALC
- Corroboree Aboriginal Corporation
- Gunjeewong Cultural Heritage Corporation
- Forbes Aboriginal and Community Working Party
- Wiradjuri Council of Elders Peak

Information about the Project, including a proposed methodology and an invitation to participate in a cultural heritage survey was provided to all registered Aboriginal parties. Three registered Aboriginal parties participated in the site surveys; Peak Hill LALC, Corroboree Aboriginal Corporation and Gunjeewong Cultural Heritage Corporation. Pacific Hydro attended at the commencement of these surveys to meet participants.

A copy of the draft ACHA, prepared by Umwelt Consulting Pty Ltd, was provided to all registered Aboriginal parties for review and comment. Gunjeewong Cultural Heritage Corporation provided comment by email, which indicated their agreement with the outcomes of the ACHA.

Consultation with NSW Aboriginal Land Council and Peak Hill LALC was undertaken to obtain landholder consent to lodge the development application as required as part of the landholder consent from Crown Lands.

5.4 Community benefit sharing program

Pacific Hydro values the support of the communities in which we operate. We consult with our host communities throughout our project lifecycles, from planning to development, construction and operation and support local initiatives through our community benefit sharing program. Pacific Hydro's community benefit sharing program aims to:

- Give back to the communities that host our clean energy projects
- Support and build stronger, cohesive, and more resilient communities
- Collaborate with and empower communities to identify their priorities
- Encourage and support innovative solutions and approaches to local issues
- Encourage organisations to work together and form partnerships to deliver community-based services
- Promote positive, long-term local outcomes and capabilities
- Promote local awareness of, and commitment to, the sustainable community ideal

The community benefit sharing program for the Daroobalgie Solar Farm will provide a portion of revenue from the Project back into the host community. The program is committed to supporting projects that will provide lasting benefits to the local community across the areas of; health and welfare, education and training, environment, sporting or recreation, culture and the arts and Aboriginal and Torres Strait Islanders. Funds will be distributed following an application process and consultation with and involvement of community members ensures that funding allocations are based on identified community priorities.

5.5 Ongoing stakeholder engagement

Pacific Hydro will continue engagement with all stakeholders during the development, construction, and operational phases of the Project.

During the public exhibition period of the EIS, Pacific Hydro will hold a community engagement session to allow the community an opportunity to ask detailed questions about the findings of the specialist environmental assessments and potential impacts of the Project.

Throughout all phases of the Project, Pacific Hydro will maintain an up-to-date Project website with contact details and a means of providing feedback. Newsletters will be circulated to communicate important Project milestones, dates and/or events.

6. Environmental impact assessment

6.1 Biodiversity

6.1.1 Overview

A biodiversity assessment was undertaken by GHD and is provided in Appendix C. The study involved:

- Desktop assessment and background research
- Site surveys including four biodiversity assessment methods (BAM) surveys (September 2018 to August 2020) and three candidate species credit fauna and flora surveys (August 2019, August 2020, December 2020)
- Vegetation mapping
- Identification of impacts and potential mitigations
- Offset calculations
- Preparation of a Biodiversity Development Assessment Report (BDAR)

The study area for the biodiversity assessment includes the solar farm site, the ETL and switchyard site. A buffer of 1,500 m was used for desktop assessments.

6.1.2 Existing environment

6.1.2.1 Landscape features

The Project is in a primarily agricultural area, northeast of the rural town of Forbes. Key landscape features are shown in Table 6.1.

Table 6.1 Landscape features

Landscape feature	Description
IBRA bioregions and subregions	NSW South West Slopes Bioregion, Lower Slopes
NSW (Mitchell) landscape regions	Eugowra Plains (solar farm site and eastern section of ETL) Calarie Plains (western section of ETL)
Soils	Alluvial clay soils on a relatively flat landscape
Rivers and streams	An unnamed watercourse traverses the southeastern corner of the solar farm site. Undefined, ephemeral drainage lines are present in the eastern and western sections of the ETL
Important wetlands	No important wetlands occur in the study area, on adjacent land or downstream
Key fish habitat	The watercourse on the solar farm site and drainage lines present along the ETL route are not listed as key fish habitat areas. The Lachlan River and its floodplain areas (located approximately 3.5 km and 1 km south of the solar farm site respectively) have been identified as a major river and key fish habitat
Connectivity features	Vegetation in the study area provides limited connectivity with areas outside the study area with the exception of woodland in the Crown land reserve which is connected to a larger patch of woodland vegetation
Areas of geological significance and soil hazard features	There are no karst, caves, crevices, cliffs, rocks or other areas of geological significance located within or surrounding the study area
Areas of outstanding biodiversity value	No declared areas of outstanding biodiversity value occur in or near the study area
Landscape features listed in the SEARs	No additional landscape features are listed in the SEARs

6.1.2.2 Vegetation

The majority of the solar farm site has been cleared and used for agriculture (sheep and cattle grazing, and cropping) with cropping and improved pasture dominated by exotic species comprising 267.43 hectares of the site and native vegetation just 0.2 hectares. Two rows of plantings within the solar farm site have been classified as category 1 – exempt land due to evidence of them being planted post 1990 and being within existing cleared and cropped paddocks.

The ETL and switchyard site have also been predominantly cleared, however native grassland species have persisted in the central portion of the ETL. There are small patches of gilgai wetland dominated by *Eleocharis* spp. with native grass species such as *Cynodon dactylon* (Couch) and *Enteropogon acicularis* (Curly Windmill Grass) surrounding the gilgais and Weeping Myall woodland. The western section of the ETL crosses a Crown land reserve, which is predominantly woodland dominated by Grey Box.

Plant community types (PCTs) mapped within the study area are summarised in Table 6.2 and shown in Figure 6.1 and Figure 6.2.

Table 6.2 PCTs in the study area

Vegetation type	BC Act status	EPBC status
PCT 26 – Weeping Myall open woodland of the Riverina Bioregion and NSW South Western Slopes Bioregion	Endangered ecological community	Endangered ecological community
PCT 76 – Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions *This PCT is present in a number of vegetation zones including planting, good and derived native grassland*	Endangered ecological community	Endangered ecological community
PCT 80 – Western Grey Box – White Cypress Pine tall woodland on loam soil on alluvial plains of NSW South Western Slopes Bioregion and Riverina Bioregion *This PCT is present in a number of vegetation zones including good, derived native grassland and derived scrub*	Endangered ecological community	Endangered ecological community
PCT 244 – Poplar Box grassy woodland on alluvial clay-loam soils mainly in the temperate (hot summer) climate zone of central NSW (wheatbelt)	Not listed	Does not meet the key diagnostic characteristics in the listing advice
PCT 360 – Gilgai wetland mosaic in the southern NSW South Western Slopes Bioregion	Not listed	Not listed

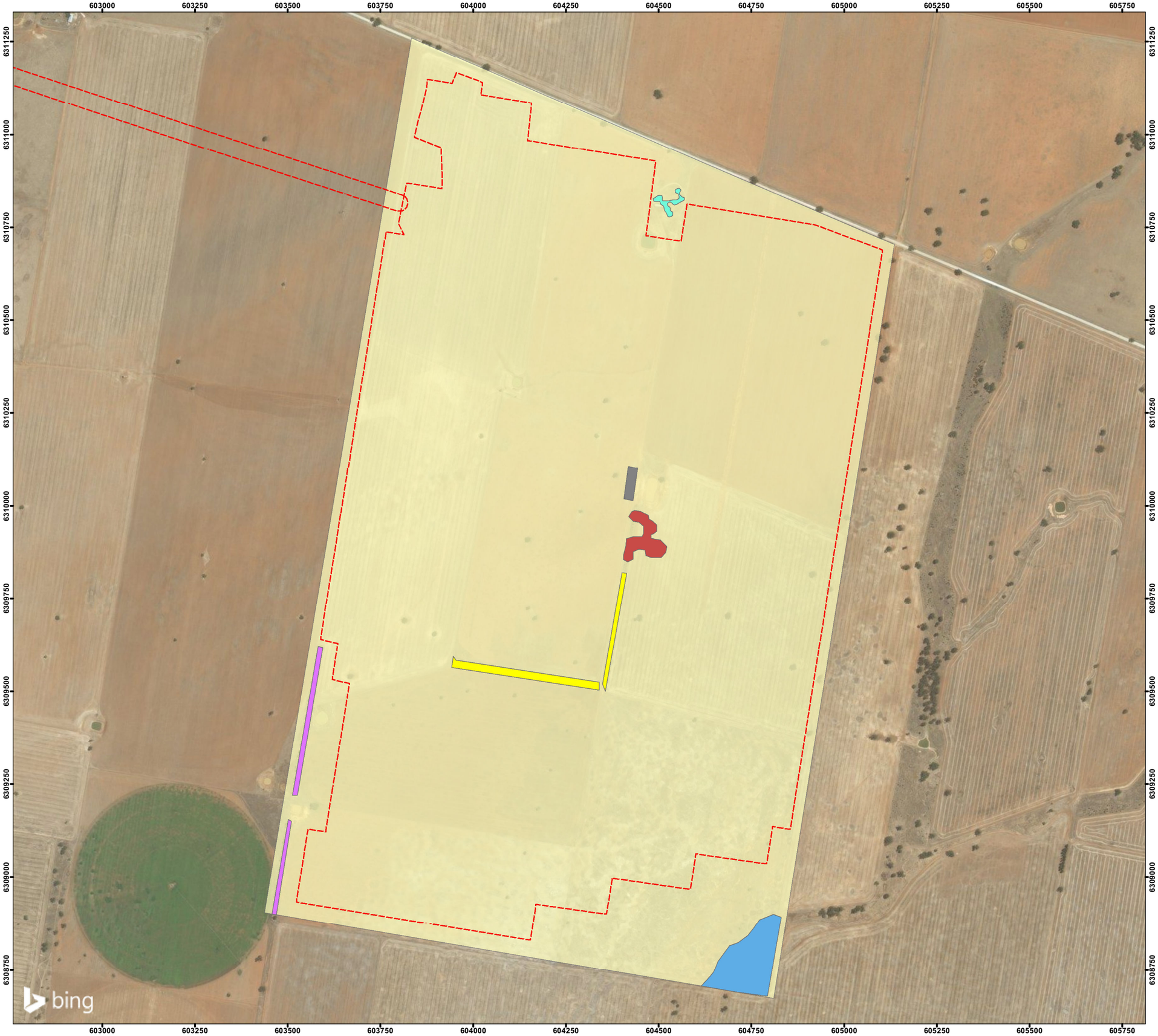
6.1.2.3 Flora species

A total of 215 species from 55 families were identified within the study area during the assessment, including 134 native species and 81 exotic species. No threatened flora species were identified.

6.1.2.4 Fauna species

A total of 61 species of fauna were recorded during field surveys. These included 57 bird species, two mammal species and three frog species. Two threatened fauna species listed under the BC Act were recorded during the surveys: Grey-crowned Babbler and Superb Parrot.

Fauna habitat in the Project area is summarized in Table 6.3. There are no culverts, cliff lines, substantial rock outcrops, important wetlands or waterbodies within the Project area.



PROJECT
Daroobalgie Solar Farm, Australia

TITLE
Figure 6.1: Vegetation - Solar Farm Site

DRAWING NO
AU-3015-ENG-PHA-GN-MAP-00011

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DATUM	MGA94 (z55)
REV	B

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0 100 200 400 m

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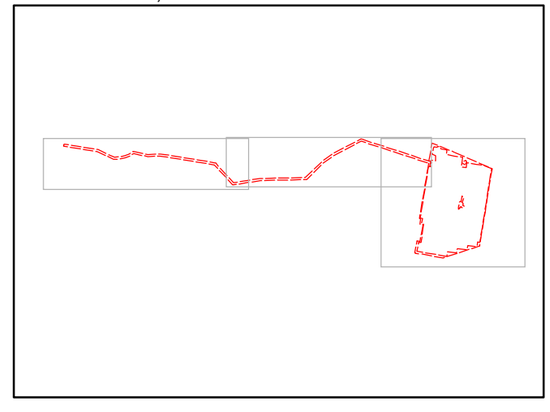
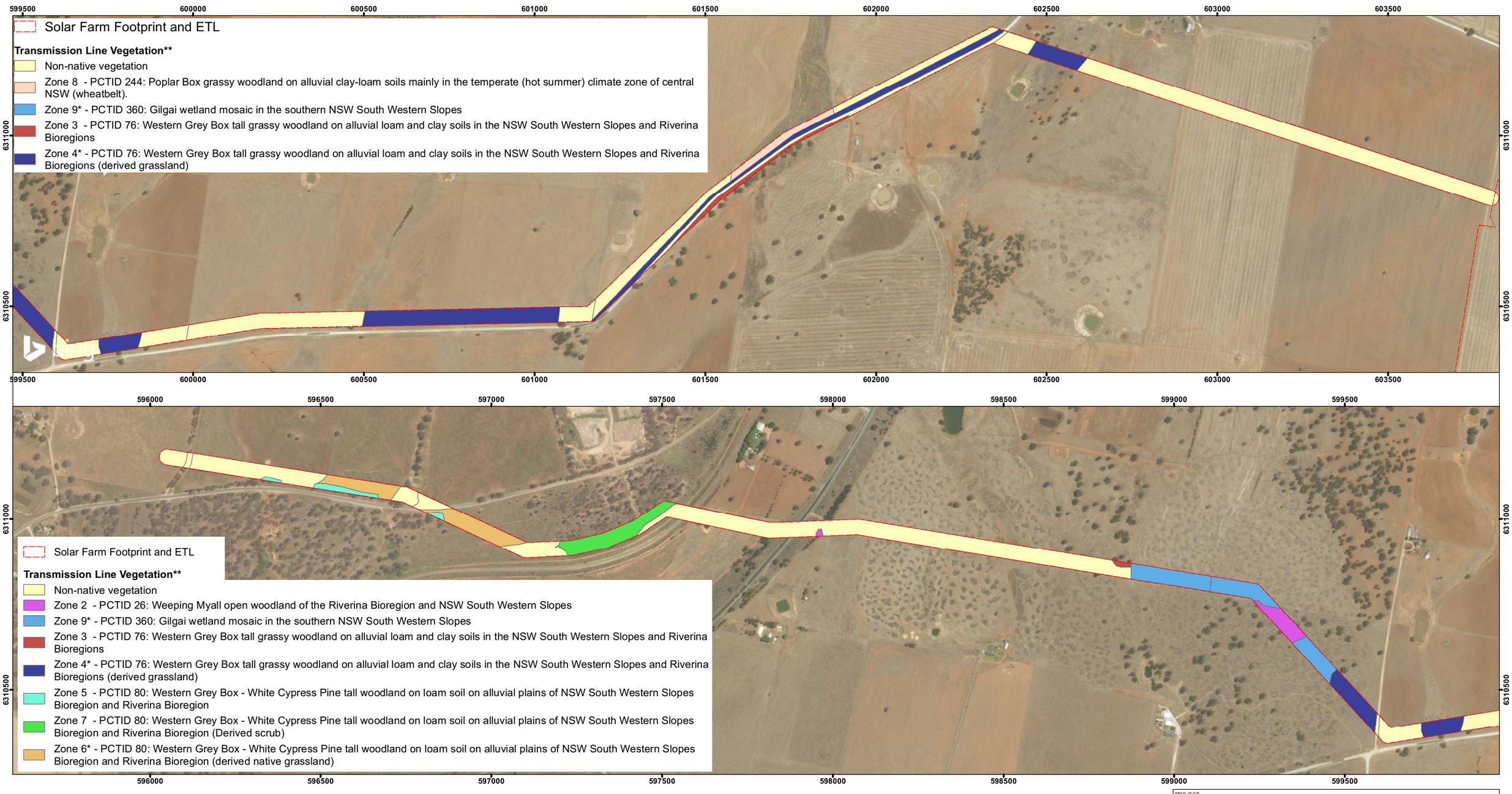
Solar Farm Footprint and ETL

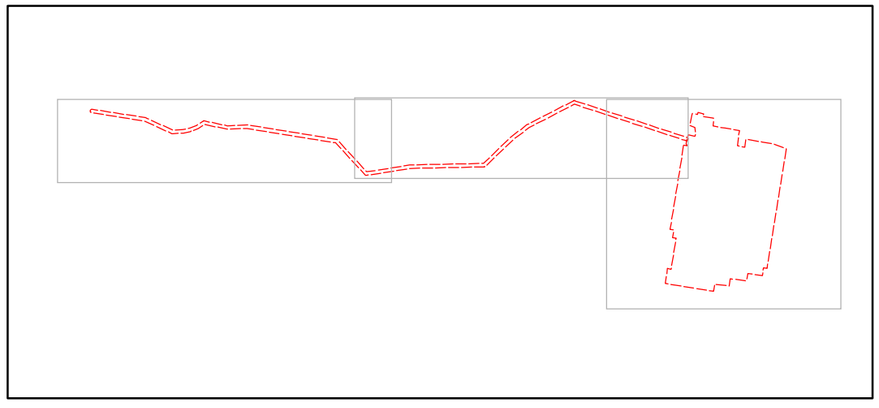
Vegetation*

- Category 1 - Exempt Land
- Non-native vegetation
- PCTID 217: Mugga Ironbark - Western Grey Box - Cypress Pine tall woodland on the footslopes of low hills in the NSW South Western Slopes Bioregion (planted)
- PCTID 360: Gilgai wetland mosaic in the Southern NSW South Western Slopes Bioregion
- PCTID 76: Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregion
- PCTID 80: Western Grey Box - White Cypress Pine tall woodland on loam soil on alluvial plains of the NSW South Western Slopes Bioregion and Riverina Bioregion
- Zone 1 - PCTID 76: Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregion (planted)

Data Source:
* GHD, 22/07/21







Data Source:
** GHD, 22/07/21

PROJECT
Daroobalgie Solar Farm, Australia

TITLE
Figure 6.2: Vegetation - ETL and Switchyard

DRAWING NO
AU-3015-ENG-PHA-GN-MAP-00012

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SCALE: 1:11,000 A3

COORDINATE SYSTEM: MGA94 (55S)

REV: B

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Table 6.3 Fauna habitat in study area

Fauna habitat	Description	Fauna recorded	Threatened species
Native grassland and isolated paddock trees	Occasional isolated paddock trees, some containing hollows, are present and some areas of grassland occur adjacent to patches of woodland. Paddock tree species mostly comprise Western Grey Box with some Buloke occurring in the eastern section of the solar farm site. Commonly occurring native groundcover species include Windmill Grass (*Chloris truncata*), *Digitaria* spp., Purple Wiregrass (*Aristida ramosa*) and Curly Windmill Grass (*Enteropogon acicularis*)	A number of bird species typically associated with open grazing country were recorded. Galahs, Red-rumped Parrot and Eastern Rosella were recorded in remnant roadside vegetation and scattered paddock trees amongst grassland habitat, often near hollows. Other bird species observed included the Common Starling, Noisy Miner, Raven, Australian Magpie, Pied Butcherbirds, Welcome Swallows, Rufous Songlarks and Black Kites. The introduced Brown Hare was observed in open paddocks	Superb Parrots were observed traversing the paddocks and open grassland area within the study area. Additionally, they were recorded perching and foraging in Western Grey Box trees in woodland adjacent to grassland areas within the solar farm site
Roadside vegetation/ woodland patches	A small patch of Weeping Myall woodland is present in the central section of the ETL. Hollow-bearing trees are present within the woodland patches, including narrow remnants along road corridors. Leaf litter and fallen timber is present to varying degrees throughout patches, with higher abundances occurring in Western Grey Box dominated woodland where cypress pine is absent. Regeneration is occurring throughout most patches of woodland. There is some connectivity along roadside corridors extending into adjacent private property and in the western section of the study area vegetation is well connected to the large patch of woodland in the adjacent Crown land reserve. Groundcover is a mixture of native and introduced species and dominated by grass and forb species	A number of woodland bird species were recorded in these areas, including the Eastern Rosella, Australian Magpie and Yellow-rumped Thornbill. Cockatiels were recorded within Western Grey Box woodland along Forest road on multiple occasions and observed entering hollows within the woodland. A single microbat species, the White-striped Freetail-bat was recorded on the edge of woodland habitat at the far-western extent of the ETL	The Grey-crowned Babbler was recorded calling in a patch of Western Grey Box – White Cypress Pine woodland in the western portion of the study area
Farm dams and wetlands	There are small patches of gilgai wetland dominated by *Eleocharis* spp in the central portion of the ETL. Along Forest Road there are depressions and table drains within the road reserve that would hold water for periods following rainfall. These flooded areas contained emergent and fringing vegetation typical of wetland areas, including *Eleocharis* spp., rushes and sedges. Six farm dams are present in the solar farm site. These farm dams contain no emergent vegetation and fringing vegetation is generally limited to common grass species. Small, undefined drainage lines are also present, some leading to and from these dams. Some of these drainage lines eventually flow into the Lachlan River to the south via a network of drainage lines. There is no key fish habitat mapped at the proposal site or any adjacent or downstream areas that could be affected by the Project	Common frogs such as the Eastern Sign-bearing Froglet and Bibron's Toadlet were heard calling within the gilgai habitat in the central section of the ETL. Bird species typical of wetland habitats such as ducks and herons were recorded at the dams in the study area and gilgai habitat, including Plumed Whistling Duck, Australian Wood Duck and White-necked Heron. The dams and gilgais would provide a source of water for other birds, microbats and macropods. Microbats are also likely to forage for insects above water habitat	Targeted surveys for Sloan's Froglet were undertaken over two survey periods in August 2020 and the species was not recorded. No other threatened species are likely to occur in this habitat type. Threatened bird species likely to occur occasionally use water habitats as a drinking source

6.1.3 Potential impacts

6.1.3.1 Direct impacts

Native vegetation

Solar panels and associated infrastructure on the solar farm site, would be constructed within approximately 267.43 hectares of cropped land and exotic grassland, with a small area of native tree plantings (category 1 land) and a further 0.2 hectares of native planting. All paddock trees (including 10 hollow-bearing trees) would be removed throughout the cropped and exotic grassland area and there would be short-term impacts across the entire area during the construction period associated with the movement of vehicles and equipment and installation of infrastructure.

The most substantial impacts of construction would be associated with impacts to areas of woodland along the ETL. Impacts to derived native grassland, cropped and exotic grassland would be limited to the removal of vegetation for pole placement, an area of about four-square metres per pole. Areas of woodland within the 45-metre-wide easement would be cleared of trees, and shrubs that grow to a height within 6.5 metres of the centre line, with groundcover allowed to regenerate following disturbance at the completion of construction. In total, 3.7 hectares of native remnant woodland would be removed or modified for the transmission line.

There are no native vegetation impacts associated with construction of the switchyard.

Direct impacts on native vegetation are summarised in Table 6.4.

Table 6.4 Direct impacts on native vegetation

Plant community type	Threatened ecological community	Area impacted (ha)
Solar farm		
Zone 1 – PCT 76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions - planting	Endangered ecological community (EEC) – Grey Box Woodland (BC Act)	0.23 (total)
Non-native vegetation (cropped/predominantly exotic grassland and category 1 plantings)		267.43
ETL		
Zone 2 – PCT 26 Weeping Myall open woodland of the Riverina Bioregion and NSW South Western Slopes Bioregion - good	EEC – Weeping Myall Woodland (BC Act & EPBC Act)	0.65
Zone 3 – PCT 76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions - good	EEC – Grey Box Woodland (BC Act & EPBC Act)	0.59
Zone 5 – PCT 80 Western Grey Box – White Cypress Pine tall woodland on loam soil on alluvial plains of NSW South Western Slopes Bioregion and Riverina Bioregion - good	EEC – Grey Box Woodland (BC Act & EPBC Act)	0.38
Zone 7 – PCT 80 Western Grey Box – White Cypress Pine tall woodland on loam soil on alluvial plains of NSW South Western	EEC – Grey Box Woodland (BC Act & EPBC Act)	1.4

Plant community type	Threatened ecological community	Area impacted (ha)
Slopes Bioregion and Riverina Bioregion – derived scrub		
Zone 8 – PCT 244 Poplar Box grassy woodland on alluvial clay-loam soils mainly in the temperate (hot summer) climate zone of central NSW (wheatbelt) - Planting	Does not meet condition criteria for EPBC Act EEC	0.68
Non-native vegetation (cropped/predominantly exotic grassland, plantings)		0.87
Total native vegetation (transmission line)		3.70
Total native vegetation (solar farm & transmission line)		3.93
Total		**272.52**

Fauna habitat

The vegetation that would be removed provides habitat resources for native fauna species, including threatened species of fauna. The clearing of approximately 3.93 hectares of woodland and scattered paddock trees would include the removal of mature trees and hollow-bearing trees that are relied on by many native fauna for shelter and breeding. In the context of the areas of remaining native woodland vegetation surrounding the Project area, particularly in the Crown land reserve in the western section of the ETL, the Project would remove a small proportion of available habitat resources for local populations of native fauna. It is unlikely, however, that this would substantially impact on the available habitat resources of local fauna in the study area.

6.1.3.2 Indirect impacts

Indirect impacts that may occur as a result of the Project are described in Table 6.5.

