# ENVIRONMENTAL IMPACT STATEMENT

## Forest Glen Solar Farm SSD-941258

October 2021

**Project Number: 20-492**

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# DOCUMENT VERIFICATION

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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:** NGH Pty Ltd, Suite 11, 89-91 Auckland Street, Bega NSW 2550.

**Applicant:** X-Elio Australia Pty Ltd

**Proposed Development:**

The Forest Glen Solar Farm proposal includes the construction, operation and decommissioning of a photovoltaic solar farm with an installed capacity of up to approximately 110 megawatts (MW DC) (90MW AC equivalent) for the generation of electricity. Associated infrastructure would include a substation, battery storage (25MWh; i.e. 25MW power output for one hour) and connection to an existing transmission line.

**Land to be developed:**

The Forest Glen Solar Farm proposal would be located on an approximately 789 hectare property comprising of Lot 6 DP 755102 and site access. Site access would be via Delroy Road which includes Lot 1 DP1198911, Lot 51 and Lot 52 DP755094 and Crown Land.

**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 Regulation 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: | Jane Love | Brooke Marshall |
| Qualification | BEnvSc (Land and Water), MEM | B.Nat.Res (Honours) |
| Signature: | | |
| Date: | 17/09/2021 | 17/09/2021 |

# Acronyms and Abbreviations

| | |
|---|---|
| 4WD | Four Wheel Drive |
| ABRI | Australian Battery Recycling Initiative |
| ABS | Australian Bureau of Statistics |
| AC | Alternating Current |
| ACHA | Aboriginal Cultural Heritage Assessment |
| ACHCRP | Aboriginal Cultural Heritage Consultation Requirements for Proponents |
| AGD Code | Australian Dangerous Goods Code |
| AEMC | Australian Electricity Market Commission |
| AEMO | Australian Energy Market Operator |
| AEP | Annual Exceedance Probability |
| AHD | Australian Height Datum |
| AHIMS | Aboriginal heritage information management system |
| AoS | Assessment of Significance |
| APZ | Asset Protection Zone |
| ARENA | Australian Renewable Energy Agency |
| ARPANSA | Australian Radiation Protection and Nuclear Safety Agency |
| ASL | Above sea level |
| ASRIS | Australian Resource Information System |
| AV | Articulated Vehicles |
| AWS | Automatic weather station |
| BAL | Basic Left Turn |
| BAM | Biodiversity Assessment Methodology |
| BC Act | *Biodiversity Conservation Act 2016* (NSW) |
| BCD | Biodiversity Conservation Division |
| BDAR | Biodiversity Development Assessment Report |
| BESS | battery energy storage system |

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|---|---|
| BFEMOP | Bushfire Emergency Management of Operations Plan |
| Biosecurity Act | *Biosecurity Act 2015* (NSW) |
| BLM | Bureau of Land Management |
| BMP | Biodiversity Management Plan |
| BOM | Australian Bureau of Meteorology |
| BOS | Biodiversity Offsets Scheme |
| BPAD | Bushfire Planning & Design |
| BS | Battery Storage |
| BSAL | Biophysical Strategic Agricultural Land |
| CBSP | Community Benefit Sharing Program |
| CCP | Community Consultation Plan |
| CHR | Channelised Right Turn Lane |
| CIV | Capital Investment Value |
| $CO_2$ | Carbon dioxide |
| $CO_2$eq | $CO_2$ equivalent |
| CEC | Clean Energy Council |
| CEMP | Construction environmental management plan |
| CTMP | Construction Traffic Management Plan |
| CSIRO | Commonwealth Scientific and Industrial Research Organisation |
| Cwth | Commonwealth |
| DA | Development Application |
| DAWE | Federal Department of Agriculture, Water and the Environment |
| dB(A) | Decibels, a measure of A-weighted (c.f.) sound levels |
| DC | Direct Current |
| DECCW | Department of Climate Change and Water |
| DEM | Digital Elevation Model |
| DEMP | Decommission Environmental Management Plan |

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|---|---|
| DIS | Department of Industry and Science |
| DLALC | Dubbo Local Aboriginal Lands Council |
| DoEE | (Cwth) Department of the Environment and Energy |
| DPI | (NSW) Department of Planning and Infrastructure (now DPIE) |
| DPIE | (NSW) Department of Planning, Industry and Environment |
| EEC | Endangered ecological community – as defined under relevant law applying to the proposal |
| EIA | Environmental impact assessment |
| EIE | Explanation of Intended Effect |
| EIS | Environmental Impact Statement |
| ELF | Extremely Low Frequency |
| EMF | Electromagnetic Field |
| EMS | Environmental Management Strategy |
| EP&A Act | (NSW) *Environmental Planning and Assessment Act 1979* |
| EPA | (NSW) Environment Protection Authority |
| EPBC Act | (Cwth) *Environment Protection and Biodiversity Conservation Act 1999* |
| EPC | Engineering Procurement and Construction |
| EPL | Environment Protection Licence, issued under the POEO Act (c.f.) |
| EPI | Environmental Planning Instruments |
| ERP | Emergency Response Plan |
| ESCP | Erosion and Sediment Control Plan |
| ESD | Ecologically Sustainable Development |
| FM Act | (NSW) *Fisheries Management Act 1994* |
| GDE | Groundwater Dependent Ecosystem |
| GHG | Greenhouse Gas |
| GWh | Gigawatt hours |
| ha | hectares |
| HRV | Heavy rigid vehicles |

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|---|---|
| Heritage Act | (NSW) *Heritage Act 1977* |
| HV | High Voltage |
| Hz | Hertz |
| IBRA | Interim Biogeographical Regionalisation for Australia |
| ICNG | Interim Construction Noise Guideline |
| ICNRP | International Commission on Non-Ionizing Radiation Protection |
| IEA | International Energy Agency |
| IPA | inner protection area |
| ISP | Integrated System Plan |
| ISEPP | (NSW) *State Environmental Planning Policy (Infrastructure) 2007* |
| KFH | Key Fish Habitat |
| kL | kilolitere |
| km | kilometres |
| kV | kilovolts |
| kW | kilowatts |
| LA | Lifecycle assessment |
| LALC | Local Aboriginal Land Council |
| LCA | Land Category Assessment |
| LCU | Landscape Character Unit |
| LEMC | Local Emergency Management Committee |
| LEP | Local Environment Plan |
| LIB | Lithium-ion batteries |
| Li-ion | lithium-ion |
| LPG | Liquified Petroleum Gas |
| LSC | land and soil capability |
| LSPS | Local Strategic Planning Statement |
| LUCRA | Land Use Conflict Risk Assessment |

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|---|---|
| m | Metres |
| The Mining SEPP | (NSW) *Mining, Petroleum, Production and Extractive Industries State Environmental Planning Policy 2007* |
| MJ/m2 | Megajoules per metre squared |
| ML | Megalitres |
| mm | Millimetres |
| MNES | Matters of National Environmental Significance under the EPBC Act (c.f.) |
| MRV | Medium ridged vehicles |
| MW | Megawatt |
| MWh | Megawatt hours |
| NEM | National Energy Market |
| NES | Matters of National environmental significance under the EPBC Act (*c.f.*) |
| NMLs | Noise Management Levels |
| NMP | Noise Management Plan |
| NPfI | Noise Policy for Industry |
| NPW Act | *National Parks and Wildlife Act 1974* (NSW) |
| NSW | New South Wales |
| NVI | Native Vegetation Index |
| O&M | Operations and Maintenance |
| OBFMC | Orana Bush Fire Management Committee |
| OEH | (NSW) Office of Environment and Heritage, formerly Department of Environment, Climate Change and Water |
| OEMP | Operation Environmental Management Plan |
| OSOM | Over Size Over Mass Vehicles |
| PAD | Potential Archaeological Deposit |
| PBP | Planning for Bushfire Protection |
| PCS | Power Conversion Station |
| PCT | Plant Community Type |