Table 6.5 Potential indirect impacts on biodiversity

Impact	Description
Disturbance of native vegetation	In addition to the direct removal of native vegetation, the area within the ETL easement is also likely to be indirectly disturbed during the construction period due to vehicle movement, material set-down in the vicinity of pole locations and general construction activity. Following completion of construction, the groundcover would be allowed to regenerate to a condition similar to its existing state
Reflected light and heat generated by solar panels	Reflected heat and light from the solar panels would increase the temperature of the microclimate around the infrastructure. This may alter the species composition and richness. It may also affect growth of plants. These impacts may then affect habitat for small fauna such as lizards that may occur in these areas Research indicates temperatures quickly return to ambient temperatures within a short distance from the solar arrays. In some Australian jurisdictions, a 30 m buffer between arrays and neighbouring properties has been determined an adequate distance for heat dissipation (CEC, 2021)
Weed invasion and edge effects	Various weeds and exotic pasture species are present throughout the study area. Construction of the Project would result in new edges along already fragmented woodland patches and has the potential to introduce or spread weeds. Given the existing degree of vegetation clearing and ongoing disturbance from infrastructure and agricultural practices in the study area this would comprise a very minor increase in the degree of edge effects
Pests and pathogens	Construction activities, in general, have the potential to introduce or spread pathogens such as Phytophthora (*Phytophthora cinnamomi*), Myrtle Rust (*Uredo rangelii*) and Chytrid fungus (*Batrachochytrium dendrobatidis*) into

Impact	Description
	native vegetation. The potential for impacts associated with these pathogens is low, given the disturbed nature of much of the Project area, lack of permanent flowing water on site, and the environmental safeguards that would be implemented during the construction process
Noise, light and vibration	Noise and vibration disturbance during construction could disturb resident fauna. While there would be localised increases in noise, vibration and light that would temporarily create substantial disturbance, increases above existing background levels during construction are unlikely to result in a significant impact on fauna that occur in the study area
Sedimentation and erosion, aquatic disturbance and pollution	Construction of the Project has the potential to result in the mobilisation of contaminated sediments into waterways, or chemical spills from vehicles or plant. Sediment laden or contaminated runoff to waterways can alter water quality and adversely affect aquatic life. Given the modified nature of drainage lines in adjacent areas and their ephemera nature, the potential for impacts is negligible. Mitigations will also be implemented during the project's construction and post-construction rehabilitation of disturbed areas which will further reduce the potential for these impacts

6.1.3.3 Serious and irreversible impacts

A determination of whether an impact is serious and irreversible must be made in accordance with the principles set out in the BC Act. The principles are aimed at identifying and preventing impacts which are likely to contribute significantly to the risk of extinction of a threatened species or ecological community in NSW.

As the study area does not contain any threatened ecological communities or species that are listed as a serious and irreversible impact entity, the Project is not anticipated to result in a serious and irreversible impact.

6.1.3.4 Matters of national ecological significance

The Project would result in direct impacts to the following matters of national ecological significance (MNES) protected under the EPBC Act:

- Grey Box (*Eucalyptus microcarpa*) Grassy Woodland and Derived Native Grasslands of South-Eastern Australia (PCT 76, PCT 80) which is listed as an EEC
- Weeping Myall Woodlands (PCT 26) which is listed as an EEC
- Superb Parrot (*Polytelis swainsonii*) which is listed as a vulnerable species

Areas of woodland, derived native grassland and derived scrub are all consistent with the criteria for listing as EEC forms of the relevant communities under the EPBC Act, with the exception of the planted part of PCT 76. The Superb Parrot was recorded during the survey period for the proposal and vegetation to be removed by the proposal provides potential habitat for the species.

The Project would remove approximately 2.60 hectares of Grey Box Woodland and 0.65 hectares of Weeping Myall Woodland. This represents a small fraction of the mapped habitat within the study area, with about 160 hectares and 24.4 hectares of these communities, respectively. There are additional areas of these communities outside of the mapped areas and within the locality, and as such this quantum of impact would represent an even smaller portion of the communities being removed by the proposal. The Superb Parrot is likely to utilise both of these communities and other woodland vegetation as habitat and therefore potential habitat for this species in the study area is about 184.4 hectares. The proposed habitat removal represents a minor fraction of this and an even smaller portion within the wider locality. No patches of habitat would be completely removed, and no connecting links would be severed.

Given the relatively small area of direct impacts on these communities and habitat for the Superb Parrot in the context of the additional potential habitat in the surrounding study area and locality, the proposal is unlikely to constitute a significant impact.

An EPBC Act referral was submitted to the DoEE in August 2021. The referral decision – not a controlled action, was received on 7th September 2001.

6.1.4 Mitigation and management measures

The mitigation of impacts arising from the Project have been presented according to the hierarchy of avoidance, mitigation and offsetting of impacts.

6.1.4.1 Avoidance

The proposal has been located and designed to avoid impacts on biodiversity values. The solar farm has been purposefully sited in an area of agricultural land that has been predominately cleared of native vegetation. The two areas of remaining remnant vegetation on the solar fam site and the gilgai wetland area in the southeast corner of the site, have been avoided to ensure minimal direct impacts on native biota and their habitats (refer Figure 6.1).

Three ETL routes were studied as part of the route selection studies. The final ETL has been carefully aligned to avoid areas of native vegetation as much as possible and minimise impacts on biodiversity.

6.1.4.2 Mitigation and management

The mitigation and management measures outlined in Table 6.6 will be incorporated into a Construction Environmental Management Plan (CEMP) and implemented during construction to mitigate any potential impacts.

Table 6.6 Biodiversity mitigation and management measures

Timing	Mitigation measures
Pre-construction/ clearing	A fauna management plan will be prepared prior to construction. This will detail fauna management protocols including management of tree hollows and fauna handling. The removal of hollow bearing trees is to be undertaken in accordance with a tree hollow management protocol and involves the presence of a qualified ecologist or wildlife specialist experienced in the rescue of fauna
	All workers will be provided with an environmental induction prior to starting work on site. This will include information on the ecological values of the site and protection measures to be implemented to protect biodiversity
	Erosion and sediment control measures will be installed prior to any earthworks or construction occurring on site and inspected regularly
	Areas of native vegetation and trees to be retained will be fenced off or marked to avoid additional incidental impacts on vegetation. Fencing will protect the entire tree protection zone (i.e. 10 times the diameter of the trunk at breast height)
	Habitat features such as hollow trunks and limbs within the Project site that are impacted will be salvaged and replaced within adjacent areas of woodland as far as is practicable
Construction	Stockpiles of construction materials, fill or vegetation will be stored in existing cleared areas and not within areas of adjoining native vegetation
	A dust suppressant and/or protective covering will be applied to exposed stockpiles during windy conditions
	Construction traffic will be restricted to access tracks
	Pole placement along the ETL will be microsited to avoid direct impacts to gilgai wetland habitat
	Surfaces will be reinstated and stabilised as quickly as practicable after construction
Post construction/ clearing	Locally endemic tree species will be planted in areas proposed for vegetated screening of the solar farms. Species will be selected from the list of species typical of the PCTs present on site wherever practical

6.1.4.3 Offset

Impacts associated with the Project that require offsetting include the removal of 3.9 hectares of native vegetation, and associated habitat for threatened biota. Offsets required, in accordance with the Biodiversity Assessment Method, are:

- PCT 76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions (planting) – 4 ecosystem credits
- PCT 76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions (good) – 10 ecosystem credits
- PCT 26 Weeping Myall open woodland of the Riverina Bioregion and NSW South Western Slopes Bioregion (good) – 16 ecosystem credits
- PCT 80 Western Grey Box – White Cypress Pine tall woodland on loam soil on alluvial plains of NSW South Western Slopes Bioregion and Riverina Bioregion (good) – 9 ecosystem credits
- PCT 80 Western Grey Box – White Cypress Pine tall woodland on loam soil on alluvial plains of NSW South Western Slopes Bioregion and Riverina Bioregion (derived scrub) – 26 ecosystem credits
- PCT 244 Poplar Box grassy woodland on alluvial clay-loam soils mainly in the temperate (hot summer) climate zone of central NSW (wheatbelt) (planting) – 9 ecosystem credits

In accordance with the offset rules established by the Biodiversity Conservation Regulation 2017 Pacific Hydro will meet its offset obligations either through:

- Retiring the appropriate credits from an established stewardship site
- Monetary payment directly into the Biodiversity Conservation Trust Fund, or
- Funding an approved biodiversity action. Funding a biodiversity action may be available as a last resort, subject to consultation with approval authorities, if all other options are determined to be unsuitable

6.1.5 Residual impacts

Direct impacts on biodiversity have been avoided, as much as possible, through the careful siting of the solar farm, ETL and switchyard. The Project will, however, result in the unavoidable impact of 3.9 hectares of native vegetation. This residual impact is expected to be offset by the purchase or retirement of biodiversity credits or payment to the Biodiversity Conservation Trust Fund.

The Project is not anticipated to have any serious or irreversible impacts or significant impacts on threatened flora or fauna species or have a significant impact on any MNES.

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6.2 Cultural heritage

6.2.1 Overview

An Aboriginal cultural heritage assessment (ACHA) and historic heritage assessment (HHA) were undertaken by Umwelt (Australia) Pty Ltd for the Project (Appendix D and E). The assessments included desktop research, review of heritage databases, consultation with Aboriginal parties and a three-day site survey of the Project area.

6.2.2 Consultation

Consultation with Aboriginal parties was undertaken in accordance with the relevant aspects of Part 5, Division 2 Clause 60 of the NPW Regulation and the Aboriginal Cultural Heritage Consultation Requirements for Proponents (DECCW, 2010). As a result of notification, the following five Aboriginal parties registered an interest in the Project:

- Peak Hill LALC
- Corroboree Aboriginal Corporation
- Gunjeewong Cultural Heritage Corporation
- Forbes Aboriginal and Community Working Party
- Wiradjuri Council of Elders Peak

Information about the Project, including a proposed methodology and an invitation to participate in a cultural heritage survey was provided to all registered Aboriginal parties. Three registered Aboriginal parties participated in the site surveys; Peak Hill LALC, Corroboree Aboriginal Corporation and Gunjeewong Cultural Heritage Corporation. Pacific Hydro attended at the commencement of these surveys to meet participants.

A copy of the draft ACHA was provided to all registered Aboriginal parties for review and comment. Gunjeewong Cultural Heritage Corporation provided comment by email, which indicated their agreement with the outcomes of the ACHA.

6.2.3 Existing environment

6.2.3.1 Aboriginal cultural heritage

The Project area is located within the northeastern boundaries of the territory of the Wiradjuri people, one of Australia's largest tribes.

The terrain within and surrounding the Project area largely comprises flat to very gently inclined landforms dispersed with gilgai mounds and ponds. Based on this context, it is likely that that Aboriginal people occupied and passed through the Project area and broader region, and that archaeological evidence of this occupation may remain. It is likely that Aboriginal people utilised resources that the gilgai provided as they moved through the landscape toward larger more permanent water sources such as the Lachlan River to the south of the Project area. It is also predicted that large portions of the Project area will be so significantly disturbed by past agricultural practices that sites are unlikely to remain in those areas.

A search of the Aboriginal Heritage Information Management System (AHIMS) database was conducted on 25 May 2020 and 9 February 2021, using the eastings and northing data for the Project area and surrounding region. The search identified 15 previously identified sites. These sites comprised five modified trees (either scarred or carved) and ten sites containing stone artefacts, including two open campsites and two isolated artefacts. All the sites hold a valid site status, and no permit information has been listed, indicating that these sites still exist in the landscape. Of the 15 sites identified, none were located within the confines of the Project area, with the closest site (AHIMS 43-3-0031) being an isolated artefact located approximately 150 m south of the ETL (Figure 6.3).

Based on the environmental/cultural context and past archaeological finds a predictive model was prepared for the Project area. It indicates:

PROJECT
Daroobalgie Solar Farm, Australia

TITLE
Figure 6.3: Previously Recorded Archaeological Sites

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DATUM	MGA94 (z55)
REV	A

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0 500 1,000 2,000 m

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AHIMS Results
- Artefact
- Modified Tree (Carved or Scarred)
- Solar Farm Site
- Electricity Transmission Line (ETL)
- Existing Transmission Line (132kV)
- Switchyard
- Forbes Central West Livestock Exchange
- Public Road
- Railway
- Urban Area
- Watercourse

592000 594000 596000 598000 600000 602000 604000

6314000 6312000 6310000 6308000 6306000 6304000 6302000

Calarie Road
Newell Highway
Back Yamma Road
Troubalgie Road
Daroobalgie Rd
Forest Road
Switchyard
61-3-0154
43-3-0031
43-3-0033
43-3-0034
43-3-0032
43-2-0068
43-2-0067
43-2-0022
43-2-0026
26-3-0015
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Forbes
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The Escort Way
Lachlan River
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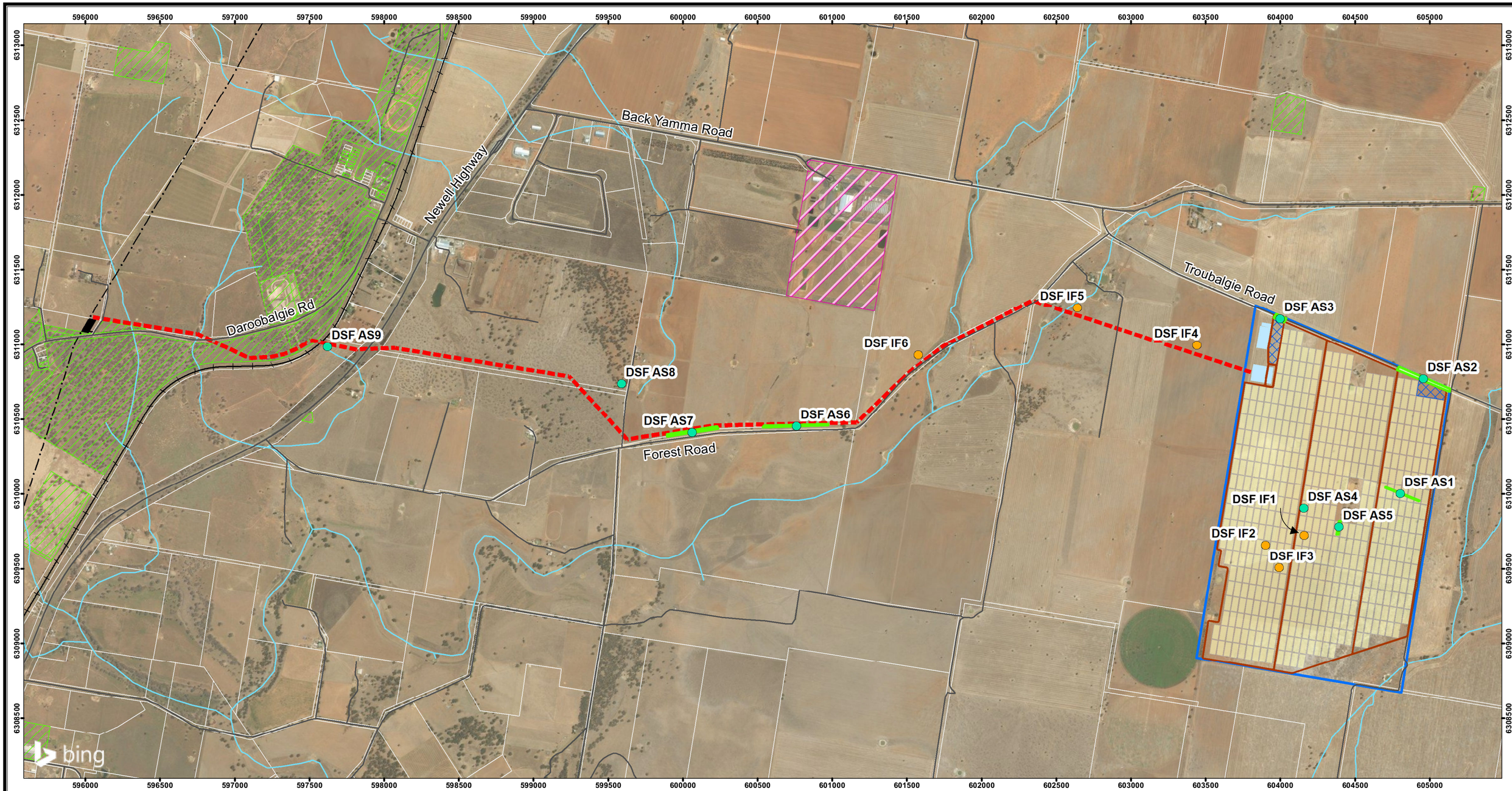

- Artefact Scatter Centre*
- Isolated Find*
- Artefact Scatter Extent**
- Solar Farm Site
- Proposed Solar PV arrays
- Proposed O&M compound (including substation and BESS)
- Proposed Construction Laydown Area
- Switchyard Site
- Electricity Transmission Line (ETL)
- Existing Transmission Line (132kV)
- Main Access Tracks
- Railway
- Waterway
- Public Road
- Forbes Central West Livestock Exchange
- Crown land
- Cadastral boundary

Data Source:
* Umwelt, 20/08/21
** Umwelt, 24/09/21

PROJECT
Daroobalgie Solar Farm, Australia

TITLE
Figure 6.4: Newly Recorded Archaeological Sites

DRAWING NO
AU-3015-ENG-PHA-GN-MAP-00015

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- Artefact sites would be the most common site type predicted to occur in the Project area. Artefact sites (such as isolated artefacts and artefact scatters) are expected to occur at low to moderate densities (when considered in the local context) along the margins of intact gilgai. Disturbed artefact scatters are also likely to occur in areas where gilgai have been modified by ploughing and other land use, noting the distribution of artefacts in this context is likely to be more sporadic and reflective of the nature of the impacts
- The presence of modified trees is unlikely due to the previous extensive vegetation clearance and disturbances that have taken place across the solar farm site and along the ETL
- Rock shelters are unlikely to be present due to a lack of suitable outcrops or boulders within the Project area
- The presence of grinding grooves[7] is considered unlikely due to unsuitable underlying geology within the Project area. It is more likely that areas in closer proximity to the Lachlan River system would uncover representative examples

There were 15 newly recorded Aboriginal archaeological sites located during the survey of the Project area. The location of each of the sites is shown in Figure 6.4 and described in Table 6.7

Table 6.7 Newly recorded sites

Site name	Site type	Site dimensions	Description
Solar farm site			
DSF AS1	Artefact scatter	215 x 1 m	6 artefacts in four loci (2 volcanic flakes, 2 silcrete flakes, 1 quartz flake, 1 quartz flaked piece) located on a 1 m wide exposure that runs along an internal paddock fence. Visibility within the exposure was approximately 90 - 100%
DSF AS2	Artefact scatter	370 x 1 m	5 artefacts in four loci (1 volcanic flake, 2 quartz flakes, 1 silcrete flake and 1 volcanic broken axe blank) on a 1m wide exposure that runs along front fence of the property. Visibility within the exposure was approximately 90 - 100%
DSF AS3	Artefact scatter	65 x 1 m	3 artefacts in two loci (1 volcanic core, 1 volcanic flake, 1 quartz flake) on a 1m wide exposure that runs along front fence of the property. Visibility within the exposure was approximately 50 - 60%
DSF AS4	Artefact scatter	15 x 3 m	4 artefacts (quartz, volcanic; flakes, flaked pieces) on a 15 x 5 m exposure around the base of a tree. There is ants nest disturbance within the site. Visibility within the exposure was approximately 80 - 90%
DSF AS5	Artefact scatter	42 x 2.5 m	17 artefacts (silcrete, quartz, volcanic; flakes, flaked pieces) located on the western edge of the main access track within the solar fam site. The track width at the site is approximately 5 m. Visibility within the exposure was 100%
DSF IF1	Isolated find	1 x 1 m	Silcrete flake on a 5 x 5 m exposure around the base of a dying tree with dropped tree branches. There is ants nest disturbance near the site. Visibility within the exposure was approximately 60 - 70%
DSF IF2	Isolated find	1 x 1 m	Quartz flake located on a 15 x 5 m exposure around the base of a tree. Visibility within the exposure was approximately 30%. Poor visibility was due to leaf litter and ants nest disturbance

[7] Grinding grooves are where Aboriginal people shaped and sharpened stone axes by grinding them against an outcrop of stone.

Site name	Site type	Site dimensions	Description
DSF IF3	Isolated find	1 x 1 m	Volcanic axe blank located on a 15 x 5 m exposure around the base of an isolated tree. Ants nest disturbance within exposure. Visibility within the exposure was approximately 90 - 95%
ETL			
DSF IF4	Isolated find	1 x 1 m	Silcrete flake located on a 20 x 4 m exposure at the base of an isolated tree. There was an ant's nest disturbance within the exposure. Visibility within the exposure was 100%
DSF IF5	Isolated find	1 x 1 m	Volcanic core located on the margin of a minor drainage line. There was no exposure at the site and the visibility was 0%.
DSF IF6	Isolated find	1 x 1 m	Volcanic flake located in a highly disturbed ploughed paddock that had recently been harvested. Visibility of the area was approximately 50%
DSF AS6	Artefact scatter	410 x 1.5 m	10 artefacts in 3 loci (4 silcrete flakes, 2 quartz flakes, 1 volcanic flake, 1 volcanic core, 1 silcrete core and 1 broken grinding implement) located on a graded access track along the front fence line of paddock. Visibility within the exposure was approximately 70%
DSF AS7	Artefact scatter	340 x 1.5 m	35 artefacts in four loci (27 silcrete flakes, 1 silcrete core, 2 quartz flakes, 4 volcanic flakes, 1 volcanic core) located on a graded access track along the front fence line of paddock. Visibility within the exposure was approximately 70 - 90%
DSF AS8	Artefact scatter	100 x 10 m	7 artefacts in three loci (3 silcrete flakes, 1 quartz flakes, 2 volcanic flakes, 1 volcanic grinding implement). There are three exposures across the site area with visibility approximately 50%
DSF AS9	Artefact scatter	2 x 1 m	2 flakes (silcrete, volcanic) located in the inflow area of a constructed dam. Highly disturbed context: artefacts likely washed into the area. Visibility within the exposure was 90%

6.2.3.2 Historic cultural heritage

The Forbes and Lachlan River region was settled by Europeans from the early 1830s (MDBA, 2019). In 1885, the land surrounding the Project area was divided for pastoral use, with a secondary focus on wheat production. Gold was discovered in the region in 1861, which saw an influx of some 30,000 people to the area. The 20th century saw the Forbes district's primary economic base change from predominately cattle, sheep and gold to wheat and sheep (wool and lamb).

The ETL crosses Crown land that is a designated Travelling Stock Reserve. Historically, these reserves were used for moving or grazing stock around NSW. Today, the Travelling Stock Reserve's are more commonly used for biodiversity conservation and/or informal recreation and to preserve cultural heritage.

A review of background information and heritage databases did not identify any national, state or local listed heritage items within (or within the immediate vicinity of) the Project area. One potential historical heritage item was identified on the solar farm site during the site inspection – a relic horse/cattle drawn cart.

6.2.4 Archaeological significance of sites

The significance of each of the newly identified sites was assessed in accordance with the Burra Charter (Australia ICOMOS, 2013). The primary criteria for determining archaeological significance relate to the rarity and representativeness of a site, as well as its integrity, intactness and overall research potential. Each element of significance was assessed for each site and results are presented in Table 6.8.

Table 6.8 Summary of archaeological significance

Site name	Rarity	Representative	Research potential	Education potential	Integrity	Overall
Solar farm site						
DSF AS1	Low	Low	Low	Low	Low	Low
DSF AS2	Moderate	Low	Low	Low	Low	Low-moderate
DSF AS3	Low	Low	Low	Low	Low	Low
DSF AS4	Low	Low	Low	Low	Low	Low
DSF AS5	Low	Low	Low	Low	Low	Low
DSF IF1	Low	Low	Low	Low	Low	Low
DSF IF2	Low	Low	Low	Low	Low	Low
DSF IF3	Moderate	Moderate	Low	Low	Low	Low-moderate
ETL						
DSF IF4	Low	Low	Low	Low	Low	Low
DSF IF5	Low	Low	Low	Low	Low	Low
DSF IF6	Low	Low	Low	Low	Low	Low
DSF AS6	Low	Low	Low	Low	Low	Low
DSF AS7	Moderate	Moderate	Low	Low	Low	Low-moderate
DSF AS8	Low	Low	Low	Low	Low	Low
DSF AS9	Low	Low	Low	Low	Low	Low

As demonstrated in Table 6.8, most sites within the Project area are common within the local context and are represented at other locations within the area. They have been predominantly assessed as having low value for rarity, representativeness, educational and research value. Therefore, the majority of the sites are assessed as having low archaeological significance. The exception to this are sites DSF IF3 and DSF AS2, which contained a less common artefact type in the form of an axe blank and partial axe. These sites are assessed as having low to moderate significance.

The cart identified on the solar farm site was also assessed to have low archaeological significance due to the fact that it is in poor condition and not considered to contribute to an understanding of the archaeological context of the area.

6.2.5 Potential impacts

The eight Aboriginal archaeological sites recorded during the survey on the solar farm site are all within the proposed disturbance area and likely to be impacted by the development.