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| PHA | Preliminary Hazard Assessment |
| POEO Act | (NSW) *Protection of the Environment Operations Act 1997* |
| ppm | parts per million |
| PV | Photovoltaic |
| RAPs | Registered Aboriginal Parties |
| RBL | Rating Background Level |
| RE Act | (Cwth) *Renewable Energy (Electricity) Act 2000* |
| REP | Regional Environmental Plan |
| RET | Renewable Energy Target |
| REZ | Renewable Energy Zone |
| RFS | Rural Fire Service |
| RNP | Road Noise Policy (DECCW, 2011) |
| 'The roadmap' | NSW Electricity Infrastructure Roadmap |
| Roads Act | (NSW) *Roads Act 1993* |
| SAII | Serious and Irreversible Impact |
| SEARs | Secretary's Environmental Assessment Requirements |
| SEIFA | Socio Economic Indexes for Areas |
| SEPP | (NSW) State Environmental Planning Policy |
| SES | State Emergency Service |
| SF | Solar Farm |
| SHI | State Heritage Inventory |
| SIS | Species Impact Statement |
| SLO | social license to operate |
| SoE | Statement of Evidence |
| sp/spp | Species/multiple species |
| SRD SEPP | (NSW) State Environmental Planning Policy (State and Regional Development) 2011 |
| SSD | State Significant Development |

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| SWMP | Soil and Water Management Plan |
| t | Tonne (Metric) |
| TEC | Threatened Environmental Communities |
| TMP | Traffic Management Plan |
| TfNSW | Transport for NSW (formerly Roads and Maritime Services) |
| V | Volts |
| VIA | Visual Impact Assessment |
| VOC | Volatile Organic Compound |
| vpd | vehicles per day |
| WAL | Water Access Licence |
| WARR Act | (NSW) Waste Avoidance and Resource Recovery Act 2001 |
| WHO | World Health Organisation |
| WM Act | (NSW) *Water Management Act 2000.* |
| WMP | Waste Management Plan |
| yr | year |
| ZVI | Zone of Visual Influence |

# Table of definitions

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|---|---|
| The proposal | The construction, operation and decommissioning of a photovoltaic solar farm with an installed capacity of up to approximately 110 megawatts (MW DC) (90MW AC equivalent) for the generation of electricity. This would comprise of the following:<br>• Solar array<br>• Upgrades to Delroy Road and new internal roads<br>• Underground and above ground cables<br>• Battery storage (25MWh) (i.e., 25MW power output for one hour)<br>• Onsite substation and operational facilities.<br>• Connection to the onsite Essential Energy 132 kV transmission line. |
| Proponent | X-Elio Australia Pty Ltd |
| Proposal site | The broader area surveyed and assessed that encompasses the development footprint. Lot 6 DP 755102, which includes all the solar farm infrastructure. As well as the site access, described below and includes Crown Land, Lot 1 DP1198911, Lot 51 and Lot 52 DP755094.<br>The proposal site total area is 789ha. |
| Site access | Delroy Road, which includes Crown Land, Lot 1 DP1198911, Lot 51 and Lot 52 DP755094. The site access commences at the intersection of Delroy Road and Minore Road.<br>Road upgrades are only required for Delroy Road. No works are proposed on Minore Road. |
| Development footprint | All areas of land which may be directly impacted by the proposal, either during construction, operation or decommissioning. This includes areas required for environmental controls and machinery manoeuvring and stockpiling / laydown. Generous delineation of this footprint allows flexibility during the final design stages of the project. The final disturbance is likely to be smaller than the Development footprint presented within this EIS, subject to detailed design with appointed contractors (refer to Indicative infrastructure layout definition below).<br>The Development footprint for Forest Glen SF is 444ha (36.9ha of this has been identified as ‘exclusion areas’ which would be protected from impacts). The Development footprint would be subdivided and leased by X-Elio Australia Pty Ltd during the operational life of the solar farm. |
| Indicative infrastructure layout | The Indicative infrastructure layout showing where key infrastructure components would be located and representing a likely ‘worst case’ impact within the Development footprint. This area has been buffered to allow for construction disturbance and used to estimate biodiversity offset requirements for the project. It most closely represents the area of actual |

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|---|---|
| | impact required to construct and operate the solar farm. The final infrastructure layout will be subject to detailed design with appointed contractors.<br><br>The Indicative infrastructure for Forest Glen SF is approximately 266ha and shown in Figure 1-10. |
| Exclusion areas | Areas within the Development footprint that would be protected and not impacted by the Proposal. The total exclusion area is 36.9ha, which includes:<br>• 28.5ha with high biodiversity value<br>• 8.4ha of waterways and waterway buffers. |
| Associated receivers | Landowners that are involved with the Proposal. These receivers are not considered in visual and noise assessment. |
| Sensitive receivers | Non-associated receivers, include neighbouring properties to the proposal that may be impacted by noise, vibration and visual impacts. They are assessed specifically in Section 7.1 and Section 7.2. |

# EXECUTIVE SUMMARY

## Introduction

This Environmental Impact Statement (EIS) identifies and assesses the potential environmental and planning issues associated with the construction, operation and decommissioning of the proposed Forest Glen Solar Farm (henceforth, Forest Glen SF or the proposal). The proposal would have a nominal capacity of up to approximately 110 megawatts (MW, DC) (90MW AC equivalent). The proponent is X-Elio Australia Pty Ltd.