Ground disturbance associated with construction of the ETL is predominately associated with the pole locations. Some further disturbance, however, is anticipated in association with the

transportation of equipment and machinery along the ELT easement. It is, therefore, possible that all seven sites identified along the ETL could be disturbed by the Project (Table 6.9).

The area surrounding the cart on the solar farm site is not anticipated to be impacted by the development and the cart can remain on site in-situ.

Table 6.9 Level of impact and management approach of Aboriginal archaeological sites

Site name	Level of impact	Management approach
DSF AS1	Direct	Salvage
DSF AS2	Direct	Salvage
DSF AS3	Direct	Salvage
DSF AS4	Direct	Salvage
DSF AS5	Direct	Salvage
DSF IF1	Direct	Salvage
DSF IF2	Direct	Salvage
DSF IF3	Direct	Salvage
DSF IF4	Direct	Salvage
DSF IF5	Direct	Salvage
DSF IF6	Direct	Salvage
DSF AS6	Direct	Salvage
DSF AS7	Direct	Salvage
DSF AS8	Direct	Salvage
DSF AS9	Direct	Salvage

6.2.6 Mitigation and management measures

6.2.6.1 Salvage, reporting and storage of artefactual material

The following mitigation and management strategies or options for potentially impacted sites were discussed with the registered Aboriginal parties during the site survey:

- Conservation – avoidance and protection of sites
- Further investigation – further work to clarify the nature, extent and significance of the sites identified
- Salvage – collection of visible artefacts prior to disturbance
- Disturbance without salvage – no further mitigation/management of identified sites

Due to the nature and low/moderate significance of the sites potentially impacted by the Project, salvage was identified, by the registered Aboriginal parties, as the most appropriate management measure for the sites. Salvage will involve the collection and documentation of artefacts, prior to disturbance. The salvage procedure is to be outlined in an Aboriginal Cultural Heritage Management Plan (ACHMP).

If the recovered archaeological assemblage contains enough material to allow for a statistically viable analysis, the salvaged material will be subject to detailed analysis. This involves the recording of artefact class and raw material for all artefacts. Following salvage activities and analysis, a report will be compiled in accordance with Heritage NSW guidelines and requirements.

Any salvaged Aboriginal stone artefacts will be temporarily stored in a secure location on the solar farm site or at the offices of the Peak Hill LALC. Arrangements for care and control of the salvaged artefacts will be made in consultation with Heritage NSW and the registered Aboriginal parties.

6.2.6.2 Aboriginal Cultural Heritage Management Plan

An ACHMP will be developed and implemented for the Project in consultation with the relevant registered Aboriginal parties and agencies. The ACHMP will include:

- Provision for the salvage of surface artefacts (as discussed above)
- Measures to ensure topsoil material excavated in the Project area remains within in the local area to ensure any artefacts that may have been present (within a disturbed context) will remain in the area
- A procedure for management any additional Aboriginal objects identified during the construction process
- A procedure to be followed in the unlikely event that human remains are located during construction
- Provision for ongoing consultation with registered Aboriginal parties

6.2.6.3 Historic heritage management measures

No impact on historic heritage is anticipated as a result of the Project. However, the following general management measures will be implemented in accordance with best practice:

- An unexpected find procedure will be developed to manage the unlikely event that potential heritage items are uncovered during construction
- Employees, contractors and subcontractors will be made aware of their obligations and requirements in relation to the relevant provision of the *Heritage Act* through site induction

6.2.7 Residual impacts

With the implementation of the mitigation measures outlined above and the salvage of identified archaeological material within the Project area, the Project is anticipated to have a low overall impact on Aboriginal and historic cultural heritage.

6.3 Land

6.3.1 Overview

Several assessments were undertaken to inform an understanding of the land's characteristics, availability, development risks and the potential for land use conflicts.

A Soil and Land Resource Assessment was undertaken by Minesoils Pty Ltd (Appendix F). This assessment included:

- A soil survey to identify soil types, qualities and risks. Soil samples were collected and tested from seven locations on the solar farm site. Sample depths were typically 0 - 10 cm, 30 - 40 cm and 60 - 70 cm. Soil profiles were assessed in accordance with the Australian Soil and Land Survey Field Handbook soil classification procedures (NCST, 2009)
- A land and soil capability assessment in accordance with the Land and Soil Capability Assessment Scheme (OEH, 2012). This scheme uses the biophysical features of the land and soil to derive detailed rating tables for a range of land and soil hazards
- Management/mitigation measures for handling soil during construction, operations and rehabilitation

An Erosion and Sediment Control Assessment was also undertaken by SMEC to assess the potential erosion hazard of the site and outline suitable erosion and sediment controls for the Project. The assessment is included as Appendix G.

A Land Use Conflict Risk Assessment (LUCRA) was undertaken by Umwelt (Australia) Pty Limited. This assessment included a site visit and land use interviews with nine landholders in the Project area. The LUCRA report is included as Appendix H.

6.3.2 Existing environment

6.3.2.1 Soil types

The solar farm site contains two dominant soil types: Deep Red to Brown Dermosols and Gilgai Brown to Black Vertosols. The Red/Brown Dermosols are predominately in the center to north of the site. The Brown/Black Vertosols are predominately in the southeast corner of the site are associated with gilgais which are also evident in the southeast of the site.

The soils in the Project area exhibit moderate to high levels of risk associated with sodicity and dispersion. The flatness of the site, however, inherently reduces erosion and sediment risks, given that surface runoff can only move at very low velocities.

Acid Sulphate Soils (ASS) are commonly found less than five metres above sea level, particularly in low-lying coastal areas such as mangroves, salt marshes, floodplains, swamps, wetlands, estuaries, and brackish or tidal lakes. The Project area is located approximately 280 km from the coast and above 250 m above sea level and does not have a history of acid generation from disturbed soil or regolith material. The Australian Soil Resource Information System (ASRIS, 2011) shows the Project area as having a 'low' and 'extremely low' probability of ASS occurrence.

6.3.2.2 Agriculture and land capability

The land and soil capability of the solar farm site is mapped as class 4 land which is considered to have moderate agricultural capability, however the capability assessments from across the solar farm site were classified as a mix of class 4 and class 6 due to the presence of sodic topsoil in some locations (Figure 6.5). Class 6 soil and land capability indicates low agricultural capability. The solar farm site is currently used for grazing and crop production.

No part of the Project area is mapped as Biophysical Strategic Agricultural Land (BSAL) i.e., land with high quality soil and water resources capable of sustaining high levels of productivity.

PROJECT
Daroobalgie Solar Farm, Australia

TITLE
Figure 6.5: Land capability classes (OEH, 2012)

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SCALE	1:50,000 A3
DATUM	MGA94 (z55)
REV	A

N

0 500 1,000 2,000 m

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Soil Capability Survey Site ID*
- Class 4
- Class 6

Land Capability Class**
- Class 3
- Class 4

- Solar Farm Site
- Electricity Transmission Line (ETL)
- Switchyard
- Railway
- Public Road
- Watercourse

Data Source:
* Minesoils, 01/03/21
** Office of Environment and Heritage (OEH), 2012. The land and soil capability assessment scheme: second approximation – A general rural land evaluation system for NSW

Table 6.10 Land capability class by Project area

	Solar farm		Switchyard		ETL	
	Area (ha)	Percentage (%)	Area (ha)	Percentage (%)	Length (m)	Percentage (%)
Class 3	-	-	0.5	100%	3,627	43
Class 4	268	100%	-	-	4,745	57

Table 6.11 Land capability classes – general definitions (OEH, 2012)

LSC class	General definition
Land capable of wide variety of land uses (Cropping, grazing, horticulture, forestry, nature conservation)	
1	**Extremely high capability land**: Land has no limitations. No special land management practices required. Land capable of all rural land uses and land management practices
2	**Very high capability land**: Land has slight limitations. These can be managed by readily available, easily implemented management practices. Land is capable of most land uses and land management practices, including intensive cropping with cultivation
3	**High capability land**: Land has moderate limitations and is capable of sustaining high-impact land uses, such as cropping with cultivation, using more intensive, readily available and widely accepted management practices. However, careful management of limitations is required for cropping and intensive grazing to avoid land and environmental degradation
Land capable of a variety of land uses (cropping with restricted cultivations, pasture cropping, grazing, some horticulture, forestry, nature conservation)	
4	**Moderate capability land**: Land has moderate to high limitations for high-impact land uses. Will restrict land management options for regular high-impact land uses such as cropping, high-intensity grazing and horticulture. These limitations can only be managed by specialized management practices with a high level of knowledge, expertise, inputs, investment and technology
5	**Moderate-low capability land**: Land has high limitations for high-impact land uses. Will largely restrict land use to grazing, some horticulture (orchards), forestry and nature conservation. The limitations need to be carefully managed to prevent long-term degradation
Land capable for a limited set of land uses (grazing, forestry and nature conservation, some horticulture)	
6	**Low capability land**: Land has very high limitations for high-impact land uses. Land use restricted to low-impact land uses such as grazing, forestry and nature conservation. Careful management of limitations is required to prevent severe land and environmental degradation
Land generally incapable of agricultural land use (selective forestry and nature conservation)	
7	**Very low capability land**: Land has severe limitations that restrict most land uses and generally cannot be overcome. On-site and off-site impacts of land management practices can be extremely severe if limitations not managed. There should be minimal disturbance of native vegetation
8	**Extremely low capability land**: Limitations area so severe that the land is incapable of sustaining any land use apart from nature conservation. There should be no disturbance of native vegetation

6.3.2.3 Land use

The land use surrounding the Project is predominately agricultural, including cropping and sheep grazing with scattered rural dwellings. Other key land uses and features in the surrounding area include:

- The Forbes Central West Livestock Exchange located on Back Yamma Road, approximately 2.5 km west of the solar farm site

- Central West Industrial Park located on the corner of Newell Highway and Back Yamma Road, adjacent to the Livestock Exchange, approximately 3 km west of the solar farm site
- The Lachlan River, situated approximately 3.5 km from the southern boundary of the solar farm site
- Newell Highway and Stockinbingal - Parkes railway line which are crossed by the ETL
- Crown land reserve which is crossed by the ETL

Nine landholders in the Project area were interviewed to ascertain perceived potential land use conflicts (Figure 6.6). The responses indicated that the surrounding landholders did not believe that the proposed Project would impact on their current operations or present land use conflicts that were not manageable.

6.3.3 Potential impacts

6.3.3.1 Soil

Shallow earthworks (estimated less than 0.5 m) are expected across the solar farm site during construction. Minor ground disturbance at footings will also be required for installation of supporting structures for PV panels. Construction earthworks activities are likely to be relatively short duration (< 2 months) prior to restoring suitable ground cover to minimise erosion and sediment risks from ground disturbances. An estimate of soil loss (tonnes/ha/year) was calculated for individual construction catchments on the solar farm site using the revised universal soil loss equation (Landcom, 2004). All construction catchments showed ‘very low’ soil loss class. Although the estimated annual soil loss indicated the need for sediment basins, the lack of grade across the solar farm site and relatively short duration of ground disturbance suggest that alternative sediment treatment devices, such as rock check dams, silt fencing and low earth berms, would be more appropriate mitigations. At least four of the existing farm dams on the solar farm site will be retained to assist with surface water control.

The ETL is expected to involve localised ground disturbance at overhead power pole locations and along the access easement.

The switchyard site is expected to undergo minor ground disturbance associated with the preparation of the site, stripping of topsoil, excavation of foundations and installation of the switchyard bench. A catchment assessment of the switchyard site showed soil loss would be very low and no sediment basins would be required at the site.

6.3.3.2 Agricultural and land capability

The land within the Project area has low to moderate capability and use is therefore generally restricted to cropping with restricted cultivation, stock pasture, low-level grazing, forestry or some horticulture. The site will not support intensive cropping or grazing.

The installation of solar panels and associated infrastructure on the solar fam site will impact the current agricultural use of the land. It is not anticipated, however, that the inherent agricultural capability of the land will be affected by the Project and the site will be restored to its current agricultural capability at the end of the solar farms’ life. Once the Project is operational, there is potential for stock to be grazed on the solar farm site at particular times of years. Pacific Hydro will consult with the site’s landholder to explore the opportunity for this type of shared use or ‘agri-solar’ opportunity.

PROJECT
Daroobalgie Australia

TITLE
Figure 6.6: Interviewed Landholders for LUCRA

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DATUM MGA94 (z55)
REV C

N

0 500 1,000 2,000 m

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Newell Highway
Switchyard
Lachlan River

Solar Farm Site
ETL
Existing Transmission Line (132kV)
Switchyard

Dwelling
- Associated
- Non-Associated

Interviewed Landholders
- 1
- 2
- 3
- 4
- 9
- 11
- 13 (Forbes Central West Livestock Exchange)
- 14
- 15

5km Distance from Solar Farm Site
Cadastral Boundary *
Main Road
Rail Line

Data Source:
* NSW Gov, 15/07/20

6.3.3.3 Land use

A LUCRA has been carried out in accordance with the Land Use Conflict Risk Assessment Guide (DPI, 2011) which utilises a 'probability and consequence' risk matrix to estimate the potential for land use conflict (Table 6.12).

Table 6.12 Risk rating table

Probability/ Consequence	Almost certain	Likely	Possible	Unlikely	Rare
Severe	25	24	22	19	15
Major	23	21	18	14	10
Moderate	20	17	13	9	6
Minor	16	12	8	5	3
Negligible	11	7	4	2	1

Red = higher risk, Grey = lower risk

An initial risk rating of activities, without mitigations, that may cause a land use conflicts were identified in the LUCRA. Activities that received the highest risk rating (> 12) were:

- Noise generated during the construction of the solar farm, ETL and switchyard above relevant criteria, impacting amenity
- Increased traffic movements on unsealed roads resulting in dust generation which can impact human and environmental health
- Increased traffic movements to and from the solar farm site resulting in traffic hazard for neighbouring landholders and the Forbes Central West Livestock Exchange. Increased traffic volumes potentially impacting/degrading the physical condition of local roads
- Erosion resulting in sediment runoff entering nearby water bodies, impacting the environment and beneficial use of the water (irrigation or stock water)
- Spread of weeds or invasive pests to neighbouring land due to poor land management practices on the solar farm site
- Loss of local amenity and visual amenity form solar farm including from glare and reflectivity of PV panels
- Increased bushfire risks for surrounding lands associated with the inverters and BESS
- Dust generated by neighbouring farmers during paddock preparation impacting the operation of the solar panels
- Interference to the existing TransGrid infrastructure when connecting the ETL

These potential land use conflicts have been fully assessed in the technical impact assessments undertaken for the Project (noise, traffic, visual etc.) and mitigation measures identified to ensure potential conflicts are minimized. The mitigated risk for each of the potential conflicts listed above were rated as low (< 8) indicating:

- They will have a minor or short/term impact to the environment and community
- They can be effectively managed as part of normal operations
- They are unlikely to cause neighbour disputes

As part of the community engagement program for the Project, landholders within 5 km of the solar farm site have been contacted and allowed an opportunity to share any issues/concerns they have with the proposed Project. Nine landholders surrounding the solar farm site and in close proximity to the ETL and switchyard site were specifically contacted as part of the LUCRA and questioned about potential land use conflicts. Issues raised during this consultation included:

- Traffic during construction
- Visual appearance of the Project

Overall, however, the surrounding landholders were positive about the proposed Project and indicated that they did not anticipate that it would impact on their current operations or present land use conflict that would not be manageable.

6.3.4 Mitigation and management measures

6.3.4.1 Soils

The following mitigation and management measures will be implemented to manage soil resources during construction:

- At least four of the existing farm dams on the solar farm site will be retained to assist with surface water control
- An Erosion and Sediment Control Plan will be prepared in accordance with Managing Urban Stormwater: Soils and Construction (Landcom, 2004) prior to the commencement of construction
- Construction activities will be staged to minimise the extent and duration of ground disturbance
- Disturbed areas will be stablised quickly and progressively throughout construction staging. If required, grass seeding and/or sprayed polymer seals will be utilised to prevent wind erosion and aid with early revegetation
- Stormwater flows onto, through and from the solar farm site (including separation of ‘clean’ and ‘dirty’ stormwater runoff) will be controlled through the installation of measures such as rock check dams, silt fencing and low earth berms
- Erosion and sediment control measures will be implemented at all watercourse or drainage line crossings along the ETL
- A sediment fence will be installed at the southern end of the switchyard site to slow down surface flows before they leave the site
- Control measures will be implemented at the commencement of the construction program and then inspected and maintained regularly throughout

6.3.4.2 Agricultural and land capability

A Decommissioning and Rehabilitation Environmental Management Plan will be prepared prior to decommissioning that outlines how the site will be restored to its previous condition. The plan, will incorporate contemporary methods at the time, however in addition to the removal of solar farm infrastructure, is expected to require:

- Progressive rehabilitation of disturbed areas
- Backfilling of any trenches and excavations
- Reseeding of pasture/crop in consultation with the landholder
- Revegetation with native species where required

6.3.4.3 Land use

Mitigation and management measures relevant to potential amenity and traffic impacts are presented in sections 6.4 to 6.8.

6.3.5 Residual impacts

The Project presents ‘very low’ erosion hazards and with the implementation of standard erosion and sedimentation controls impacts to soil are anticipated to be negligible/minor.

It is anticipated that once the solar farm is decommissioned and the site rehabilitated, the agricultural capability of the land will be fully reinstated.

The Project will change the current land use of the solar farm site from agricultural to electricity generation however with the implementation of the management measures detailed above, there will be no discernable impact from the Project on any of the surrounding land uses. Consultation with surrounding landholders has not identified any significant concerns with the change in land use from agricultural land to solar farm.

6.4 Landscape and visual

6.4.1 Overview

A Landscape and Visual Impact Assessment (LVIA) has been prepared by SMEC Pty Ltd and is provided in Appendix I. The assessment includes:

- Identification of a Zone of Theoretical Visual Influence (ZTVI)
- Desktop studies to identify potential visual receptors most likely to be impacted by the Project
- Site visits on 23 July 2020 and 14, 15 April 2021
- Assessment of potential impacts on the landscape and public viewpoints
- Preparation of three photomontages of the proposed solar farm and one photomontage of the proposed switchyard
- A glare analysis
- Recommended mitigation and management measures including a Landscape Mitigation Plan of the solar farm and switchyard sites

6.4.2 Existing environment

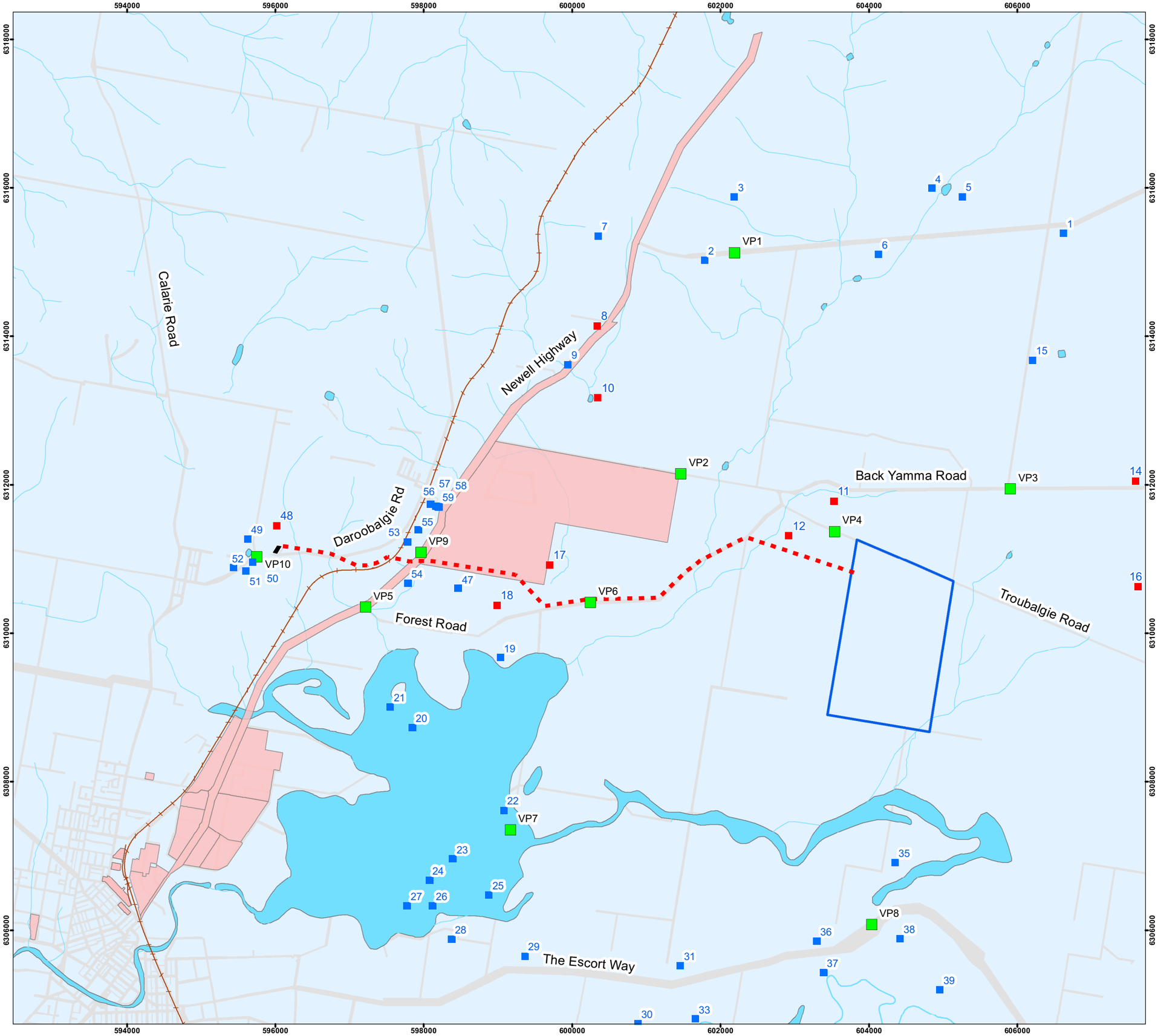
The Project is located on farmland and has been used for grazing and cropping. The topography of the area surrounding the Project is flat to a gently undulating consistent with Central West NSW landscapes.

The landscape typical of the region is predominately cleared, open grazing land with scattered groupings of remnant native trees. Retained vegetation is common along watercourses, roadsides and along the perimeters of paddocks and property boundaries. Land surrounding the site has been predominantly cleared for rural paddocks and associated residential use, with some native and exotic vegetation plantings associated with the residential buildings.

Three Landscape character types (LCTs) have been identified in the area surrounding the Project: Agricultural plains, Floodplain and Forbes-Newell Highway industrial corridor. These LCTs are shown in Figure 6.7 and described in Table 6.13.

Table 6.13 Landscape character types and key characteristics

Agricultural plains	Floodplain	Forbes- Newell Highway industrial corridor
Open landscape with long range views to the ranges of Mt Coonambro to the east. The patterns of the landscape often appear as a patchwork of different colours and textures, dependent upon the nature of the farming occurring within any given area and the time of year. Scattered residential dwellings and ancillary farm buildings at very low densities. Remnant native vegetation typically at the edges of agricultural paddocks, along riparian corridors, and along roads. A highly modified landscape, with human intervention on the landscape often visible and clearly evident	Higher coverage of vegetation compared to the cleared Agricultural plains. Dense corridors of vegetation indicating location of waterways and wetlands. Views punctuated by vegetation	The Forbes-Newell Highway industrial corridor is zoned within the Forbes LEP as IN1 (General Industrial), with some smaller pockets of R5 (Large lot residential), B5 (Business Development) and SP2 (Infrastructure). The lots to the east and west of the Newell Highway comprise warehouses, large retail and manufacturing facilities. These corridors are known as Landrace Industrial Estate and Central West Industrial Park. Dominant elements in the Forbes-Newell Highway industrial corridor are warehouses, large retail businesses, manufacturing plants, the Forbes Central West Livestock Exchange, large lot dwellings, electrical substation and overhead powerlines



PROJECT
Daroobalgie Solar Farm, Australia

TITLE
Figure 6.7: Location of Landscape Character Types and Viewpoints

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CREATED	M. Yee
CLEARED	K. Munro
APPROVED	K. Munro
DATE	14/02/22
SCALE	1:50,000 A3
DATUM	MGA94 (z55)
REV	A

PacificHydro

FOR EXTERNAL DISTRIBUTION

- Viewpoint*

Landscape Character Types*
- Flood Plain
- Forbes-Newell Highway Industrial Corridor
- Agricultural Plains

Dwelling
- Associated
- Non-Associated

- Solar Farm Site
- Electricity Transmission Line (ETL)
- Switchyard
- Railway
- Watercourse
- Public Road / Road Reserve

Data Source:
* SMEC 2021, Landscape and Visual Impact Assessment.

Image 6-1 Typical character of Agricultural plains

Image 6-2 Typical character of floodplain (paddock and vegetation lined Lachlan River at the background)

Image 6-3 Typical character industrial corridor (Forbes Central West Livestock Exchange, Back Yamma Road, Daroobalgie)

Figure 3.2 shows the location of all associated and non-associated dwellings in the Project area. In summary:

- There are two associated dwellings (11 and 12) within one kilometre of the solar farm site (no non-associated dwellings)
- There are five associated dwellings and two non-associated dwellings (35 and 38) within three kilometres of the solar farm site. The closest non-associated dwelling (35) is 1.8 km from the southern boundary of the solar farm site
- There are three non-associated dwellings (47, 53 and 54) within ~500 m of the ETL. These receptors are along the Newell Highway and adjacent to the Forbes-Newell Highway industrial corridor
- There is one associated dwelling and four non-associated dwellings (49 – 52) within ~500 m of the switchyard site

6.4.3 Potential impacts

6.4.3.1 Landscape and visual

The potential landscape and visual impacts associated with the Project have been assessed in the following ways:

- Landscape impacts have been assessed against each of the LCTs detailed above. Potential impacts are summarised in Table 6.14.
- Visual impacts have been assessed[8] from ten representative public viewpoints. Viewpoints are considered indicative of the views that may be experienced from nearby dwellings. Table 6.15 provides a summary of these viewpoint assessment and associated impact ratings
- Photomontages were prepared to demonstrate what the proposed Project will look like from three viewpoints. These are included in Appendix I

[8] Impacts have been assessed during the operational phase of the project only. The impact assessment has been undertaken based upon the anticipated conditions approximately seven to 10 years post-construction

Table 6.14 Landscape impact assessment

LCT	Landscape sensitivity	Magnitude of change	Impact
Agricultural plains	The Agricultural plain is a landscape which has been highly modified from its natural, pre-European state. Human modifications are clearly evident through widespread clearance of native vegetation and via the presence of roadways, dwellings, ancillary agricultural buildings and domestic scale electricity infrastructure. As such, it is considered to have capacity to absorb the type of change envisaged by this Project. Whilst it is not considered to be of any specific scenic value, some receptors likely place value upon its openness and typically low built form density. There are no specific planning controls attributing special value to this landscape. Overall, this LCT is considered to be low sensitivity.	The height of the PV cell at up to 4 m will mean that the views of the solar farm site are likely only at close range where no screening vegetation is present. It is considered that the ZTVI is a relatively small portion of what is a widely distributed and expansive LCT. Furthermore, the visual prominence of the solar farm site, ETL and switchyard will reduce with increased distance from the Project itself, such that they are barely perceptible towards the periphery of the viewshed. Within closer range to the Project, infrastructure such as the PV cells and associated infrastructure will result in an evident change in landscape characteristics; however, the extent of this change is considered minor in relation to the expansive extent of this LCT. Supporting Project infrastructure is still considered to be of a scale and form that is commensurate with the existing built form typology of the rural landscape and can be adequately absorbed by the landscape. Overall, the magnitude of change is considered to be 'noticeable'.	Minor
Floodplain	The floodplain within the study area has a higher concentration of vegetation associated with the floodplain and associated waterways. Views are often punctuated by vegetation. Some receptors likely place value upon the floodplain's enclosed nature of vegetation coverage and uniform foliage texture. There are no specific planning controls attributing special value to this landscape. As such, the landscape is considered to have some capacity to absorb the type of change envisaged by this Project, particularly given that the modifications are occurring outside of the footprint of the floodplain itself. Overall, the LCT is considered to be of low sensitivity.	When viewed from afar, the solar farm site, ETL and switchyard will have much less visual mass relative to the vegetation associated with floodplain and thus are not expected to compete visually with the landform and associated vegetation. Moreover, there is a limited area from which the Project would form part of views towards the floodplain. When viewed from within the floodplain LCT, and in particular from the local access roads, views toward the solar farm site, ETL and switchyard are expected to occupy a small proportion of the horizontal and vertical fields of view, often only through the gaps of existing vegetation, minimising their ability to indirectly impact upon the character of this LCT.	Negligible to minor
Newell Highway industrial corridor	The industrial precinct(s) within the study area are highly modified landscapes, with a high prevalence of built form and infrastructure visible within these areas, particularly in along the Newell Highway. As such, they are considered to have capacity to absorb the type of change envisaged by this Project. Overall, this LCT is considered to be of low sensitivity.	The screening effect of built form and vegetative coverage within the precinct associated with this LCT means that the solar farm site, ETL and switchyard are expected to be largely screened from within the precinct. Overall, the magnitude of change on the LCT is considered to be barely perceptible.	Negligible to minor

Table 6.15 Public viewpoint impact assessment

Viewpoint No.	Location	Representative of receptor	Distance to Solar Farm Site	Distance to nearest ETL	Distance to switchyard site	Visual Sensitivity	Magnitude of Visual Change	Visual Impact Rating
1	Ashburnham Road	2, 3, 4, 5, 6, 7	4.2 km	3.85 km	7.34 km	Low	Barely perceptible	Negligible to minor
2	Back Yamma Road	8, 9, 10	2.55 km	1.15 km	5.48 km	Low	Barely perceptible	Negligible to minor
3	Kooringle Road	1, 13, 14, 15, 16	1.5 km	2.39 km	9.8 km	Low	Barely perceptible	Negligible to minor
4	Troubalgie Road	11, 12	0.03 km	0.4 km	7.8 km	Low	Considerable change	Minor to moderate
5	Newell Highway - Forest Road	20, 21	6.35 km	0.58 km	1.40 km	Low	Barely perceptible	Negligible to minor
6	Forest Road	17, 18, 19, 47	3.40 km	0.22 km	4.27 km	Low	Noticeable change	Minor
7	Littles Road	22, 23, 24, 25, 26, 27, 28, 29	4.57 km	3.42 km	4.88 km	Low	Barely perceptible	Negligible to minor
8	The Escort Way	30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 43, 44, 45	2.75 km	4.75 km	9.43 km	Low	Barely perceptible	Negligible to minor
9	Newell Highway	53, 54, 55, 56, 57, 58, 59	5.75 km	0.14 km	1.90 km	Low	Barely perceptible	Negligible to minor
10	Calarie - Daroobalgie Road	49, 50, 21, 52	8 km	0.35 km	0.31 km	Low	Barely perceptible	Negligible to minor

As detailed in Table 6.14 and Table 6.15, the potential landscape and visual impacts anticipated from the Project are predominately negligible to minor.

The greatest visual impact from the solar farm site is expected from viewpoint 4 (minor to moderate) on Troubalgie Road. This viewpoint is close to the northwest corner of the solar farm site meaning that the BESS, substation and O&M compound are clearly noticeable within the view and, in occupying a large proportion of the view, form a considerable change in visual character when compared to the existing conditions. The view is experienced by local residents and farm workers. The most sensitive visual receptors are expected to be the two associated dwellings (houses 11 and 12) that that are less than one kilometre of the Project. A photomontage showing the proposed view from this location is provided in Appendix I.

The potential for visual impacts of the solar farm site lessens with distance from the Project, with the other public viewpoints assessed as only having negligible to minor potential impacts. From these viewpoints, the PV cells or associated infrastructure typically appear as smaller elements within the view or are screened from view and therefore exert less influence upon the existing visual character.

A photomontage of viewpoint 1 Ashburnham Road, the viewpoint with the highest elevation in the Project area, is provided in Appendix I. As shown in the figure, the solar farm is barely perceptible from the viewpoint which is more than four kilometres from the solar farm site.

Potential visual impacts associated with the ETL are most significant from viewpoints 6 (Forest Road) and 9 (Newell Highway). At these locations, the ETL is anticipated to be visible due to the close proximity of the monopole structures and flat topography. In these locations, where there is no screening vegetation, the ETL will have clearly discernible elements within the view and would provide some level of contrast with the existing agricultural character. The existing view, however, is highly modified and already includes some built structures in the form of the transmission lines, and such is considered to have some capacity to accommodate the proposed ETL.

Potential visual impacts of the switchyard site have been assessed to be minor as the site is highly modified and already includes some vertical elements in the form of the existing 132 kV transmission line and poles. The switchyard will, however, be partially visible through gaps of existing vegetation along Daroobalgie Road.

6.4.3.2 Glare

A software program specialising in glare analysis (ForgeSolar) was used to calculate potential impacts from glare. The assessment predicts that the risk of glint and glare related impacts being experienced by receptors as a result of this Project is considered nil. This is predominately due to the following factors:

- Reflectivity associated with photovoltaic cells is typically less than commonly found objects within the surrounding area (e.g. motor vehicles, steel roofing, water)
- Screen planting is proposed on the solar farm site
- In order for glare-related impacts to be experienced, a direct line of sight to the photovoltaic cells is required. Vegetative screening is frequently in place between the location of the proposed solar farm site and receptors. This screening limits the availability of views and by extension limits the potential for glare-related impacts to be experienced from ground level by receptors
- The proposed use of a tracking system means that for the most part, the angle of reflectance from the photovoltaic cells will be relatively close to perpendicular to the surface of the cell itself. At times when the tracking system has reached the limit of its range of movement and the angle of incidence shifts away from the perpendicular (i.e. at sunrise and sunset) the reflected light will be reflected up and away from the ground. It is therefore assumed that, relative to ground level, reflected light will typically be reflected up and away from the ground at or near to a minimum of 30° relative to the horizontal

6.4.4 Mitigation and management measures

The proposed Project is not anticipated to have any major impact on landscape values or surrounding receptors. Nevertheless, a Landscape Mitigation Plan has been prepared for the solar farm and switchyard sites to ensure the Project is blended into the existing landscape, as much as possible.

6.4.4.1 On-site mitigation

On-site mitigation will focus upon screening the PV panels as well as elements such as the BESS, substation, ancillary buildings and the switchyard. Continuous buffer planting along the boundary of the solar farm site in the direction of sensitive receptors is considered an adequate measure to screen the PV panels from external view. Additionally, ancillary buildings should wherever possible be constructed in an architectural style which reflects the overriding vernacular of the rural landscape. Materials and colours utilised in ancillary buildings, battery storage and associated infrastructure should be non-reflective and should be painted in neutral colours to ensure that visual impacts are minimised.

The proposed Landscape Mitigation Plan is provided in Appendix I. The plan recommends that a planting zone of approximately five metres wide or equivalent to two rows of native shrubs mix, is positioned between the property boundary and the security fencing in locations where there is no existing vegetation and where the arrays or ancillary infrastructure are immediately adjacent to viewpoints in the public domain.

To ensure that the screen planting integrates into the existing landscape character, the screening will be planted with a mix of endemic tree and shrub species and the tree planting layout will be planted in groups of two to three at random spacing of 15 - 20 m to match the landscape character of the remnant vegetation. To ensure that the screen planting is successful all landscape works will be maintained regularly for a period of 24 months. Maintenance should generally include the removal of weeds and replacement of dead or non-performing plants.

6.4.4.2 Off-site mitigation

Viewpoints that may warrant off-site mitigation include nearby residential dwellings with direct views towards the Project, in particular the ETL, from which views cannot be adequately mitigated by screen planting. Off-site mitigation will focus on locations where sensitive receptors are expected to experience views frequently or for long durations, such as from dwellings or outdoor gathering/entertaining spaces. Consultation with landowners to date have not identified a need for off-site mitigation however this will be considered if requests for off-site screening from impacted landholders are received.

6.4.5 Residual impacts

Landscape and visual impacts from the Project have been assessed to be negligible or minor from all but one of the viewpoints assessed. The viewpoint predicted to have a minor to moderate visual impact is located close to the northwest corner of the solar farm site on Troubalgie Road. Visual impact in this location will be mitigated by on-site screen planting as detailed in the Landscape Mitigation Plan.

6.5 Noise

6.5.1 Overview

A Noise and Vibration Impact Assessment has been prepared by Resonate Consultants Pty Ltd and is provided in Appendix J. The assessment was prepared in accordance with:

- Interim Construction Noise Guidelines (DECC, 2009)
- Road Noise Policy (DECCW, 2011)
- NSW Noise Policy for Industry (EPA, 2017)

No vibration impacts were anticipated as a result of construction or operation of the Project. Therefore, this section summarises the results of the noise assessment only.

6.5.2 Existing environment

The area surrounding the solar farm site is agricultural and zoned rural for primary production. The proposed ETL traverses six private, rural properties and crosses two infrastructure zones, the Newell Highway and the Stockinbingal-Parkes railway line. The proposed switchyard site is zoned for primary production and surrounded by agricultural land and large lot, residential properties.

Existing ambient noise levels are dominated by rural noise sources, such as cultivation and harvesting of crops and livestock grazing and management. Properties in the area are typical of those in rural areas and are large lots with planted gardens, sheds and equipment around a dwelling.

Central West Industrial Park is approximately 1.5 km north of the Project area and is accessed from Back Yamma Road. It contains a number of businesses including the Forbes Central West Livestock Exchange, a busy saleyard.

Project-related traffic is anticipated to travel along Troubalgie Road and Back Yamma Road before accessing the Newell Highway. Travel along Forest Road will be largely restricted but may be used by some light vehicles. The existing traffic along Troubalgie Road, Forest Road is minimal, with generally up to one light vehicle or heavy vehicle per hour. Existing traffic on Back Yamma Road fluctuates with the activities of the Livestock Exchange.

Background noise measurements have not been conducted for the Project, therefore the Noise Policy for Industry (NPI) recommended background levels have been adopted for the purpose of this assessment (Table 6.16). These are considered representative of typical rural environmental with few surrounding noise sources.

Table 6.16 Minimum recommended background levels in accordance with NPI

	Daytime (7 am – 6 pm)	Evening (6 pm – 10 pm)	Night-time (10 pm – 7 am)
Minimum rating background noise level – dB(A)	35	30	30

Figure 3.2 shows the location of all associated and non-associated dwellings in the Project area. In summary:

- The nearest dwelling to the solar farm site (~600 m from the northwest corner of the site) is an associated dwelling. There are five associated dwellings and two non-associated dwellings (35 and 38) within three kilometres of the solar farm site. The closest non-associated dwelling (35) is 1.8 km from the southern boundary of the solar farm site.
- There are three non-associated dwellings (47, 53 and 54) within ~500 m of the ETL. These dwellings are along the Newell Highway and adjacent to the Forbes-Newell Highway industrial corridor
- There is one associated dwelling and four non-associated dwellings (49 – 52) within ~500 m of the switchyard site

6.5.3 Assessment criteria

6.5.3.1 Construction noise

The Project-specific construction noise management levels (NMLs) are presented in Table 6.17 below. These NMLs have been established with due regard to the requirements of the Interim Construction Noise Guidelines (ICNGs) for all identified residential and other sensitive (non-residential) receptors. NMLs for all periods are provided for completeness despite construction works limited to the recommended standard hours for construction.

Table 6.17 Project-specific construction noise management levels

Receiver type	Construction noise management levels, $L_{eq,\ 15\ minute}$, dB(A)				High noise affected, $L_{eq,\ 15\ minute}$, dB(A)
	Standard hours	Out of hours			
	Day	Day	Evening	Night	
Residential	45	40	35	35	75

6.5.3.2 Road traffic noise

If road traffic noise during the Project construction is within 2 dB(A) of current levels, then the objectives of the Road Noise Policy (RNP) are met and no specific mitigation measures are required. Where the Project road traffic noise levels exceed 2 dB(A) of current levels then the consideration should be given to the actual noise levels associated with construction traffic and whether or not these levels comply with the RNP criteria as presented in Table 6.18.

Table 6.18 RNP residential road traffic noise criteria

Road category	Type of Project/land use	Assessment criteria – dB(A)	
		Day (7am to 10pm)	Night (10pm to 7am)
Freeway/arterial/ sub-arterial roads	Existing residences affected by additional traffic on existing freeways/arterial/sub-arterial roads generated by land use developments.	$L_{Aeq,15hr}$ 60 (external)	$L_{Aeq,9hr}$ 55 (external)
Local roads	Existing residences affected by additional traffic	$L_{Aeq,1hr}$ 55 (external)	$L_{Aeq,1hr}$ 50 (external)

6.5.3.3 Operation

The noise generated during the operation of the Project will be assessed against the NPI. The criteria for industrial noise generated by the Project are provided in Table 6.19. The Project noise trigger level is the lowest value of the intrusiveness or amenity noise level for each period and are shown below in bold.

Table 6.19 NPI noise criteria (rural amenity area)

Receiver	Period	Noise level – dB(A)			
		Recommended amenity noise level L_{eq}	Assumed background noise level	Project noise trigger level $L_{eq(15minute)}$	
			RBL[1]	Intrusiveness	Amenity[2,3]
Residential	Daytime	50	35[4]	**40**	53
	Evening	45	30[4]	**35**	48
	Night-time	40	30[4]	**35**	43

Noise emissions from the proposed development have been assessed in accordance with NPI 'noise enhancing' meteorological conditions. This ensures a conservative assessment and where compliance under 'worst-case' conditions are predicted then compliance during other scenarios is expected.

6.5.4 Potential impacts

6.5.4.1 Construction impacts

Construction works are proposed to be carried out during standard daytime periods:

- 7.00 am to 6.00 pm Monday to Friday
- 8.00 am to 1.00 pm on Saturdays

Exceptions may be staff arriving and leaving site and the delivery of large solar farm components. Any activity outside normal construction hours would only be undertaken in accordance with approvals from relevant authorities.

The main noise sources associated with the construction of the Project are presented in Table 6.20.

Table 6.20 Construction stages and equipment sound power levels

Project area	Stage	Scenario	Equipment	No. of plant per 15-minute period	Individual equipment maximum Leq sound power level (1) – dB(A)
Solar farm site	1	Site preparation, clearing & demolition	Excavator	2	107
			Bulldozer 28 tonne	1	107
			Chainsaw	2	117(2)(3)
			Tree mulcher	1	115
			Light vehicle	2	94
			Dump truck	1	106
Solar farm site	2	Establish site compound, access roads & delivery of materials	Hand tools	2	94
			Excavator	2	107
			Light vehicle	3	94
			Delivery trucks / semi-trailers	3	100(3)
			Bulldozer 28 tonne	1	107
			DPU / plate compactor	2	103
			Grader	1	107
			Roller 18 tonne	1	102
			Asphalt paver & tipper lorry	1	108
			Bobcat	1	104
			Telehandler	2	105
			Mobile crane	1	106
Solar farm site	3	Installation of foundation for substation and BESS(s)	Piling rig	1	114(2)(3)
			Bobcat	1	104
			Crane	2	106

Project area	Stage	Scenario	Equipment	No. of plant per 15-minute period	Individual equipment maximum Leq sound power level (1) – dB(A)
			Excavator	2	107
			Concrete vibrating needle	2	103
			Concrete agitator truck (discharging)	1	103
			Concrete agitator (low to mid revs)	1	107
Solar farm site	4	Installation of underground cabling	Vermeer trencher	2	105
			Cable laying trailer & tractor	2	103
			Loader	2	110
Solar farm site	5	Assembly of panel frames, mounts & transformer units	Telehandler	2	105
			Generator	2	99
			Compressor	1	93
			Hand tools	2	94
			Ratchet gun	4	94
			Mobile crane	1	106
Solar farm site	6	Site rehabilitation / removal of temporary construction facility	Light vehicle	2	98
			Excavator	2	106
			Bulldozer 28 tonne	1	107
			Loader	1	110
			Dump truck	2	106
			Semi-trailer	1	104
ETL	7	Installation of foundation and towers of electricity transmission line	Piling rig	1	114(2)(3)
			Bobcat	1	104
			Crane	1	106
			Excavator	1	107
			Concrete vibrating needle	1	103
			Concrete agitator truck (discharging)	1	103
			Concrete agitator (low to mid revs)	1	107
			Telehandler	1	105
			Generator	1	99
			Compressor	1	93
			Hand tools	2	94
Switch	8		Piling rig	1	114(2)(3)

Project area	Stage	Scenario	Equipment	No. of plant per 15-minute period	Individual equipment maximum Leq sound power level (1) – dB(A)
		Installation of foundation for switchyard	Bobcat	1	104
			Crane	1	106
			Excavator	2	107
			Concrete vibrating needle	2	103
			Concrete agitator truck (discharging)	1	103
			Concrete agitator (low to mid revs)	1	107
			Dump truck	1	106
			Roller 18 tonne	1	102

(1) Sound power levels of equipment have been referenced from Transport for NSW's *Construction Noise and Vibration Strategy*, UK Government Department for Environment, Food and Rural Affairs' *Update of Noise Database for Prediction of Noise on Construction and Open Sites* and Resonate's sound database

(2) Denotes "annoying" item of equipment as defined in the ICNG (i.e. contains characteristics such as impulsiveness, tonality etc.), and as such includes a +5 dB penalty adjustment to predictions

(3) Overall SWL assumes a maximum duration of 7.5 minutes operation in any 15-minute period

Table 6.21 outlines the predicted impacts from construction of the Project.

Table 6.21 Predicted noise impacts during construction

Project area	Stage	Predicted impacts
Solar farm site	1 to 6	Predicted noise levels have been based on continuous operation of the noise sources identified for each construction stage. Predictions are therefore considered to represent the highest potential noise impacts. The predicted noise levels would typically be short-term, occurring for the duration of the construction period when works are conducted in the vicinity of each receiver. The results indicate that construction activities would be unlikely to exceed the construction noise management levels at all surrounding residential receivers. The predicted noise levels also indicate that the surrounding residences would not be highly noise affected by the construction activities. The worst case predicted construction noise levels are 40 dB(A) and 39 dB(A) at receivers 11 and 12 (refer to Figure 3.2) during Stage 1 "Site preparation, clearing & demolition" activities. These worst-case levels are still well below the 42 dB(A) standard construction hours NML.
ETL	7	Construction noise at receivers that are 1.5 km or more away from the ETL route are predicted to experience construction noise levels of 42 dB(A) or less and be within the NML. Receivers 11, 12[9], 17[7],, 18[7], 19, 47, 48[7], 49 to 59 are less than 1.5 km from the ETL and likely be adversely impacted by ETL construction works as the works move along the route. Construction activities are short-term and localised. Key construction activities will take place at pole locations which will be spaced 200 to 300 m apart. Noise impacts experienced at each pole location will be very short term (< 2 days) and the overall timeframe for construction of the ETL is likely to be 6 to 8 weeks. Noise management and mitigation measures to be implement during the construction of the ETL are outlined in section 6.5.5.

[9] Receiver is an associated receiver and will be receiving compensation for the ETL easement through their property

Project area	Stage	Predicted impacts
Switchyard site	8	Based on the approximate distances of the receivers closest to the switchyard (receivers 48 to 52) to be approximately between 255 m and 570 m away, the Stage 8 construction noise levels are predicted to be between 59 dB(A) and 60 dB(A). Receivers nearest to the switchyard site are likely to experience the worst-case noise impacts which exceeds the 42 dB(A) standard construction hours NML by up to 18 dB(A). It is predicted that Stage 8 construction noise at receivers that are 1.7 km or more away from the switchyard site would likely comply with the standard construction hours NML. Noise management and mitigation measures to be implement during the construction of the switchyard are outlined in section 6.5.5.

6.5.4.2 Road traffic noise impacts

Table 6.22 indicates the existing and proposed traffic for Troubalgie Road, Forest Road and the Newell Highway[10] during their applicable periods appropriate to each classification of road.

Table 6.22 Construction road traffic noise predictions

Road name	Road type	Criteria (day/night)	Period	Existing traffic volume (daytime 7 am to 10 pm)		Proposed traffic volume (daytime 7 am to 10 pm)		Predicted noise level – dB(A)	
				Light	Heavy	Light	Heavy	Existing	Future
Troubalgie Road	Local Road	55/50	1 hour	1	1	10	10	36	46
Forest Road	Local Road	55/50	1 hour	1	1	10	10	36	46
Newell Highway	Arterial Road	60/55	15 hour	1075	706	30	70	58	59

Based on the above, the proposed construction traffic is predicted to increase the overall traffic noise levels along Troubalgie Road and Forest Road during the peak one hour traffic flows, however the absolute noise level is below the Road Noise Policy base criteria meaning impacts are expected to be minimal. The additional construction traffic along the Newell Highway is not predicted to result in an increase in traffic noise by more than 2 dB compared to existing traffic movements along this road.

6.5.4.3 Operational impacts

The main noise sources associated with the operation of the solar farm consists of the following:

- Power conditioning units (PCUs) which contain the DC-AC inverters, medium voltage transformers, switchgear, Supervisory Control and Data Acquisition (SCADA) and communications equipment
- Tracker motors
- Maintenance activities: Staff members will be on site to operate and maintain the solar plant equipment. Maintenance activities are expected to involve low noise generating manual hand tools, be infrequent and be conducted on an as-needs basis during daytime hours
- Substation
- BESS

Noise from the inverters with integrated transformers can be tonal in nature and therefore a 5 dB penalty has been applied to the predicted noise contributions from this source in accordance with

[10] As there are no noise sensitive receptors on Back Yamma Road, a road traffic noise prediction has not been included.

Table C.1 of the NPI. The L_{Aeq} sound power levels of plant and equipment from the proposed operations are given in Table 6.23 below.

Table 6.23 Operational equipment sound power levels

Equipment	Estimated number	Sound power level Leq – dB(A) (Individual equipment)
PCUs	23	98(1)
Tracker panel motors	2,625	74
Maintenance activities, includes trucks travelling along the access road within the site	-	103
Substation	1	98(1),(2)
BESS	-	90

(1) Includes a +5 dB(A) adjustment for tonal characteristic as per the NPI

(2) Sound power level derived from a substation sound pressure level of 85 dB(A) at 1 metre

During the night period the tracker panel motors will not be operating. Hence, for the night-time operational assessment, only the PCUs, maintenance activities, substation and BESS have been assessed against the more stringent night-time NPI noise criterion.