This EIS has been prepared in accordance with Part 4 of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act) to support a Development Application (DA) to be lodged with the NSW Department of Planning, Industry and Environment (DPIE). The objective of this EIS is to fulfil the requirements of Schedule 2 of the Environmental Planning and Assessment Regulation 2000 (EP&A Regulation) and Section 4.15 of the EP&A Act. The structure and content of the EIS addresses the Secretary's Environmental Assessment Requirements (SEARs), provided by DPIE on 30 October 2020.

Environmental constraints can be defined as factors which affect the 'developability' of a site and include physical, ecological, social and planning factors. A map of these constraints was prepared for the Scoping Report (NGH, 2020). Following the detailed field investigations, the mapping has been further refined for the EIS. This process demonstrates how the proposal has appropriately responded to the site's constraints. With reference to the site's key constraints, the proposal assessed in this EIS has:

- Avoided higher biodiversity value land. Once the broader site was selected, the Development footprint was refined iteratively, in tandem with the detailed biodiversity assessment. The layout has been developed to avoid higher quality areas of native vegetation onsite including:
    - 11.9ha of PCT 201 Fuzzy Box Woodland on alluvial brown loam soils mainly in the NSW South Western Slopes Bioregion
    - 16.4ha of PCT 255 Mugga Ironbark - Buloke - Pillga Box - White Cypress Pine shrubby woodland on sandstone in the Dubbo region, south-western Brigalow Belt South Bioregion
    - 0.1ha of PCT 81 Western Grey Box - cypress pine shrub grass shrub tall woodland
- Buffered waterways in accordance with their classification and the "Guidelines for Riparian Corridors on Waterfront Land", for 2$^{nd}$ order and above streams, to minimise impacts on hydrology and water quality. Excepting required crossings, these areas will be avoided by the proposal. Rehabilitation of disturbed riparian areas will be subject to best practice guidelines.
- Avoided placement of above ground solar arrays and buildings within existing electricity easement, approximately 10.6ha.

## Proposal justification

The Forest Glen SF proposal is justified in the positive contribution it makes to mitigating the harmful effects of climate changes, improving the electricity grid's reliability, lowering the cost of power, as providing employment and economic stimulus benefits to the local community:

- Contributions to mitigating climate change
    - It would contribute to meeting Australia's renewable energy targets and greenhouse gas commitments. The proposal would generate enough clean, renewable energy for about 40,000 average NSW homes, displacing approximately 164,000 metric tonnes of carbon dioxide, currently generated by non-renewable sources per annum.
    - The proposal aligns with international, commonwealth and state goals and polices for mitigating climate change and renewable energy projects.
- Improving the grid's reliably and cost of power

  - Being a renewable energy project, the Forest Glen SF proposal would assist in improving electricity reliability and security within Australia, as the energy supply from coal-fired power stations is reduced.
  - Addressing the issue that solar farms cannot operate continuously (e.g. they do not operate during the night) the Forest Glen SF proposal will also address grid reliability by installing a BESS to store energy during periods of high generation.
  - The Forest Glen SF proposal would assist in increasing competition in the wholesale energy market and thereby would assist in reducing electricity prices within Australia.
- Providing local benefits to regional communities
  - The Forest Glen SF proposal would provide direct and indirect employment opportunities during the construction and operating phases of the project. As well, an injection of expenditure into the local area is predicted as construction staff utilise local services and supplies.
  - The proposal would be a new land use in the locality, diversifying local land uses and providing a drought resilient revenue stream to augment agricultural enterprises.