The switchyard and ETL, although part of the Project operations, are not noise intensive and are unlikely to adversely impact on surrounding noise sensitive receivers. Hence, the switchyard and ETL are not considered in the operational noise impact assessment.

The predicted operational noise levels for the day, evening and night-time periods show that operational noise levels from the Project are expected to comply with the NPI noise criteria at all surrounding receivers. The highest predicted noise levels during the daytime and evening periods are 30 dB(A) and 29 dB(A) at receivers 11 and 12 respectively (refer to Figure 3.2). The highest predicted noise levels during the night-time period are 35 dB(A) and 34 dB(A) at receivers 11 and 12 respectively. The predicted night-time operational noise levels also comply with the sleep disturbance criteria. Adverse meteorological condition (i.e. temperature inversion) has been applied to the night-time operational noise modelling. Hence, the night-time predicted operational noise levels are louder than the daytime and evening levels.

6.5.5 Mitigation and management measures

Noise impacts during construction of the solar farm site and operation of the Project are predicted to result in negligible noise impact. To mitigate noise impacts, during the construction of the ETL and switchyard, a Noise and Vibration Management Plan will be prepared prior to construction which will include, but not be limited to, the following measures:

- Noise generating works will be undertaken during the ICNG standard daytime construction hours (i.e. 7.00 am to 6.00 pm Monday to Friday and 8.00 am to 1.00 pm on Saturdays). Activities outside standard hours will only be undertaken in accordance with approvals from relevant authorities and potentially affected sensitive receptors
- The ETL easement entry and exit points will be located as far as possible from sensitive receivers, with consideration of safe access
- Trucks will not arrive on site or be permitted to queue near sensitive receivers prior to the 7.00 am start time unless required by road safety considerations
- Noise and vibration management requirements will be communicated to all staff all staff and sub-contractors of areas and work practices where potential noise impacts have been identified through inductions, toolboxes and targeted awareness training

- Equipment will be operated in the correct manner including replacement of engine covers, repair of defective silencing equipment, tightening of rattling components, repair of leakages in compressed air lines and shutting down equipment not in use
- The simultaneous use of plant and hand tools will be avoided to reduce noise emissions from multiple sources at once
- Residential receptors where NMLs are anticipated to be exceeded will be consulted a minimum of five days prior to construction works
- A noise complaint management procedure and 24-hour contact number will be developed and provided to all nearby sensitive receptors

6.5.6 Residual impacts

Noise levels associated with the construction of the solar farm are predicted to be within NMLs at all surrounding receivers.

Noise levels associated with the construction of the ETL have been predicted to exceed NMLs at receivers within approximately 1.5 km of the works. Noise impacts are not however anticipated to be significant as they will be very short term (< 2 days) and localised at pole locations which are spaced approximately 200 to 300 m apart.

Noise levels associated with the construction of the switchyard have also been predicted to exceed NMLs at receivers within approximately 1.7 km of the site. Noise impacts are anticipated to be short term and mostly associated with equipment and trucks used to install foundations and transport materials to the site.

A Noise and Vibration Management Plan will be prepared and implemented to reduce noise impacts as much as practicable during construction.

Traffic noise levels along local roads during construction are predicted to be below the Road Noise Policy base criteria meaning impacts are expected to be minimal.

Operational noise levels are predicted to comply at all nearby surrounding receivers.

6.6 Traffic and Transport

6.6.1 Overview

A Traffic and Transport Assessment was prepared by SMEC Australia Pty Ltd and is included as Appendix K. The assessment included:

- A site visit on 2 March 2021 (Tuesday), to understand the local road network and undertake traffic count surveys during peak operating hours of the Forbes Central West Livestock Exchange
- Intersection performance (SIDRA) assessment for six intersections
- Safe intersection sight distance (SISD) analysis for the Newell Highway/Forest Road intersection

6.6.2 Existing environment

6.6.2.1 Regional road and rail network

It is likely that either the Port of Botany, Port of Newcastle or Port Kembla would be used to deliver construction related materials for the Project. Construction materials would be transported to the Project area via road or rail.

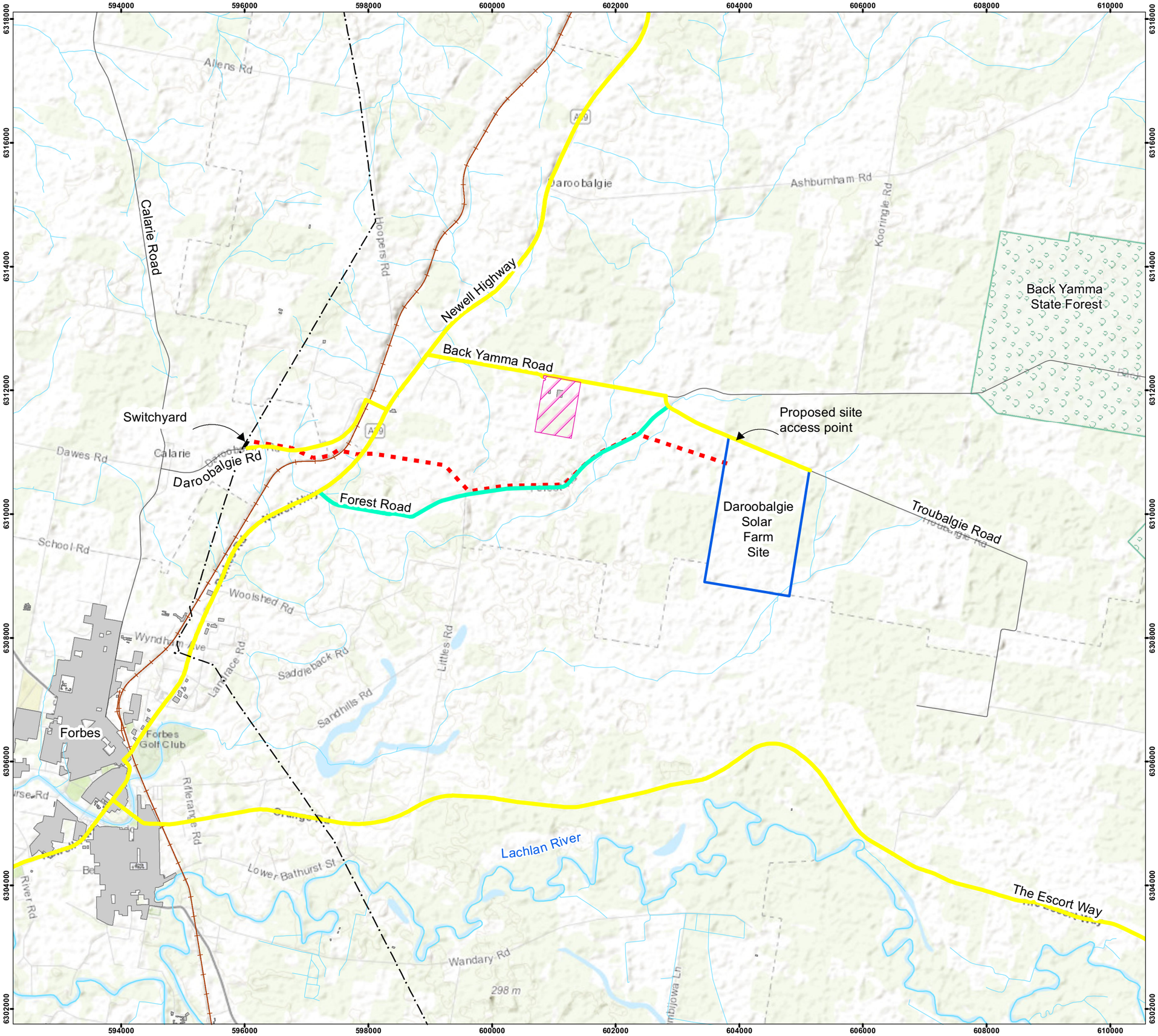
To support the NSW state government's target for increased rail modal share, the Project will explore the use of rail for haulage of Project components. Rail is a safe and efficient option for transporting the many intermodal shipping containers that will be used to deliver solar panels and other components. The Stockinbingal - Parkes railway line is located close to the solar farm site, which is managed by the Australian Rail Track Corporation (ARTC). Parkes, which is approximately 25 km from the solar farm site, is the crossroads of the Australian railway system, with access to all of the state capitals and major ports via the Defined Interstate Rail Network (DIRN), which is standard gauge. Locations where intermodal containers might be unloaded include sidings at Forbes (Mountain Industries intermodal terminal) and Parkes (several sidings) with extensive intermodal handling and transhipment capabilities. There are also several local trucking contractors who can handle the 'last miles' from the railhead to the Project site.

There are two road options available to transport construction materials, namely from the north using Newell Highway (A39) and/or Henry Parkes Way via Parkes or from the south using The Escort Way and Newell Highway via Forbes. All of these roads are designated heavy vehicle routes and would be able to accommodate additional heavy vehicle movements associated with the Project. Both of these routes would require heavy vehicles to access the site from Newell Highway via Back Yamma Road and Troubalgie Road. The intersection at Newell Highway and Back Yamma Road has spare capacity to accommodate vehicles coming both north from Parkes and south from Forbes.

6.6.2.2 Local road network

Heavy and light vehicles required for the construction of the solar farm site will access the site via the Newell Highway, Back Yamma Road and Troubalgie Road. Heavy vehicles required for the construction of the ETL and switchyard are likely to use Forest Road, Newell Highway and Daroobalgie Road. These routes are shown in Figure 6.8.

Details of each of these roads are provided in Table 6.24.



PROJECT
Daroobalgie Solar Farm, Australia

TITLE
Figure 6.8: Proposed Route - Construction Traffic

DRAWING NO
AU-3015-ENG-PHA-GN-MAP-00018

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APPROVED	K. Munro
DATE	03/03/22
SCALE	1:60,000 A3
DATUM	MGA94 (z55)
REV	A

N

0 750 1,500 3,000 m

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Road Type*
- Heavy and Light Vehicle Route
- Restricted Vehicle Route**

- Solar Farm Site
- Electricity Transmission Line (ETL)
- Existing Transmission Line (132kV)
- Switchyard
- Public Road
- Railway
- Forbes Central West Livestock Exchange
- Urban Area
- State Forest
- Watercourse

Note:
* Data source, Transport for NSW 2021
** Heavy vehicles prohibited unless essential for ETL construction. Light vehicle use restricted during construction.

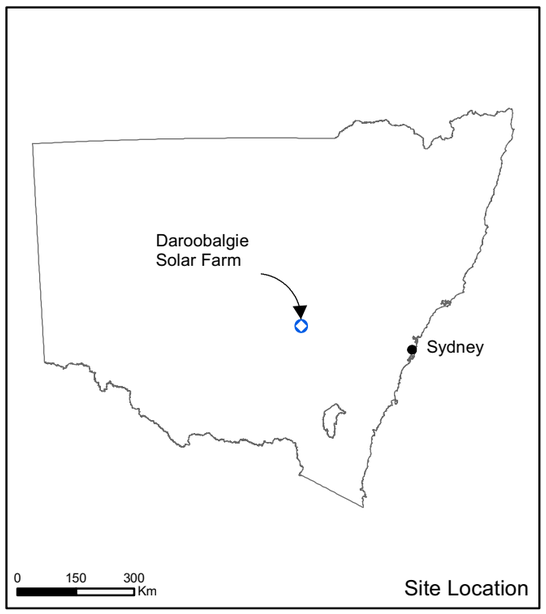


Table 6.24 Local road network

Road	Road classification[11]	Description
Newell Highway	State	A major national highway connecting Queensland, Victoria and NSW. The highway is single carriageway in the vicinity of the Project and within Forbes varying from two to four lanes with speed limits ranging from 50 km/h (Forbes township) to 110 km/h
Back Yamma Road	Local	Two-way road, sealed road with posted speed limit ranging from 80-100 km/h with reduced speed zones associated with some sharp bends
Troubalgie Road	Local	Narrow, unsealed two-way road with a causeway near the intersection with Back Yamma Road
Forest Road	Local	Narrow two-way, unsealed road. Speed limit ranges from 80-100 km/h with several bends throughout the road segment
Daroobalgie Road	Local	Sealed, two-way road

6.6.2.3 Site access

A single site access will be established on the solar farm site northern boundary on Back Yamma Rd. The site access point will be constructed with a rural property access type treatment to cater for the largest vehicle accessing the site in accordance with the Austroads Guide to Road Design.

6.6.2.4 Other road users

There are currently no public transport services on the local roads immediately surrounding the solar farm site, however there is an existing school bus that uses Back Yamma Road, Daroobalgie Road and a small section of the Newell Highway.

The Forbes Central West Livestock Exchange, located on Back Yamma Road, is a state-of-the-art cattle and sheep saleyard. The Livestock Exchange is open 7 days a week however, and peak operating hours are generally:

- Sunday 3 pm to 7 pm
- Monday 5 am to 9 pm (sale day)
- Tuesday 3 am to 9 pm (sale day)

6.6.3 Potential impacts

The construction phase will generate the largest amount of traffic during the lifetime of the Project. Vehicle movements associated with operational activities are expected to be very low and are predicted to have negligible impacts on the existing road network. Decommissioning will generate traffic and impacts similar to those outlined in this assessment for the construction phase. Impacts will be addressed in a specific Traffic Management Plan at the time of decommissioning.

6.6.3.1 Project traffic volumes

Construction related heavy vehicle movements during the various stages of construction are shown in Table 6.25. The maximum daily truck movements are anticipated to occur during site establishment and access road construction with an estimated 1358 one-way truck movements over an 8-week period. Assuming standard working hours, this equates to approximately 29 one-way heavy vehicle movements per (working) day or approximately three one-way heavy vehicle movements an hour. This ‘worst-case’ scenario with regards to heavy vehicle related movements has been used to predict impacts during construction.

[11] https://roads-waterways.transport.nsw.gov.au/classification/map

During construction and decommissioning there is a total of approximately 18 one-way, OSOM vehicle movements anticipated.

The average number of staff during the construction stage is estimated to be 200. Assuming a vehicle occupancy of 1.2 persons per vehicle, this is anticipated to generate ~167 one-way light vehicle movements during the morning peak hour and afternoon peak hour.

Table 6.25 Estimated heavy vehicle movements (one-way) and heavy vehicle types

Phase and duration[12]	Purpose	Vehicle type	No. of one-way vehicle movements	No. of one-way vehicle movements per task	No. of one-way vehicle movements per week
Site mobilization and demobilisation (~ 4 weeks)	Portacabin delivery and removal	Low loader	20	24	6
	Water tank delivery and removal	Low loader	4		
Site establishment and access roads construction (~ 8 weeks)	Skip delivery and removal	Low loader	40	1358	170
	General deliveries	Semi-trailer	34		
	Crane mobilization and demob	Crane	4		
	Delivery of imported capping for road laydowns and crane hardstands	Truck and dog	400		
	Plant delivery and removal: excavators, compactors drill rig	Low loader	30		
	Fuel delivery	Fuel trucks	40		
	Water carts	Water cart	720		
	Concrete deliveries for maintenance container hardstands	Concrete agitators	90		
HV trenching (~12 weeks)	Cable delivery	Semi-trailer or B-double	180	1820	152
	Fuel deliveries	Fuel trucks	40		
	Backfill material delivery	Dump truck	1400		
	DC cabling trays and combiner boxes	Semi-trailer or B-double	200		
PV plant installation (~30 weeks)	Module deliveries	Semi-trailer	1300	2354	78
	Mounting structure and pile deliveries	Semi-trailer	1000		
	Inverter delivery	Low loader	26		
	Telescopic handler and excavator	Low loader	28		
Substation construction (~52 weeks)	Delivery of transformer units (4 OD vehicles) Crane (4 OD vehicles)	OD vehicle	9	9	1

[12] Tasks are not sequential and will overlap. Total duration of construction works is anticipated to be ~56 weeks

Phase and duration[12]	Purpose	Vehicle type	No. of one-way vehicle movements	No. of one-way vehicle movements per task	No. of one-way vehicle movements per week
	Electrical building (1 OD vehicle)				
Electrical transmission line (~12 weeks)	Transmission towers	Semi-trailers	100	100	8
Switchyard (~ 30 weeks)	Concrete deliveries	Concrete agitators	90	110	4
	Infrastructure deliveries	Semi-trailers	20		
Total one-way heavy vehicle movements				**5,775**	

6.6.3.2 Road and intersection capacity

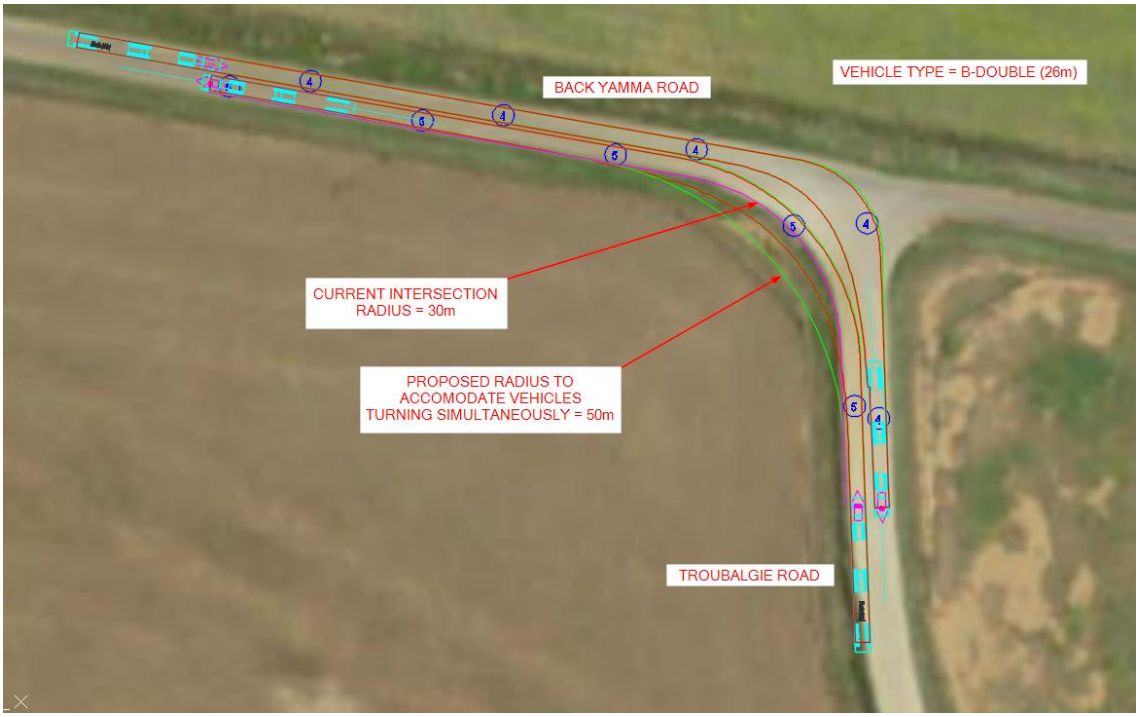
The performance of six key intersections along the construction traffic route were assessed on the basis of the additional construction related traffic volumes. All intersections are predicted to perform with acceptable level of service with the additional construction related traffic. Details of the SIDRA outputs for each intersection are provided in Appendix K.

The Back Yamma Road/Troubalgie Road intersection is not anticipated to be able to accommodate two truck turning movements simultaneously (i.e., right turn from Back Yamma Road to Troubalgie Road and left turn from Troubalgie Road to Back Yamma Road) and is likely to require upgrading to accommodate Project-related construction traffic. Increasing the intersection radius of the turn from 30 m to 50 m would allow B-double vehicles (up to 26m) to pass simultaneously (Image 6-4).

Any vehicle greater in length than 26m or OSOM will require an access permit in accordance with the Heavy Vehicle National Law (HVNL) prior to travel on the road network. The permit will be issued with conditions such as pilot and escort requirements, warning lights and signage and other travel restrictions that may be appropriate.

Initial consultation with Forbes Shire Council and TfNSW has indicated support for the proposed intersection upgrade. Further consultation will support the detailed design of the intersection upgrade during the preparation of the traffic management plan for the Project. The land potentially affected by the intersection upgrade is cleared, agricultural land and no biodiversity or cultural heritage impacts are anticipated as a result of the upgrade.

Image 6-4 Back Yamma/Troubalgie Road proposed intersection upgrade



6.6.3.3 Pavement conditions

The proposed construction vehicle route via The Escort Way, Newell Highway and Back Yamma Road (between the Newell Highway and the Livestock Exchange) is a designated heavy vehicle route and construction-related traffic is anticipated to have negligible/minor impact on pavement conditions.

Troubalgie Road, however, as an unsealed road is likely to deteriorate under increased traffic loads, particularly during wet weather conditions when water may pond, or even flows across the road.

Heavy vehicle traffic will be prohibited from using Forest Road, which is also unsealed, to access the solar farm site. The only heavy vehicle traffic that will be permitted access to Forest Road during construction, will be the small number of vehicles required for the construction of the ETL. Light vehicles use of Forest Road will also be heavily restricted during construction and operations. Therefore, only minor impacts are anticipated on the pavement condition of Forest Road as a result of the Project.

6.6.3.4 Travel speed

Average travel speed on The Escort Way is anticipated to decrease due to slow moving heavy vehicles, including over-dimensional vehicle movements. This is anticipated to have a moderate impact on The Escort Way average travel speed. There is also a potential reduction in average travel speed and increase in travel time for other traffic accessing the Forbes Central West Livestock Exchange, especially during peak operating times.

6.6.3.5 School bus

Construction traffic is anticipated to have moderate impacts on existing school bus routes along Back Yamma Road and The Escort Way.

6.6.3.6 Traffic safety

As construction related traffic is expected to be relatively minor in comparison to local traffic, the impact on overall road safety within the town center of Forbes is expected to be minimal.

A sight intersection safety distance (SISD) analysis of the Forest Road/Newell Highway intersection was undertaken at the request of Traffic for NSW and Forbes Shire Council. The

assessment indicated that the SISD required at the intersection is 300 m. This distance is currently achieved in both directions to/from a vehicle at this intersection on the Newell Highway.

6.6.3.7 Cumulative impacts

The Forbes Central West Livestock Exchange, located on Back Yamma Road, is 2.5 km from the proposed solar farm site. The proposed construction transportation route for the Project includes the use of Back Yamma Road and therefore cumulative traffic impacts are likely as a result of the Project. Traffic count surveys were undertaken on a sale day of the Livestock Exchange. As such, any traffic movements associated with the Livestock Exchange's peak hours have been captured in this assessment.

The Livestock Exchange is open 7 days a week however, peak operating hours are:

- Sunday 3pm to 7pm
- Monday 5am to 9pm (sale day)
- Tuesday 3am to 9pm (sale day)

During these peak operating hours, delays for vehicles accessing the livestock exchange are possible during the construction period of the solar farm (~12-18 months).

The potential impacts on the operation of the Livestock Exchange have been considered in the Traffic and Transport Impact Assessment (Appendix K). The performance of the Newell Highway/Back Yamma Rd intersection was predicted to perform with acceptable level of service with the additional construction related traffic however to mitigate potential traffic impacts on Back Yamma Road, construction-related traffic and deliveries will be minimized during the peak operating times of the Livestock Exchange. It is considered that with careful scheduling of Project deliveries, disruption to the normal operation of the Livestock Exchange will be minor.

There are no other major developments within close vicinity to the Project that are anticipated to coincide with the construction phase of this Project.

6.6.4 Mitigation and management measures

The mitigation measures outlined in Table 6.26 have been identified in consultation with Forbes Shire Council and TfNSW.

Table 6.26 Traffic and transport mitigation measures

Potential impact	Mitigation measure
Intersection capacity - Back Yamma/ Troubalgie Road	Back Yamma Road/Troubalgie Road intersection will be upgraded to accommodate OSOM vehicle movements during the construction period
Pavement condition – general	Pre, mid and post construction road dilapidation reports will be prepared to assess pavement conditions and drainage structures on local roads that will be utilized by construction traffic
Pavement condition – Troubalgie Road	Troubalgie Road between Back Yamma Road and the site access point(s) will be upgraded to a sealed road The Back Yamma Road/Troubalgie Road intersection, will be widened to accommodate two-way heavy vehicle movements, including OSOM vehicles
Pavement condition – Forest Road	Heavy vehicle use of Forest Road will be prohibited (unless required for ETL construction) Light vehicle use of Forest Road will be restricted through signage, project-specific code of conduct or other measures A transport pool for construction staff with common schedules and accommodation locations will be considered, to reduce staff vehicle movements on Back Yamma Road and Forest Road during peak hours
Average travel speed	Construction vehicle movements during peak hours will be minimised wherever possible (i.e., 8 am to 9 am and 4 pm to 5 pm)

Potential impact	Mitigation measure
	Deliveries will be avoided, and construction related traffic minimised during peak operating times of the Forbes Central West Livestock Exchange
School bus	Construction material delivery and associated heavy vehicle movements including over-dimensional vehicle movements will be scheduled to be outside school bus operating hours
Traffic safety	Construction vehicle movements will be minimized during peak hours (i.e., 8 am to 9 am and 4 pm to 5 pm) The Back Yamma Road/Troubalgie Road intersection will be upgraded to accommodate two-way heavy vehicle movements, including OSOM vehicles in consultation with road authorities Advisory speed limits will be placed on Back Yamma Road and Troubalgie Road to enhance safety. Signage will also be installed on Forest Road to restrict its use
General	A Traffic Management Plan will be developed in consultation with the haulage contractor, Forbes City Council and TfNSW, prior to construction. The Traffic Management Plan will include all mitigation measures outlined in above and provide: – Details of the haulage route to be used during construction – Assessment of road conditions along the haulage route – Requirements for the upgrade of Back Yamma Road/Troubalgie Road intersection to accommodate OSOM vehicle movements during the construction period – Identification of any other road/intersection upgrades required – A pre-dilapidation survey of local roads that may be impacted during construction – Timing for mid and post dilapidation survey of road conditions to identify any damage caused by construction traffic – A delivery schedule for key construction materials – Community consultation requirements and contact details – The process for dealing with any community complaints during construction – All controls to be implemented (signage, speed limits, code of conduct etc.)

6.6.5 Residual impacts

With the implementation of the mitigation measures identified in Table 6.26, in particular the upgrade of Troubalgie Road and the Back Yamma Road/Troubalgie Road intersection, impacts on the pavement condition of local roads is anticipated to be minimal. In addition, pre, mid and post construction dilapidation surveys of road conditions will identify any damage caused by Project related traffic and ensure remediation works are undertaken if damage is identified.

The introduction of three heavy vehicle movements per hour and up to 167 light vehicle movements during the morning and afternoon peak during the construction period is likely to cause some disruption or inconvenience to local traffic. However, this will be mitigated, as much as possible, through the measures outlined in the Traffic Management Plan.

6.7 Water

6.7.1 Overview

A flooding assessment was undertaken by SMEC Pty Ltd and is provided in Appendix L. The assessment includes:

- A review of topographical and hydrological existing data
- Hydrogeological modelling
- Development of a 2D TUFLOW hydraulic model to assess potential flood impacts for 1%, 5% and 10% AEP events
- A site visit in very wet conditions to understand the expected flood behaviours and overland flow paths

A hydrogeological assessment was undertaken by SMEC Pty Ltd and is provided in Appendix M. The assessment is based on desktop review of available information and results of a preliminary geotechnical testing undertaken on the solar fam site in 2019 (Golder, 2019).

6.7.2 Existing environment

6.7.2.1 Climate

The climate in the Project area is mild to warm with significant temperature variations between seasons. Mean monthly rainfall is relatively consistent throughout the year with an annual average of approximately 480 mm. Average evapotranspiration exceeds rainfall annually, and in all months except June. The high evapotranspiration limits rainfall recharge to groundwater which is considered less than three percent of the annual rainfall.

6.7.2.2 Surface water

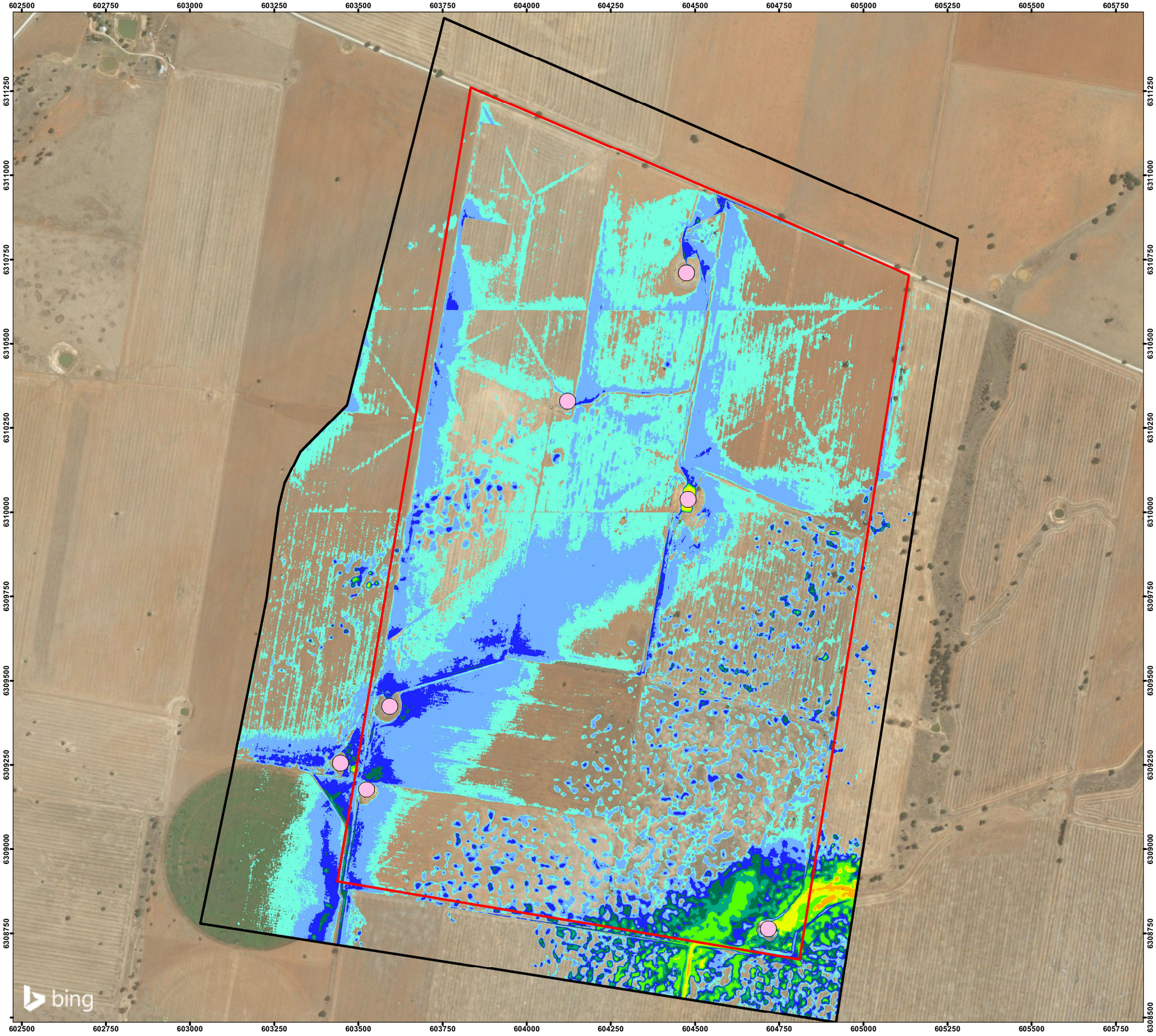
The solar farm site is located on land which gently slopes from north to south from around 250 m AHD at the northern boundary on Troubalgie Road to around 244 m AHD at the southern boundary. From the southern boundary the land generally slopes further to the south towards the Lachlan River located some 3.5 km away. There are six dams present within the solar farm site (Figure 6.9). Small ephemeral waterholes, known locally as gilgai, are present in some paddocks, mainly within the southeastern section of the site. These have been progressively ploughed and levelled by farming activities over time

Two major overland flow paths traverse the solar farm site (refer Figure 6.9). The first originates from the north and crosses the site near the southwestern boundary where there are two existing farm dams. The other major flow path follows a natural, unnamed watercourse to the east of the site which intersects the solar farm site at the southeast corner. During heavy rainfall events, stormwater runoff from the site is inferred to flow southeast into unnamed watercourses, which discharge into the Lachlan River after traversing The Escort Way via culverts.

Flood depth maps (refer Figure 6.9) show that 1% AEP peak water depth over most of the site is less than 300 mm except at the farm dams and the southeast corner where ponding reaches up to 1.5 m. The hazard classification throughout most of the site under the 1% AEP storm event was calculated to be H1 (generally safe for people, vehicles and buildings). However, under the 1% AEP storm events in the southeast corner, where both depths and velocities are higher, and in existing farm dams, hazard classifications are as high as H3 (unsafe for all vehicles, children and the elderly).

Flood depth for the 1% AEP storm at the switchyard site is less than 200 mm and peak flood velocity is less than 0.6 m/s. There are no considerable floodways within the site and the flood hazard for the site is classified as H1 (generally safe for people, vehicles and buildings).

Undefined, ephemeral drainage lines are present in the eastern and western sections for the ETL. The proposed overhead ETL is not anticipated to change existing flood behaviour (flow path and flood levels).



PROJECT
Daroobalgie Solar Farm, Australia

TITLE
Figure 6.9: Peak Water Depth (1% AEP) - Solar Farm Site

DRAWING NO
AU-3015-ENG-PHA-GN-MAP-00019

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APPROVED	K. Munro
DATE	14/02/22
SCALE	1:11,000 A3
DATUM	MGA94 (z55)
REV	A

N

0 100 200 400 m

PacificHydro

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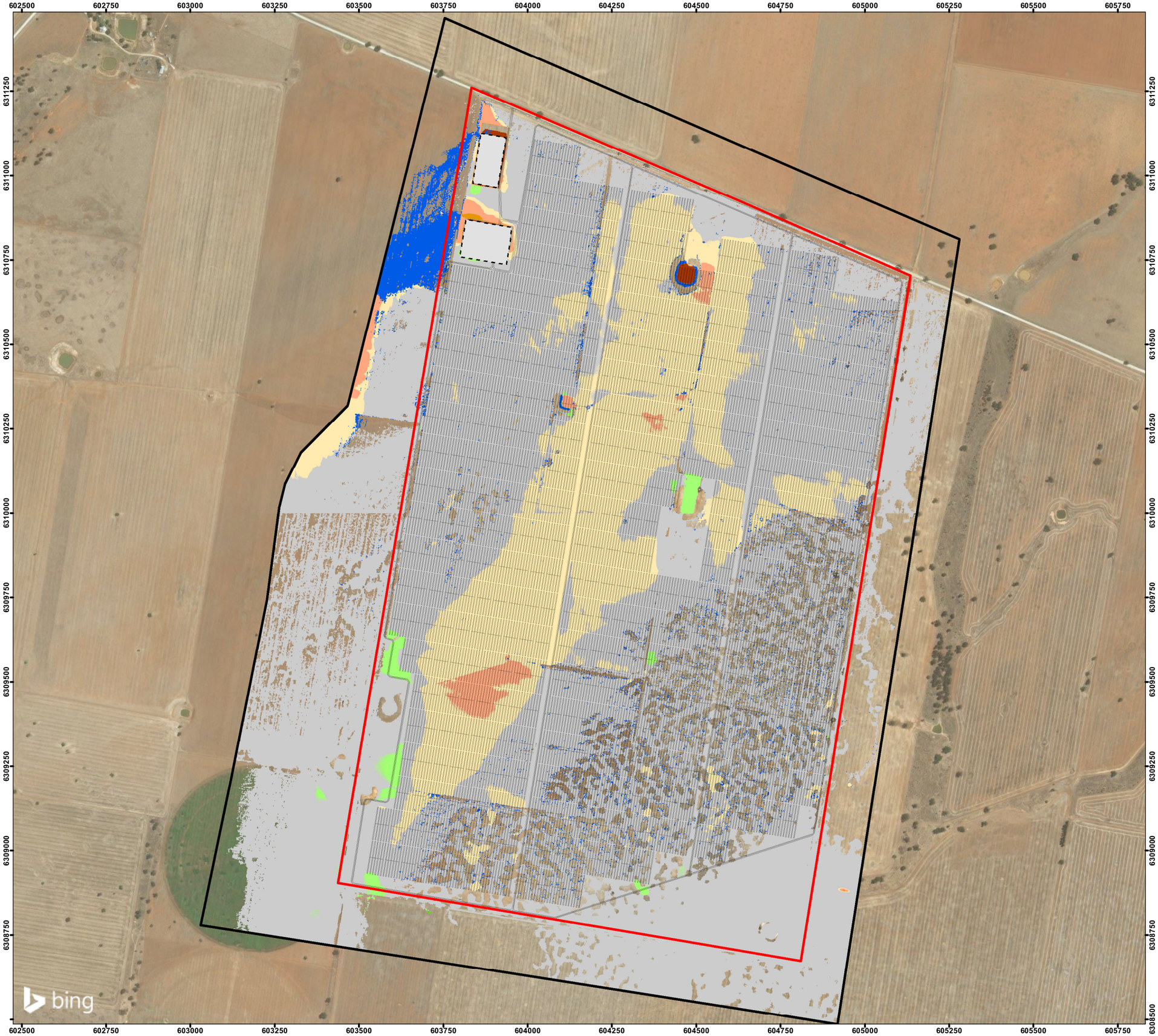
- Hydraulic Model Boundary*
- Solar Farm Site
- Farm Dam

1% AEP - Peak Water Depth (m) *

- <= 0.05
- 0.05 to 0.1
- 0.1 to 0.2
- 0.2 to 0.3
- 0.3 to 0.4
- 0.4 to 0.5
- 0.5 to 0.75
- 0.75 to 1.0
- 1.0 to 1.5
- 1.5 to 2.0
- > 2.0

Data Source:
* SMEC, Flood Risk Impact Assessment, 27/09/2021



PROJECT
Daroobalgie Solar Farm, Australia

TITLE
Figure 6.10: 1% AEP Afflux (Increase in Flood Levels)

DRAWING NO
AU-3015-ENG-PHA-GN-MAP-00020

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DATUM	MGA94 (z55)
REV	A

N

0 100 200 400 m

PacificHydro

FOR EXTERNAL DISTRIBUTION

- Hydraulic Model Boundary*
- Solar Farm Site
- General Arrangement Layout
- Substation Design Surface

1% AEP - Afflux (m)*
- -1 to -0.2
- -0.2 to -0.1
- -0.1 to -0.03
- -0.03 to -0.01
- -0.01 to 0.01
- 0.01 to 0.03
- 0.03 to 0.1
- 0.1 to 0.2
- 0.2 to 0.5
- 0.5 to 2
- Was Dry, Now Wet (<30mm)

Data Source:
* SMEC, Flood Risk Impact Assessment, 27/09/2021

6.7.2.3 Groundwater

Immediately underlying the Project, the upper Quaternary and Tertiary alluvial unconsolidated sediment sequence is divided into two major aquifer formations, the Cowra Formation and the deeper Lachlan Formation. The Cowra Formation unconformably overlies the Lachlan Formation and basement rocks. It is generally 30 to 50 m thick in most areas (Bilge, 2012). The Cowra Formation forms an important stock, domestic and irrigation water supply in the Forbes area.

A search of the Bureau of Meteorology National Groundwater Explorer indicates 51 registered bores within approximately seven kilometres of the solar farm site. The nearest borehole with groundwater level information is GW022640 located 3.7 km northeast of the solar farm site. Groundwater levels range between 59.4 m and 65.9 m below ground level at this location. The depth to groundwater within the solar farm site was assessed during the preliminary geotechnical investigation conducted by Golder (2019). Groundwater was not encountered in the six auger holes, which were dug to a depth of 7.5 m.

6.7.3 Potential impacts

6.7.3.1 Surface water

Potential impacts on surface water and flooding at the solar farm site will be largely avoided by excluding the southeastern corner of the site from development and retaining four of the six existing farm dams. Flood modelling for the proposed Project shows that the major flow paths through the site are maintained and that the watercourse in the southeast corner will not be adversely impacted by the Project.

Flood modelling for the proposed Project does however indicate that:

- Flood storage is reduced compared to existing conditions due to the loss of two farm dams
- In the northwest corner of the solar farm site where the substation, O&M facilities and BESS will be located, the overland flow path is blocked and redirected to the west of these benched areas. Results indicate afflux of up to 30 mm within the property west of the solar farm site (Figure 6.10)

The proposed ETL is not anticipated to change existing flood behaviour. There is the potential for some gilgai wetlands to be disturbed during the construction of the transmission line however pole placement for the transmission line in the area of the gilgai wetlands will be micro-sited to avoid direct impacts where possible.

Flood modelling of the proposed switchyard indicates that the peak flood velocity (0.7 m/s) and low hazard rating remain almost the same as existing conditions. Results show afflux of up to 55 mm mainly in the area along the western boundary of the switchyard site. Afflux reduces to 10 – 20 mm further away to the west.

6.7.3.2 Groundwater

The potential impacts to groundwater include:

- Water quality changes due to soil disturbance
- Contamination via chemical or hydrocarbon spills
- A reduction in evapotranspiration due to shading of the ground surface
- An increase in recharge across the Project due to shading and point source recharge from panel runoff

The maximum depth for solar panel footings is assumed to be less than two metres which is not anticipated to intercept the water table at the solar farm site. The maximum excavation depth for electricity transmission poles is expected to be less than four metres which is unlikely to intercept the top of the water table. The installation of driven piles for the solar panels and changes to the impervious areas are not anticipated to have an identifiable impact on groundwater levels or quality. Construction water supplies will not be sourced from groundwater, therefore there are no anticipated impacts due to extraction.

6.7.4 Mitigation and management measures

The following management and mitigation measures will be employed during construction and operation of the Project:

6.7.4.1 Surface water

- A shallow swale (north to south) adjacent to the proposed substation on the solar farm site will be provided to mitigate afflux in the neighbouring property, west of the site
- A shallow swale along the western and southern boundaries of the switchyard site will be provided to mitigate afflux to the west of the site
- Finished flood levels of buildings, temporary storage areas and electrical enclosures will be above 1% AEP flood level plus an appropriate freeboard
- All electrical equipment including PV modules will be installed 300 mm above 1% AEP flood levels
- The main access track and internal tracks will be designed to remain trafficable under 10% AEP design storm event to allow required access to and maintenance of solar panels
- Further flood modelling will be undertaken post the civil and drainage detailed design to confirm flood modelling results

6.7.4.2 Groundwater

- All fuel and chemicals stored for the Project will be in approved bunded areas
- Refuelling activities will be undertaken in a bunded area or on hardstands where fuel spill kits are available
- Temporary Project offices and workspaces will have a portable above ground systems (i.e. above ground pump out septic systems)
- Construction water supplies will be trucked to site

6.7.5 Residual impacts

Flood behaviour for the proposed and existing development on the solar farm site are predicted to be essentially the same, predominately due to the exclusion of the southeastern corner from the solar farm design and the retention of four of the six existing farm dams. At the switchyard site, overland flow is shallow in depth and very low in velocity and flood behaviours for the proposed Project are generally retained from existing conditions. The proposed overhead ETL is not anticipated to change existing flood behaviour (flow path and flood levels).

Afflux predicted on neighbouring properties at the solar farm and switchyard sites will be minor and minimised through the use of shallow swales around Project infrastructure.

All potential impacts to groundwater are considered minor and are not anticipated to adversely impact groundwater resources. Increased recharge due to point source runoff and reduced evapotranspiration may have a small but positive recharge effect.

6.8 Hazards and risks

6.8.1 Overview

A Preliminary Hazard Assessment was prepared by GHD Pty Ltd and is included as Appendix N. The desktop assessment was undertaken with consideration of the following guidelines:

- SEPP 33: Hazardous and Offensive Development Application Guidelines
- Hazardous Industry Planning Advisory Paper No. 4 (HIPAP No. 4) – Risk Criteria for Land Use Safety Planning (NSW Department of Planning, 2011a)
- Hazardous Industry Planning Advisory Paper No.6 (HIPAP No. 6) – Guidelines for Hazard Analysis (NSW Department of Planning, 2011b)
- Multi-level Risk Assessment (NSW Department of Planning, 2011c)
- Guidelines for limiting exposure to time-varying electric, magnetic and electromagnetic fields (up to 300GHz) (ICNIRP, 1998)
- Planning for Bushfire Protection (NSW Rural Fire Service, 2019)

The methodology used for the assessment, as outlined in SEPP 33, was hazard screening, hazard identification and preliminary hazard analysis. This section also specifically assesses the risks from the Project of electric and magnetic fields (EMFs) and bushfire.

6.8.2 Existing environment

The proximity of neighbouring properties to the Project area helps to inform the likely significance of potential impacts from the Project on surrounding areas. The solar farm site is relatively remote with two residences within one kilometre of the site and seven residences within three kilometres of the site (refer Figure 3.2). The closest residences to the ETL and switchyard site are 150 m and 300 m respectively.

The Project area is predominately agricultural. A search of the NSW Rural Fire Service Bushfire Prone Land Mapping Tool determined that the land within the Project area is not identified as bushfire prone land. As the Project is not within a defined bushfire prone area, compliance to Planning for Bushfire Protection is not required. However, Planning for Bushfire Protection does provide guidance on bushfire mitigation options which are recommended for the Project. The nearest defined bushfire prone land, Back Yamma State Forest, is approximately seven kilometres from the northeast corner of the proposed solar farm boundary.

6.8.3 Potential impacts

6.8.3.1 Dangerous goods

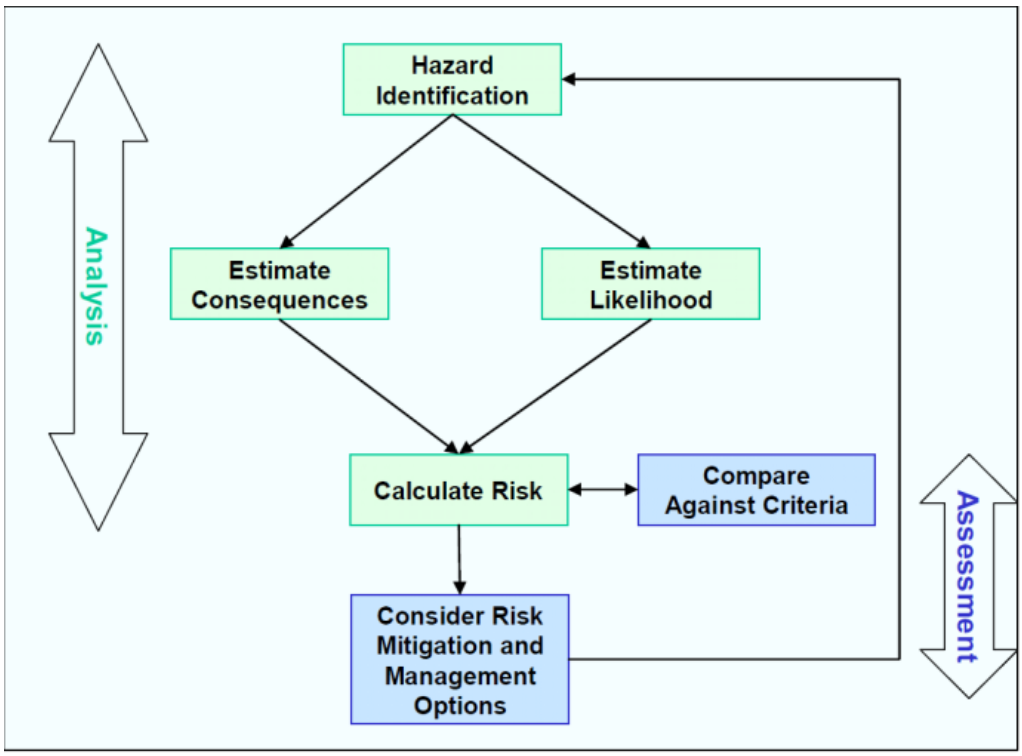
The hazard risk screening process involved the identification of classes and quantities of all dangerous goods to be used, stored or produced on site with an indication of storage locations. The quantities of dangerous goods are then assessed against the SEPP 33 threshold quantities. The screening assessment found that storage thresholds for construction and operation were not exceeded. Furthermore, the screening assessment found that the movement of dangerous goods, both during construction and operation, will be minimal given the storage and use requirements of the Project. Therefore, the SEPP 33 dangerous goods movement thresholds are not predicted to be exceeded.

6.8.3.2 BESS

Despite the hazard screening indicating that the Project will not exceed any of the SEPP 33 threshold quantities for dangerous goods, a preliminary hazard assessment (PHA) was undertaken, predominately to assess potential hazards associated with the BESS. A level 2 PHA uses a semi-qualitative approach based on comprehensive hazard identification to demonstrate that the activity does not pose a significant risk. The risk assessment process is shown in Image 6-5. In undertaking the assessment, the following assumptions were made:

- All plant and equipment are installed and operated in accordance with appropriate Australian Standards, codes and guidelines
- Dangerous goods are stored in accordance with the Australian Dangerous Goods Code, relevant standards and guidelines
- All equipment and systems are designed to be inherently safe

Image 6-5 Risk assessment process for PHA level 2 of BESS



The hazard identification process identified four hazard scenarios with the potential for off-site impacts (Table 6.27).

Table 6.27 Hazard scenarios with potential off-site impacts

Project phase	Hazard scenario	Causes
Construction	Vehicle interactions on public road	– Vehicle movements to and from the site – Works adjacent to public roads
Construction	Fire started within the Project area	– Hot works
Operation	Overheating of lithium-ion batteries	– Over and under voltage during discharge of batteries – Thermal runaway reactions – Over discharge of the batteries
Operation	Mechanical or chemical damage of lithium-ion battery assemblies	– Rapid heating of individual cells (e.g. lack of venting, thermal runaway reactions) – Vehicle impact into batteries

Lithium-ion batteries are regulated as Class 9 miscellaneous dangerous goods (also known as hazardous materials) under the Australian Dangerous Goods Code. Lithium-ion batteries can pose unique safety hazards since they contain a flammable electrolyte and may be kept pressurised. If a battery cell is charged to quickly, it can cause a short circuit, leading to potential explosions and fires.

The key hazard for battery systems is thermal runaway. There are a number of causes of thermal runaway including:

- Latent battery failure caused by a manufacturing fault
- Overcharging
- Overheating within containers

Generic data on lithium-ion batteries was used to determine the consequence, likelihood and overall risk of the thermal runaway hazard scenarios listed above. This risk was compared with the risk criteria for land use and safety planning in HIPAP 4 (Table 6.28) and shown to comply for all thermal runaway hazard scenarios (Table 6.29).

The assessment assumes that the BESS is located a minimum of 4.5 m from the property boundary and mitigation and management measures detailed in section 6.8.4 are implemented.

Table 6.28 HIPAP 4 risk criteria

Impact	On-site criteria	Off-site criteria
Fatality (12.6 kW/m^2 & 21 kPa)	5.00 x 10^{-05}	1.00 x 10^{-06}
Serious injury (4.7 kw/m^2 & 7 kPa)	-	5.00 x 10^{-05}
Property damage (23 kw/m^2 & 14 kPa)	-	5.00 x 10^{-05}

Table 6.29 Risk of thermal runaway hazard scenarios

Event	Frequency per year	Interval years	Compliance
Off-site property damage	0	0	Complies
Off-site serious injury	0	0	Complies
Off-site fatality	0	0	Complies
On-site fatality	1.7 x 10^{-05}	58,962	Complies

6.8.3.3 Electric and magnetic fields

Electric and magnetic fields (EMF) are part of the natural environment and electric fields are present in the atmosphere and static magnetic fields are created by the earth core. EMF is also produced wherever electricity or electrical equipment is in use.

Sources of EMF associated with the Project, once operational, include the solar arrays, substation, new 132 kV transmission line and new switchyard. The potential impact of these EMFs is outlined in Table 6.30.

Table 6.30 Potential impacts from EMF

EMF source	Discussion	Potential impact rating
Solar farm - substation and electrical equipment	The substation is the main source of EMF within the solar farm site. The layout of the substation and the selection of equipment, which would be undertaken during detailed design, will be in line with the design of similar substations located throughout Australia. Careful positioning and selection of equipment is likely to result in exposure levels at the boundary of the substation being similar to existing background levels. Security fencing around the substation (and wider site) will ensure that members of the public would be at negligible risk of exposure from the substation. Access to the substation will only be available to suitably trained and inducted workers. While the rest of the electrical equipment to be located on site would generate magnetic fields, due to their voltage levels and substantial distance to the nearest sensitive receivers they are expected to comply with limits for both public and occupational exposure. Exposure levels are likely to be close to background levels at the property boundary.	Low

EMF source	Discussion	Potential impact rating
	Security fencing to be erected around the site would also prevent access to the site by members of the public and therefore limiting their exposure.	
Transmission line and switchyard	The magnetic flux from typical high voltage transmission lines are: – 10 – 200 milligauss (mG) directly under a high voltage transmission line for people doing ground-based activities – 50 mG at the edge of a high voltage transmission line easement (22.5 m from the centre line) for people doing ground-based activities (TransGrid, 2020) These magnetic fields are well below the levels contained within the interim guidelines on limits of exposure.	Low

6.8.3.4 Bushfire

There is limited vegetation on the solar farm site resulting in a low bushfire risk. Grasslands can be dry, particularly in times of drought, and although not mapped as bushfire prone, there is a risk of grass fires. The solar farm site is most at risk to fire if adjoining land is ignited and fire spreads onto site.

The majority of the surrounding land is used for agriculture, a mixture of grazing and cereal cropping. Cereal crops are typically harvested in October to early December, therefore the cross over with the fire season and the period when crops are considered sufficiently dry is short and limits the bushfire risk for the area.

Existing potential ignition sources in the vicinity of the Project are the existing TransGrid Parkes-Forbes 132 kV transmission line, Essential Energy 66 kV powerlines, Newell Highway, the rail corridor and other existing land uses. Bushfire risk from these sources is considered relatively minor as vegetation in close proximity to these areas is managed by the respective authorities. For example, the vegetation within the existing transmission line corridors is currently managed by TransGrid and Essential Energy in accordance with standard procedures to maintain safe electrical standards and operational clearances between vegetation and the conductors. As such, the likelihood of arcing between the line and grassland is minimised. TfNSW and ARTC also manage vegetation within the road and rail corridors respectively.

Potential bushfire risk from the Project is summarised in Table 6.31.

Table 6.31 Summary of bushfire risk from the Project

Bushfire risk	Discussion	Potential impact rating
Solar farm and switchyard	Bushfire risk due to thermal runaway of the BESS has been addressed in section 6.8.3.2 and is considered unlikely. Operation of the solar farm is also unlikely to result in any substantial additional bushfire risks. A literature search was undertaken for a broader range of fires originating from equipment faults at solar farms. This search found – In the United Kingdom, six solar farms, had reported a localised fire (two from inverters, two from DI connectors and two unknown) because of either poor installation or faulty equipment. A localised fire is considered to have caused some damage to areas surrounding the point of origin but did not spread beyond that area or threaten buildings – In the USA a fire was caused by a bird shorting out two power lines – In Queensland a fire was started in a construction lay-down area, potentially from rubbish – In Victoria, Australia in 2021, a fire occurred during testing of a newly installed BESS. The likely cause of the fire was found to be a	Low

Bushfire risk	Discussion	Potential impact rating
	coolant leak in the cooling system which led to thermal runaway and fire[13]. Mitigation and management measures that will be put in place to minimise bushfire risk from the Project are outlined in section 6.8.4.	
ETL	The design, installation and operation of the ETL will be undertaken in accordance with AS/NZS 7000 Overhead Line Design requirements. The risk from ignition from the ETL will be managed by implementing standard operating procedures, such as vegetation clearing and trimming that are required to be implemented under the *Electricity Supply Act 1995*	Low

6.8.4 Mitigation and management measures

Management of hazard and risk is integral to Pacific Hydro's business. Pacific Hydro's Risk Management Framework is consistent with the *Australian Standard for Risk Management*: AS/NZS ISO 31000:2009 Risk Management – Principles and guidelines and provides the structure for managing any form of risk in a systematic, consistent, transparent, and credible manner.

The risk assessment process involves risk identification, risk analysis and risk evaluation. Fundamental to the risk analysis process is the identification of controls and evaluation of their effectiveness. A risk register will be prepared and actively maintained for each phase of the Project.

Management and mitigation measures that will be implemented to manage hazards and risks are outlined in Table 6.32.

Table 6.32 Mitigation and management measures relevant to hazards and risk

Hazard	Management and mitigation measures
Dangerous goods	– Chemicals on site will be stored in accordance with Australian standards – Safe work procedures will be implemented for the handling of all chemicals including transfer storage, spill prevention and clean up requirements – Appropriate personal protective equipment will be worn by staff – Spill kits will be installed at all chemical storage locations
BESS	– The BESS will be located at least 4.5 m from the solar farm site boundary – Separation distances between battery containers will be as per AS 2067:2016 Substations and high voltage installations exceeding 1 kV a.c. – Lithium-ion batteries and associated equipment will be located within a temperature controlled and ventilated location that does not exceed the manufacturer's temperature range specification – The lithium-ion batteries storage area will be protected from flooding, by ensuring through detailed design that the substation and BESS compound applies appropriate freeboard above the 1% AEP for the area – The lithium-ion batteries will be insulated, containerised and bunded – Lithium-ion batteries will include protections and circuit controls, such as – integrated circuit control systems to avoid voltage drift – current sensing circuits to avoid short circuiting – built-in positive temperature coefficient to protect against current surges – circuit interrupt device that opens at excess pressure – safety vent to release gases on excessive pressure build-up – an active fire suppression system – separator that inhibits ion-flow when exceeding a certain temperature threshold

[13] Fire at Tesla giant battery project near Geelong was likely caused by coolant leak, investigation finds - ABC News

Hazard	Management and mitigation measures
	– a Battery Management System to properly manage the batteries state of change, including battery balancing devices, to avoid deterioration and individual cell over/ under voltage – An inspection and maintenance regime will be implemented to identify signs of damage, such as bulging/cracking, hissing, leaking, rising temperature, and smoking
EMF	Only electrical equipment that complies with the ICNIRP exposure levels will be selected
Bushfire	A Bushfire Management Plan will be prepared in consultation with the Rural Fire Service. The plan will include, but not be limited to, the following management and mitigation measures: – A 10 m wide Asset Protection Zone will be provided around the perimeter of the solar farm site and around the substation, BESS, and O&M buildings – Fuel loads will be monitored and managed in the Project area to reduce the risk of grass fires – Firefighting equipment will be stored on site including adequate emergency fire water supplies – Each building will have fully compliant fire safety systems – An emergency response plan will provide details on emergency access points and evacuation measures – Vegetation will be cleared along the ETL in accordance with TransGrid easement guidelines

6.8.5 Residual impact

The PHA determined that the risk arising from the three BESS thermal runaway fire scenarios does not exceed the individual fatality or injury risk criteria specified in the HIPAP No. 4 – Risk Criteria for Land Use Safety Planning. Furthermore, off-site risks from bushfire and EMF have been assessed to be low.

6.9 Socio-economic

6.9.1 Overview

A socio-economic impact assessment (SEIA) was undertaken by SMEC Pty Ltd and is provided in Appendix O. The SEIA was prepared in accordance with:

- Social impact assessment guideline (SIA guideline) for state significant mining, petroleum production and extractive industry development and SIA Scoping Tool (DPE, 2017)
- Social impact assessment guideline for State Significant Projects (DPIE, 2021)
- Environmental planning and impact assessment practice note: socio-economic assessment (Roads and Maritime Services, 2013)

6.9.2 Existing environment

A local and regional study area for the SEIA was defined with reference to locations and stakeholders surrounding the Project which may experience socio-economic impacts associated with the Project.

The local study area includes the area immediately surrounding the solar farm site. The local study area is sparsely populated and has been modified by agricultural activity associated with land clearing, cropping and livestock grazing. It includes the Central West Industrial Park and the Forbes Central West Livestock Exchange on Back Yamma Road.

The regional study area includes Forbes LGA and Parkes urban centre and locality (UCL). Forbes is a significant rural centre noted for its fine parks and gardens and large gracious public buildings. The economy of the area is based around pastoral and agricultural practices, particularly beef cattle grazing, the Forbes Central West Livestock Exchange, hay exports, wool, wheat, grain seed crops, oil seed crops, fruit and vegetables. Parkes is a major town in the Central West region of NSW located approximately 22 km north of the Project.

The study areas are shown in Figure 6.11.

6.9.2.1 Population

At the 2016 ABS census, the population of the local study area was 210 people and the population of the regional study area was 19,561 people. Seven residents of the local study area, or 3.3% identified as Aboriginal and/or Torres Strait Islander at the 2016 Census, compared to 10.2% and 11.1% for Parkes UCL and Forbes LGA respectively. At the 2016 ABS census, the number of people of working age (15 - 64 years) in the regional study area was 11,483.

The 2019 population projections for the Forbes LGA indicate that the region is estimated to increase by 500 people or 5.1% between 2016 and 2041. This will increase the population of the Forbes LGA from 9,800 to 10,300 people.

6.9.2.2 Labour and employment

In 2016, the top employment by occupation in Forbes LGA were managers (19.2%), professionals (14.2%), technicians and trades workers (13.9%), labourers (12.9%) and clerical and administrative workers (10.1%). The local unemployment rate was 5.4%.

The top occupation sub-groups of employment for Parkes UCL were technicians and trades workers (15.8%), professionals (15.3%), clerical and administrative workers (12.5%), community and personal service workers (11.5%) and machinery operators and drivers (11.1%). The local unemployment rate was 7.9%.

The occupation profile in the regional study area in 2016 indicates that there is potential to provide labour and skills for the Project. Both Forbes LGA and Parkes UCL had high percentage of skilled labour, such as technicians and trader workers and machinery operators and drivers.

PROJECT
Daroobalgie Solar Farm, Australia

TITLE
Figure 6.11: Local and Regional Study Area

DRAWING NO
AU-3015-ENG-PHA-GN-MAP-00021

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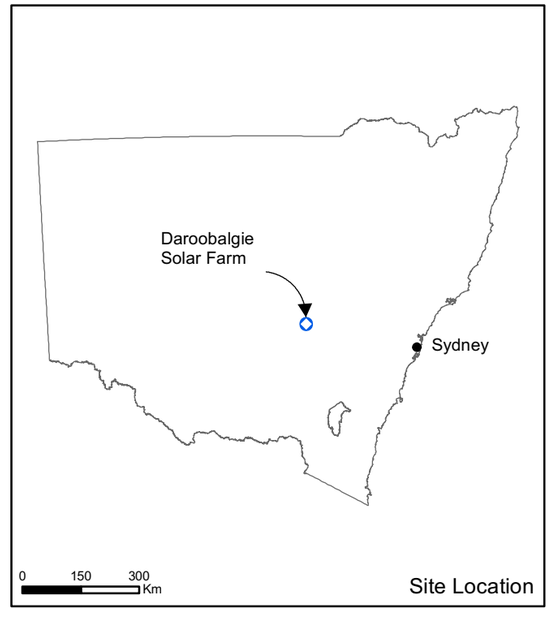
- Local Study Area (SA1, 2021)*
- Parkes Urban Centre and Locality (UCL, 2016)*
- Forbes Urban Centre and Locality (UCL, 2016)*
- Local Government Area Boundary (LGA)**
- Solar Farm Site
- Electricity Transmission Line (ETL)
- Existing Transmission Line (132kV)
- Switchyard

Data Source:
* Australian Bureau of Statistics, downloaded 23/09/21.
** NSW Government, downloaded 22/02/21.



6.9.2.3 Short term accommodation

Table 6.33 outlines short-term accommodation options within one-hour drive of the Project.

Table 6.33 Short term accommodation options in the regional study area

Accommodation type	Description
Hotels and motels	20 hotels and motels in Forbes 26 hotels and motels in Parkes
Caravan parks	Forbes Caravan and Cabin Park Forbes River Meadows Caravan Park Apex Riverside Tourist Park BIG4 Forbes Holiday Park Newell Highway Motel and Caravan Park Spicer Caravan park Parkes Overnighter Caravan Park
Airbnb	72 Airbnb accommodation options in Forbes as at 5 March 2021 92 Airbnb accommodation options in Parkes as at 5 March 2021
Property listing for rent	7 rental properties in Forbes as at 5 March 2021 (retrieved from realestate.com.au) 30 rental properties in Parkes as at 5 March 2021 (retrieved from realestate.com.au)

6.9.2.4 Community values

The Forbes LGA has strong local networks, community connection and support which engender community cohesion. Forbes Shire Council runs community events throughout the year, bringing people from both within and outside of the LGA together. Examples include the Forbes Show, Grazing Down the Lachlan, Taste on Templar, Forbes NSW Rural Women's gathering and River Art Festival Forbes. These events provide opportunities for people to meet and interact and often assist in building a sense of community and belonging.

6.9.2.5 Local amenity and character

The local study area is a rural area, and hence communities are likely to value amenity values that come with this, such as clean, fresh air and open vistas. The Forbes Shire is famous for its historic buildings and important heritage places, many listed by the National Trust of Australia (NSW). Forbes offers a range of attractions such as McFeeters Motor Museum, Lake Forbes and the Lachlan River, the Forbes Central West Livestock Exchange, Ben Hall's Place, and bird watching at the Gum Swamp wildlife refuge. The rural landscape of Forbes has important cultural and tourist value. The landscape is important to the region's identity and character and the community has a desire to protect the local natural landscape and rural views and vistas.

6.9.3 Potential impacts

6.9.3.1 Accommodation

The influx of up to 153 workers during the construction peak has the potential to increase demand for short-term and rental accommodation in the nearby townships of Forbes and Parkes. The highest demand period is that associated with the Elvis Festival in Parkes (typically 2nd weekend in January) which results in all available accommodation in both Parkes and Forbes being fully utilised. To avoid accommodation shortages during the Festival, the Project would seek to locate the workforce at alternative accommodation outside of Parkes and Forbes during the time of peak festival demand.

Outside of the Elvis Festival, there is an adequate supply of accommodation options within Forbes and Parkes with an estimated 470 available beds in Forbes and 1,500 beds in Parkes. Forbes Shire Council has recommended consideration of the Jemalong Regional Education Centre in Forbes for accommodation. This facility has been utilised by other Project construction workforces

and can provide 23 twin share rooms and accommodation for 46 construction workers. Importantly, Jemalong Regional Education Centre is not available to the general public during the Elvis Festival and therefore utilisation for the Project would not impact available supply during that peak period. It may provide a stable accommodation option across the entire construction period.

Other accommodation facilities that may be suitable for workforce accommodation in Forbes and Parkes include 46 hotels and/or motels, seven caravan parks and a variety of Airbnb properties. Discussion with these accommodation providers should occur in advance so as to secure an optimal accommodation solution which both ensures that high quality accommodation is guaranteed for the workforce whilst minimising any negative influences on availability for tourism and other purposes.

Any impact of the Project on the availability and affordability of housing and accommodation is limited to the construction phase and of a relatively short duration.

6.9.3.2 Local employment

During the construction phase, it is expected that the Project would require a peak of 320 construction workers and site support staff. Pacific Hydro is committed to promoting equitable access to employment opportunities to locals and the Aboriginal and Torres Strait Islander community. Locally sourced labour is defined as those employees that reside within a one-hour commute from the Project site. The construction workforce comprises a range of skilled and semi-skilled positions as presented in Table 6.34.

Table 6.34 Breakdown of total construction workforce and locally sourced labour

Estimated total workforce						
Workforce component	**Trade assistant /labourers**	**Civil construction /operators /riggers**	**Sub-contractors**	**Electrician**	**Project management and delivery**	**Total**
Proportion of total workforce	30%	10%	15%	25%	20%	100%
Number of positions	96	32	48	80	64	320
Estimated local workforce						
Proportion of total workforce sourced locally	80%	50%	20%	60%	25%	
Number of positions	77	16	10	48	16	167

The proportion of the workforce estimated to be able to be sourced locally accounts for approximately 52% of the peak construction workforce (equivalent to 167 employees). Regardless of the final split of local and non-local labour, the generation of 320 construction positions will benefit the local and regional labour market. In addition to direct jobs, flow on employment from the injection of investment and spending into local and regional economies will also occur. The creation of such employment opportunities and indirect economic activity will have a positive effect on the stability and prosperity of surrounding communities.

During the operation phases, the Project is anticipated to generate up to 6 full-time equivalent jobs. Additional contractors will also be required to undertake on-going maintenance and repairs and provide support services on site (e.g., cleaning, landscaping, vegetation management, waste removal etc).

6.9.3.3 Local economy

The Project's total estimated capital expenditure is approximately $188 million. This would be expended on a broad array of equipment, products and services, some of which may be procured from within the local and regional area. This injection of investment would serve to further sustain and stimulate local economic growth within the Forbes and Parkes LGAs and broader NSW.

During the construction phase, the Project would involve the procurement of construction supplies and the use of construction-related services. Flow-on impacts from the construction of the Project are also likely to benefit a number of different sectors of the local and NSW economy. Local civil , labouring and electrical businesses in particular are likely to benefit. In addition to businesses that directly benefit from the Project through increased economic activity. However, because of the inter-linkages between sectors, many indirect businesses would also benefit.

The presence of the construction workforce would increase demand for food, accommodation and other consumables in the local areas which would deliver a positive impact for existing retail, food, beverage, and accommodation service providers in towns such as Forbes and Parkes. An increase in trade would be welcomed by local businesses which have endured through the 2020-21 Covid-19 global pandemic.

During the operation phase, the Project would continue to benefit to local economy through employment and business opportunities. Whilst the scale of direct benefits to the local economy are less during operations compared to the construction phase, the long-term nature of operations provides a longer-term benefit and diversified income stream supporting the stability of businesses servicing the Project, enabling them to sustainably increase capacity and revenue over the long term.

Additional benefits to the local economy will be delivered through the community benefit sharing program that will be established for the Project. The program will allocate funding to local projects and initiatives that make a positive and long-lasting contribution to the local community.

6.9.3.4 Changes to land use

The solar farm site is approximately 300 hectares (ha) in area and part of a larger landholding of which there is single or family ownership. The land is largely cleared, having been highly modified by past disturbances associated with cropping, and the grazing of livestock. The land and soil capability of the solar farm site has been classified as a mix of class 4 and class 6 which indicates low to moderate agricultural capability. There are only seven existing dwellings within three kilometres of the site. Therefore, while the Project would involve a distinct change to the existing land use, the overall impact is considered to be moderated by the low agricultural capability of the site and low number of people who would experience the change. Furthermore, the Project will occupy a relatively small proportion of the overall extent of agricultural land in the broader area.

Land use activities, such as sheep grazing on the solar farm site and grazing along the ETL easement will be able to continue unimpeded. The switchyard site is approximately 0.5 ha in area and is located on a highly modified site adjacent to an existing 132 kV transmission line. Therefore, the impact from land use change at this site has been assessed to be minor.

6.9.3.5 Noise

During construction, residents within approximately 1.5 km of the Project may experience short-term and temporary noise impacts from construction activities. Potential noise impacts and proposed mitigation measures are outline in section 6.5. Noise impacts are not anticipated to be significant due to the scarcity of close sensitive receptors around the solar farm site and the short term and localised nature of impacts associated with the construction on the ETL. During operations, no noise impacts are anticipated as a result of the Project.

6.9.3.6 Traffic

Traffic impacts and proposed mitigation measures are outlined in section 6.6. For the majority of people in the regional study area, construction traffic impacts will be negligible as the Project will utilise existing designated heavy vehicle routes, such as the Newell Highway, that can

accommodate additional heavy vehicle movements associated with the Project. Residences and businesses along Back Yamma Road and Troubalgie Road are likely to experience some inconvenience from the approximately 29 one-way heavy vehicle movements per day and construction staff movement on these local roads during construction. Project-related construction traffic movements may also impact on the school bus route on Back Yamma Road. Measures to mitigate these impacts will be the focus of a Traffic Management Plan that will be prepared, in consultation with all local stakeholders, prior to construction. During operations, no traffic impacts are anticipated as a result of the Project.

6.9.4 Mitigation and management measures

Mitigation and management measures in response to short-term construction amenity and traffic impacts are detailed in sections 6.4, 6.5, 6.6 and 6.6. Additional socio-economic management measures that will be implemented include:

- Regular engagement with Forbes Shire Council and the community throughout the construction period to:
  - Understand concerns and expectations of the local community
  - Provide timely and transparent information to communities or specific locations/households that may be temporarily impacted by construction activities
  - Provide contact details for community enquiries and complaints
- Development of a local procurement policy to encourage the employment of locals and local sourcing of goods and services
- Coordination with local industry representatives to maximise the use of local contractors, manufacturing facilities and goods and materials suppliers, and to minimise adverse impacts to local supplies, services and tourism
- Establishment of a community benefit sharing program that shares Project benefits with the local community. The aim of the community benefit sharing program is to make a positive and long-lasting contribution to the local community and support projects that address community need and are aligned with the community priorities outlined in the Forbes Community Strategy Plan.

6.9.5 Residual impacts

With the implementation of mitigation and management measures, particularly during the construction period, along with implementation of Pacific Hydro’s community benefit sharing program, it is anticipated that construction and operation of the Daroobalgie Solar Farm will not have any substantial or negative effect on the socio-economic well-being of surroundings communities. The Project is anticipated to deliver direct economic benefits in the form of employment and procurement and indirect benefits through increased demand for goods and services within Forbes and Parkes.

6.10 Waste management

6.10.1 Overview

In NSW, waste management is governed by the Environmental Protection Authority (EPA) in accordance with the following legislation, regulations and guidelines:

- *Protection of the Environment Operations Act 1997*
- Protection of the Environment Operations (Waste) Regulations 2005
- *Waste Avoidance and Resource Recovery (WARR) Act 2001*
- Waste Classification Guidelines (EPA, 2014)

The Central West and Orana Regional Organisation of Councils, of which Forbes Shire Council is a member, have developed a regional waste group 'Netwaste' and a Regional Waste Strategy 2017 – 2021. The purpose of the strategy is to provide a high-level assessment of waste management in the region and establish a vision and strategic objectives for future waste management to reduce waste and keep materials circulating in the economy.

6.10.2 Existing environment

There is one NSW EPA licensed landfill facility in Forbes Shire Council, the Daroobalgie Waste Management Facility, which is located approximately six kilometres west of the solar farm site on Daroobalgie Rd. This landfill is less than a kilometre from the switchyard site and due to be expanded in the near future by Forbes Shire Council. A composting facility, Topsoil Organics, exists close to the project in the Central West Industrial Park.

Preliminary consultation with Council has confirmed that the landfill accepts construction waste including metals, plastics, general waste, wood waste, cardboard, batteries, tyres and e-waste.

As part of the preparation of a Waste Management Plan for the Project, further consultation will be undertaken with Forbes Shire Council regarding the potential for Project waste to be disposed of at the Daroobalgie Waste Management Facility.

6.10.3 Potential impacts

6.10.3.1 Waste sources

Waste generated during the construction phase will be similar to that produced from any major construction site including a large volume of packaging materials such as cardboard, wood pallets, and plastics. Due to the flat topography of the site, waste generated from earthmoving activities is anticipated to be minimal. Any 'cut' on-site will be reused on-site where possible.

During operations, the generation of waste will be minimal and predominately related to maintenance of equipment and on-going staff activities. Some green waste may be generated. from maintaining safe grass heights on the solar farm site. Although opportunities to graze a small number of sheep on the site to reduce the mowing requirements will be investigated.

All waste produced will be classified in accordance with EPA's Waste Classification Guidelines. The six waste classification categories under these guidelines are:

- Special waste
- Liquid waste
- Hazardous waste
- Restricted solid waste
- General solid waste (putrescible)
- General solid waste (non-putrescible)

Waste sources anticipated to be generated during construction and operation of the Project, and their classification, are listed in Table 6.35. The quantities of each waste stream will be available

post detailed design of the Project in accordance with requirements of *Waste Avoidance and Resource Recovery Act 2001.*

Table 6.35 Waste sources and classification

Waste source	Classification
Construction	
Soil or excavated material	General solid waste (non-putrescible)
Cleared vegetation	General solid waste (non-putrescible)
Packaging materials, cardboard, wood pallets, plastic	General solid waste (non-putrescible)
General waste	General solid waste (non-putrescible)
Concrete waste	General solid waste (non-putrescible)
Scrap metal and cabling materials (i.e., steel, aluminium, copper)	General solid waste (non-putrescible)
Oils, solvents, fuels and other chemicals	Liquid waste
Operations	
Food scraps and organic matter	General solid waste (putrescible)
Domestic waste	General solid waste (non-putrescible)
Timber & general packaging	General solid waste (non-putrescible)
Cable off cuts (Electrical Repairs)	General solid waste (non-putrescible)
Metals (copper, aluminium, steel)	General solid waste (non-putrescible)
Paper and Cardboard	General solid waste (non-putrescible)
Plastics (PET)	General solid waste (non-putrescible)
Oils, solvents, fuels and other chemicals	Liquid waste
Sewage	General solid waste (putrescible)

Waste generation will be greatest during the decommissioning phase of the Project. Solar PV recycling methods and initiatives are rapidly developing in Australia with research indicating ~89% of materials are potentially recoverable from solar panels[14]. It is anticipated that recycling markets for solar PVs, large scale batteries and associated equipment will continue to emerge and improve over the life of the Project (~30 years). Measures detailing the reuse, recycling and disposal of waste materials at the end-of-life of the Project will be detailed in a Decommissioning Management Plan.

Potential impacts from poor management of waste include:

- Increase of waste going to landfill
- Increase of resource use due to missed opportunities to reuse and recycle
- Land and water pollution either from poorly managed landfills or incorrectly stored and handled waste
- Negative impact on human health and animal health as a result of land and water pollution

6.10.4 Mitigation and management measures

Waste generated by the Project will be managed in accordance with the waste management hierarchy that underpins the objectives of the WARR Act. This is:

[14] https://www.reclaimpv.com

- Avoidance including action to reduce the amount of waste generated
- Resource recovery including re-use, recycling, reprocessing and energy recovery
- Disposal including management of all disposal option in the most environmentally responsible manner

Waste separation and segregation will be promoted on site with dedicated bins provided for recyclable materials. Where waste cannot be avoided, reused or recycled it will be classified and disposed of at licenced waste management facilities.

A Waste Management Plan will be developed, in consultation with Forbes Shire Council, prior to the construction of the Project which will detail:

- The quantities and classification of all waste streams
- Types and location of on-site recycling facilities
- Location of nearby waste facilities permitted to accept waste
- Requirements for transportation and tracking of waste
- Responsibility for recycling, re-use and disposal
- Incident reporting procedures

6.10.5 Residual impacts

It is anticipated that all Project-related waste will be classified, stored and handled in accordance with the above best-practice guidelines to ensure no environmental or health impacts as a result of the Project.

6.11 Cumulative impacts

Cumulative impacts have been identified and assessed in accordance with the Cumulative Impact Assessment Guidelines for State Significant Projects (DPIE, 2021).

Cumulative impacts are those which result from a number of developments being constructed or operated at the same time. Existing activities and planned developments in the region (~30 km of the solar farm site) with the potential to contribute to cumulative impacts are listed below.

Existing/operating developments:

- The Forbes Central West Livestock Exchange: Large saleyards for cattle, sheep, lambs and pigs. Located on Back Yamma Road, approximately 2.5 km northwest of the solar farm site
- Jemalong Solar Farm: A 50 MW operational solar farm located 40 km southwest of the solar farm site
- Parkes Solar Farm: A 66 MW operational solar farm located approximately 30 km northwest of the solar farm site
- Goonumbla Solar Farm: A 67.8 MW operational solar farm located approximately 30 km northwest of the solar farm site, adjacent to the Parkes Solar Farm

Planned developments:

- Stockinbingal to Parkes rail project, including the Daroobalgie crossing loop: The project involves upgrades along the existing rail corridor and building new supporting infrastructure to provide sufficient height and width to support the safe running of double-stacked freight trains. The crossing loop at Daroobalgie will provide 2.2 km of new track built to the eastern side of the existing track just north of Daroobalgie Road. Construction of the Daroobalgie crossing loop is anticipated between October 2022 and April 2023
- Newell Highway upgrade, Parkes Bypass: TfNSW proposes to build a new 10.5 km bypass on the western outskirts of Parkes. The bypass works commence on the Newell Highway at Barkers Road which is approximately 20 km north of the proposed Daroobalgie Solar Farm Project. Construction is scheduled to commence pre-Christmas 2021
- Quorn Solar Farm: An approved 80 MW solar farm located approximately 30 km northwest of the solar farm site. Construction timeframe is currently unknown
- Peninsular Solar Farm: A proposed 130 MW solar farm and battery project located approximately 27 km southeast of Forbes. This project is in the early stages of development. A construction timeframe is currently unknown

A cumulative impact assessment scoping summary from the existing and future developments is provided in Table 6.36.

Table 6.36 Cumulative impact assessment scoping summary

Existing and future projects	Approx distance from Project	Timing/overlap	Potential overlap of project on environmental matter		
			Access/traffic	Amenity	Labour/accommodation
Forbes Central West Livestock Exchange	2.5 km	Construction activities will overlap with operational activities of the livestock exchange	Back Yamma Road is an important access road for both the Livestock Exchange and the Project.	N/A	N/A
Jemalong Solar Farm	30 km	Operational	N/A	Due to the distance between these existing solar farms and the proposed Project, no cumulative visual or landuse impacts are anticipated	N/A
Parkes Solar Farm	30 km	Operational	N/A	Due to the distance between these existing solar farms and the proposed Project, no cumulative visual or landuse impacts are anticipated	N/A
Goonumbla Solar Farm	30 km	Operational	N/A	Due to the distance between these existing solar farms and the proposed Project, no cumulative visual or landuse impacts are anticipated	N/A

Existing and future projects	Approx distance	Timing/overlap	Potential Overlap of project on environmental matter		
			Access/traffic	Amenity	Labour/accommodation
Stockingbingal to Parkes rail project	7 km	October 2022-April 2023 No overlap with Project	The Daroobalgie crossing loop project presents the potential for cumulative traffic impacts should the construction schedule coincide with the Daroobalgie Solar Farm Project. This however is unlikely with construction anticipated for the rail project in 2022/2023 and Daroobalgie Solar Farm construction unlikely to commence until post 2024	N/A	N/A
Newell Highway upgrade, Parkes Bypass	20 km	Commenced. Estimated completion 2024 No overlap with Project	The Parkes Bypass has the potential for cumulative traffic impacts should the construction schedule coincide with the Daroobalgie Solar Farm Project. This however is unlikely with construction anticipated for the bypass in 2021/2022 and construction unlikely to commence for the Daroobalgie Solar Farm until post 2024	N/A	N/A
Quorn Solar Farm	30 km	Approved project. Construction timeframe uncertain	Access to the site from Parkes is shown in the Quorn Park EIS to be west via Henry Parkes Way. This road will not be utilised by the Daroobalgie Solar Farm Project.	Due to the distance between the proposed solar farm and the proposed Project, no cumulative visual or landuse impacts are anticipated	Project could draw on the same local labour resources and the accommodation facilities in Parkes and Forbes if construction timeframes coincide
Peninsular Solar Farm	27 km	Development phase Construction timeframe uncertain	The access route to site shown in the Peninsular Solar Farm Scoping document is via Payten's Bridge Road, New Grenfell Road and Lachlan Valley Way. These are not roads that will be utilised by the Daroobalgie Solar Farm Project. If the construction timeframes of the two projects coincide, cumulative traffic impacts on Newell Hwy through Forbes is possible.	Due to the distance between these the proposed solar farm and the proposed Project, no cumulative visual or landuse impacts are anticipated	Project could draw on the same local labour resources and the accommodation facilities in Parkes and Forbes if construction timeframes coincide

As can be seen from the cumulative impact scoping assessment, The Forbes Central West Livestock Exchange, located on Back Yamma Road, is the only existing or future project identified that is likely generate cumulative impacts from the Project.

The Livestock Exchange is open 7 days a week however, peak operating hours are:

- Sunday 3pm to 7pm
- Monday 5am to 9pm (sale day)
- Tuesday 3am to 9pm (sale day)

During these peak operating hours, delays for vehicles accessing the livestock exchange are possible during the construction period of the solar farm (~12-18 months).

The potential impacts on the operation of the Livestock Exchange have been considered in the Traffic and Transport Impact Assessment (Appendix K). The performance of the Newell Highway/Back Yamma Rd intersection was predicted to perform with acceptable level of service with the additional construction related traffic however to mitigate potential traffic impacts on Back Yamma Road, construction-related traffic and deliveries will be minimized during the peak operating times of the Livestock Exchange. It is considered that with careful scheduling of Project deliveries, disruption to the normal operation of the Livestock Exchange will be minor.

7. Environmental management and monitoring

7.1 Management and monitoring framework

Pacific Hydro's Health Safety Environment and Quality Management System conforms to, and is independently certified to, the requirements of ISO 9001 (Quality Management System), ISO 14001 (Environmental Management System) and OHSAS 18001 (Health and Safety Management System). Through its Health Safety Environment and Quality Management System, Pacific Hydro is obliged to meet the following four basic commitments:

- Compliance with legal requirements
- Aim of keeping our people, contractors and the public free from harm
- Prevention of pollution
- Continual improvement

Pacific Hydro's certified ISO14001:2004 Environmental Management System (EMS) applies to the management of all Project sites. To retain this certification, external annual audits are undertaken, and Pacific Hydro is required to demonstrate a process of review and continual improvement. To manage site specific environmental obligations, Pacific Hydro integrates the Environmental Management Plans approved as part of the planning process, within its overarching EMS. Under the EMS, an Environmental Aspects Register is maintained and monitored by a full-time Environmental Compliance Coordinator employed by Pacific Hydro.

7.2 Summary of management and mitigation measures

A summary of the management and mitigation measures document in this EIS is presented in Table 7.1.

Table 7.1 Summary of mitigation and management measures

Issue	Mitigation and management measure
Biodiversity	A **Construction Environmental Management Plan (CEMP)** will be prepared prior to construction. This plan will include measures to: – Ensure the removal of hollow bearing trees is to be undertaken in accordance with a tree hollow management protocol and involves the presence of a qualified ecologist or wildlife specialist experienced in the rescue of fauna – Ensure all workers are provided with an environmental induction prior to starting work on site. This will include information on the ecological values of the site and protection measures to be implemented to protect biodiversity – Fence off areas of native vegetation to be retained, to avoid additional impacts on vegetation. Fencing should protect the entire tree protection zone (i.e. 10 times the diameter of the trunk at breast height) – Plant locally endemic tree species in areas proposed for vegetated screens. Species should be drawn from the list of species typical of the PCTs present on -- site wherever practical – Salvage habitat features such as hollow trunks and limbs within the Project site and/or relocate within adjacent areas of woodland as far as is practicable – Install and regularly inspect and maintain erosion and sediment control measures – Restrict stockpiles of construction materials, fill or vegetation to existing cleared areas and not within areas of adjoining native vegetation – Apply a dust suppressant or cover to exposed stockpiles during windy conditions. Minimise periods that stockpiles are present on site – Restrict construction traffic to existing roads and access tracks – Microsite pole placement along ETL to avoid direct impacts to gilgai wetland habitat or other sensitive habitat features – Reinstate and stabilise groundcover as quickly as practicable after disturbance
Cultural Heritage	An **Aboriginal Cultural Heritage Management Plan (ACHMP)** will be prepared, prior to construction, in consultation with the relevant registered Aboriginal parties and agencies. The ACHMP will provide: – Provisions for the salvage of surface artefacts (as detailed in section 6.2.6) – Measures to ensure any topsoil material excavated in the Project area remains within in the local area to ensure artefacts that may have been present (within a disturbed context) will remain in the area – A procedure for management any additional Aboriginal objects identified during the construction process – A procedure to be followed in the unlikely event that human remains are located during construction – Provision for ongoing consultation with registered Aboriginal parties No impact on historic heritage is anticipated as a result of the Project. However, the following general management measures will be implemented in accordance with best practice: – An unexpected find procedure will be developed to manage the unlikely event that potential heritage items are uncovered during construction – Employees, contractors and subcontractors will be made aware of their obligations and requirements in relation to the relevant provision of the *Heritage Act 1977* through site induction

Issue	Mitigation and management measure
Land	• An **Erosion and Sediment Control Plan** will be prepared prior to the commencement of construction, in accordance with Managing Stormwater: Soils and construction (Landcom, 2004). Management and mitigation measures will include: – Retention of four existing farm dams on the solar farm site to assist with surface water and sedimentation control – Control of stormwater flows onto, through and from the solar farm site through the installation of measures such as rock check dams, silt fencing and low earth berms – Installation of erosion and sediment control measures at all watercourse crossings along the ETL – Installation of a sediment fence at the southern corner of the switchyard site to slow down surface flows before they leave the site – Staged construction activities to minimise the extent and duration of the ground disturbance – Progressive stabilisation of disturbed areas throughout construction staging. Grass seeding and spray polymer seals to prevent wind erosion and aid with revegetation if required. – Regular inspection and maintenance of control measures • A **Decommissioning and Rehabilitation Environmental Management Plan** will be prepared prior to decommissioning that outlines how the site will be restored to its previous condition. The plan is likely to require: – Progressive rehabilitation of disturbed areas – Backfilling of trenches and excavations – Revegetation with native species where required – Reseeding of pasture/crop in consultation with the landholder
Landscape and visual	– The **Landscape Mitigation Plan** (provided in Appendix I) will be implemented – At the request of any impacted landholders with views of Project infrastructure, off-site planting will be considered to screen visual impacts – Ancillary buildings will be constructed in style which reflects the character of the rural landscape – Materials and colours that are non-reflective and finished in neutral or muted colours will be used where possible
Noise and vibration	A **Noise and Vibration Management Plan** will be prepared prior to construction. Management and mitigation measures will include: – Ensure works are undertaken during the ICNG standard daytime construction hours (i.e., 7.00 am to 6.00 pm Monday to Friday and 8.00 am to 1.00 pm on Saturdays). Exceptions may be staff arriving and leaving site and the delivery of large solar farm components. Any construction activity outside normal construction hours will only be undertaken in accordance with any required approvals from relevant authorities – Ensure ETL easement entry and exit points are located as far as possible from sensitive receivers, with consideration of safe access – Ensure trucks do not arrive on site or be permitted to queue near sensitive receivers prior to the 7:00 am start time unless required to do so by road safety considerations (e.g., conditions of heavy vehicle or OD vehicle permit) – Inform all relevant staff and sub-contractors of areas and work practices where potential noise impacts have been identified and provide training to all Project personnel, including relevant sub-contractors on noise and vibration requirements through inductions, toolboxes and targeted awareness training – Ensure equipment is operated in the correct manner and well-maintained including replacement of engine covers, repair of defective silencing equipment, tightening of rattling components and repair of leakages in compressed air lines. Equipment will be shut down when not in use

Issue	Mitigation and management measure
	– Minimise the simultaneous use of plant and hand tools to reduce noise emissions from multiple sources at once – Consult with affected residents a minimum of five days prior to commencing works and provide a 24-hour contact number and complaints management procedure
Traffic and transport	A **Traffic Management Plan** will be developed in consultation with the haulage contractor, Forbes City Council and TfNSW, prior to construction. The Traffic Management Plan will provide: – Details of the haulage route(s) to be used during construction – A pre-dilapidation survey of all local roads and key intersections close to the Project site along the haulage route – Requirements for the upgrade of Back Yamma Road/Troubalgie Road intersection to accommodate OSOM vehicle movements during the construction period – Requirements for the upgrade of Troubalgie Road between Back Yamma Road and the site access point(s) to accommodate two-way heavy vehicle movements, including OSOM vehicles – Identification of any other road/intersection upgrades required – Timing for mid and post construction dilapidation survey of road conditions to identify any damage caused by construction traffic – A delivery schedule for key equipment and construction materials – All controls to be implemented (signage, speed limits etc.) to prohibit heavy vehicle use and limit light vehicle use of Forest Road – Restricted delivery days/times to minimise impacts to Forbes Central West Livestock Exchange and school bus route along Back Yamma Road – Community consultation requirements and contact details – The process for dealing with any community complaints during construction
Water	Surface water: – Further flood modelling will be undertaken to inform the civil and drainage during detailed design to confirm flood modelling results – A shallow swale (north to south) adjacent to the proposed substation on the solar farm site will be provided to mitigate minor predicted afflux in the neighbouring property, west of the site – A shallow swale along the western and southern boundaries of the switchyard site will be provided to mitigate minor predicted afflux to the west of the site – Finished flood levels of buildings, temporary storage areas and electrical enclosures will be installed 300 mm above 1% AEP flood levels – All electrical equipment including PV modules will be installed 300 mm above 1% AEP flood levels – The main access track and internal tracks will be designed to remain trafficable under 10% AEP storm event conditions to allow required maintenance of solar panels Groundwater: – All fuel and chemicals stored for the Project will be in approved bunded areas – Refuelling activities will be undertaken in a bunded area or on hardstands where fuel spill kits are available – Temporary Project offices and workspaces will have a portable above ground systems (i.e. above ground pump out septic systems) – Construction water supplies will be trucked to site

Issue	Mitigation and management measure
Hazard and Risk	Hazardous materials: – Chemicals on site will be stored in accordance with Australian standards – Safe work procedures will be implemented for the handling of all chemicals including transfer storage, spill prevention and clean up requirements – Appropriate personal protective equipment will be worn by staff – Spill kits will be installed at all chemical storage locations BESS: – The BESS will be located at least 4.5 m from the solar farm site boundary – Separation distances between battery containers will be as per AS 2067:2016 Substations and high voltage installations exceeding 1 kV a.c. – Lithium-ion batteries and associated equipment will be located within a temperature controlled and ventilated location that does not exceed the manufacturer temperature range specification – The lithium-ion batteries storage area will be protected from flooding, at least 300 mm above 1% AEP flood levels – The lithium-ion batteries will be insulated, containerised and bunded – Lithium-ion batteries will include protections and circuit controls, such as – integrated circuit control systems to avoid voltage drift – current sensing circuits to avoid short circuiting – built-in positive temperature coefficient to protect against current surges – circuit interrupt device that opens at excess pressure – safety vent to release gases on excessive pressure build-up – separator that inhibits ion-flow when exceeding a certain temperature threshold – an active fire suppression system – a Battery Management System to properly manage the batteries state of change, including battery balancing devices, to avoid deterioration and individual cell over/ under voltage – An inspection and maintenance regime will be implemented to identify signs of damage, such as bulging/cracking, hissing, leaking, rising temperature, and smoking EMF – Only electrical equipment that complies with the ICNIRP exposure levels will be selected Bushfire A **Bushfire Management Plan** will be prepared in consultation with the Rural Fire Service. Mitigation and management measures will include: – A 10 m wide Asset Protection Zone will be provided around the perimeter of the solar farm site and around the substation, BESS, and O&M buildings – Details of the inspection and maintenance activities required along the ETL during the lifespan of the Project, including any fire risk mitigations – Fuel loads will be monitored and managed in the Project area to reduce the risk of grass fires – Firefighting equipment will be stored on site including adequate emergency fire water supplies

Issue	Mitigation and management measure
	– Each building will have fully compliant fire safety systems – An emergency response plan will provide details on emergency access points and evacuation measures
Socio-economic	Implementation of the **Community Engagement Plan** which will include: – Regular engagement with Forbes Shire Council and the community throughout the construction period to: – understand concerns and expectations of the local community – provide timely and transparent information to communities that may be temporarily impacted by construction activities – provide contact details for community enquiries and complaints – Development of a local procurement policy to encourage the employment of locals and local sourcing of goods and services – Coordination with local industry representatives to maximise the use of local contractors, manufacturing facilities and goods and materials suppliers, and to minimise adverse impacts to local supplies, services and tourism – Establishment of a community benefit sharing program that shares Project benefits with the local community
Waste	A **Waste Management Plan** will be developed, in consultation with Forbes Shire Council, prior to the construction of the Project which will detail: – The quantities and classification of all waste streams – Types and location of on-site recycling facilities – Location of nearby waste facilities permitted to accept waste – Requirements for transportation and tracking of waste – Responsibility for recycling, re-use and disposal – Incident reporting procedures

8. Justification of the project

The Daroobalgie Solar Farm Project will contribute to the sustainable transition of electricity generation in NSW by generating approximately 250 GWh of renewable energy each year and, through the inclusion of a BESS, will deliver rapid-response dispatchable power that supports grid security and reliability.

Appropriate site selection is key to minimising impacts from large-scale solar developments. The Daroobalgie Solar Farm is in an area of high solar irradiation that has suitable climatic conditions and is in close proximity to a suitable connection point to the NEM. It is also located within a region with increasing energy demands from existing and new large mining/industrial loads and general load growth around the region which presents opportunities for direct power purchase agreements with these businesses. Whilst preliminary connection enquiries indicate current network conditions are likely to be constrained, TransGrid in their 2021 report '*Maintaining reliable supply to the Bathurst, Orange and Parkes areas'* have identified a number of planned upgrades to the transmission infrastructure which are expected to benefit the Project and reduce potential grid constraints in the near future.

The Project is situated on land that is relatively flat, has limited sensitive ecological habitat and low cultural significance. The Project avoids high-quality agricultural land, which is often one of key community concerns about large scale solar developments in rural areas. Importantly, it is relatively remote, with only two associated dwellings within one kilometre of the site. The relatively flat terrain also minimises the potential of nearby dwelling overlooking the solar farm area and being exposed to visual and glare impacts.

The Project has been designed to minimise environmental and social impacts. Design considerations have included an exclusion zone around an area subject to flooding in the southeast corner of the site and retention of four farm dams across the site to assist with surface water retention during heavy rainfall events. Another exclusion zone in the centre of the site has been established to protect an endangered ecological community of Western Grey Box woodland. Existing, planted vegetation around the perimeter of the site will also been retained to assist with visual screening.

The ETL route has been selected in close consultation with affected landholders to ensure visual and land use impact from the transmission line have been minimised. The route was also refined to avoid impacts on Western Grey Box woodland and Weeping Myall open woodland. The unavoidable impacts to native vegetation as a result of the Project (5.45 ha) are minimal for a Project of this size due to the careful site selection and design considerations. These native vegetation impacts will be offset through retirement of biodiversity credits or payment to the Biodiversity Conservation Trust Fund.

Through an extensive stakeholder engagement program, Pacific Hydro has developed positive relationships with all affected landholders, the local council, registered Aboriginal parties and the broader community. The Project has strong community support and it appears that locals are genuinely excited about the opportunities the Daroobalgie Solar Farm Project may bring through employment and expenditure in the regional economy over the life of the Project.

Pacific Hydro has a long history of operating renewable energy Project's in Australia and sharing the benefits of those Projects with the community through their community benefit sharing program. The Daroobalgie Solar Farm will be no different, with the establishment of a community benefit sharing program that make a positive and long-lasting contribution to the local community.

This EIS and the supporting technical studies, clearly demonstrate that the proposed Daroobalgie Solar Farm is a suitably located development that can be developed and effectively operate with minimal environmental and social impacts. Any residual impacts, such as amenity and traffic related impacts during construction, are anticipated to be temporary and highly localised. These residual impacts are considered to be acceptable and outweighed by the Project's many anticipated benefits.

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Appendix A SEARS

Appendix B Capital Investment Value

Appendix C Biodiversity Development Assessment Report

Appendix D Aboriginal Cultural Heritage Assessment

Appendix E Historic Heritage Assessment

Appendix F Soil and Land Resource Assessment

Appendix G Erosion and Sediment Control Technical Memo

Appendix H Land Use Conflict Risk Assessment

Appendix I Landscape and Visual Impact Assessment Report

Appendix J Noise and Vibration Impact Assessment Report

Appendix K Traffic and Transport Assessment Report

Appendix L Flood Impact Assessment Report

Appendix M Hydrogeological Assessment Report

Appendix N Preliminary Hazard Assessment

Appendix O Socio-Economic Impact Assessment