As well as these benefits, the proposal has been developed to meet the preferable site conditions as outlined in Large-Scale Solar Energy Guideline for State Significant Development (DPIE, 2018):

- The proposal site has optimal solar resources, is suitable land with good capacity to be rehabilitated from the solar farm impacts when decommissioned.
- It has close proximity to the electrical network and there is existing connection capacity in the network. An existing 132kV transmission lines traverses the site which means the that the connection to the high voltage network can be made onsite without the need to construct any transmission lines offsite. This also reduces the distribution loss factor risk.
- Th proposal is a viable scale to provide meaningful electricity generation and financial benefits while responding to site constraints and minimising environmental impacts.
- Once the solar farm reaches the end of its operational life, the site can be remediated to its existing condition so that grazing, cropping or an alternative land use can continue.

## Proposal description

The proposed Forest Glen SF is located 16 kilometres (km) west of Dubbo, NSW. It is located within the Dubbo Regional Local Government Area (LGA) and Central-West Orana region, which has been identified as a future Renewable Energy Zone **(**REZ). These zones will be developed to encourage new electricity generation projects, supported by existing transmission strength and capacity (AEMO, 2020). The Central-West Orana region has been selected as a pilot REZ. It benefits from relatively low transmission build costs, due to its proximity to the existing backbone transmission network. It has potential for a strong mix of energy resources. The REZ framework aims to be ‘shovel ready’ by the end of 2022 (NSW Government, 2020).

The Forest Glen SF would be located on Lot 6 DP 755102 and accessed via Delroy Road, which includes Crown Land, Lot 1 DP1198911, Lot 51 and Lot 52 DP755094. Of the 789ha proposal site, the Development footprint would represent approximately 444ha which would be developed for the solar farm and associated infrastructure. X-Elio proposes to lease the Development footprint part of the proposal site for the solar farm. The Development footprint area has been refined in response to the findings of the environmental assessments, site constraints and consultation with relevant government agencies, the community, and other stakeholders in order to minimise the environmental and social impacts of the project. Of this area, 36.9ha will be protected during construction and operation. These ‘exclusion areas’ include 28.5ha that have high biodiversity value and 8.4ha of waterways and waterway buffers.

The remaining 345ha of the proposal site adjacent to the Development footprint includes areas that will likely continue to be used for agriculture including cropping and grazing, by the current landowner.

An indicative infrastructure layout has been developed and is presented within this EIS. This layout was used to calculate direct impacts of the project and includes a 5m buffer to account for additional areas required for the installation of environmental controls during construction. It is this buffered layout that has been used to determine biodiversity offset requirements for the project. The Indicative infrastructure footprint for Forest Glen SF is 266ha with 5m buffer.

The key features of the proposal are summarised in Executive Summary Table 1 below. The component specifications are subject to change during detailed design. Where required, upper limit quantities and power level estimates are provided to ensure the assessment and any subsequent approval maintains the flexibility required in the detailed design stage, which will occur post approval and be subject to competitive tendering processes.

Executive Summary Table 1 Summary of key features of the proposal

| Proposal element | Description |
|---|---|
| **Proposal** | Forest Glen Solar Farm |
| **Proponent** | X-Elio Pty Ltd |
| **Capacity** | Approximately 110MW (DC) (90MW AC equivalent) |
| **Proposal site area** | Approximately 789ha |
| **Development footprint area** | Approximately 444ha includes 36.9ha of the following exclusions areas:<br>• 28.5ha of biodiversity<br>• 8.4ha of waterways. |
| **Site description** | **Proposal Site:** Lot 6 DP 755102<br>**Site Access:** Delroy Road including Crown Land, Lot 1 DP 1198911, Lot 51 and Lot 52 DP755094. |
| **Local government** | Dubbo Regional Council. |
| **Subdivision** | Subdivision of land for the location of assets which will become the property of Essential Energy (substation).<br>Subdivision of land for the separation of the project's Development footprint and residual agricultural land for the landowner. |
| **Solar array** | Number of panels: 150,000 – 200,000, 650 W bifacial modules.<br>Area of panels: approximately 275ha fenced.<br>Row spacing: 17.7m.<br>Height: 2.1m.<br>Arrays will be single-axis tracking. |
| **Substation** | Approximately 1.1 ha.<br>Onsite substation 132kV / 33kV to connect onsite to 132kV line.<br>132/33kV transformers and associated infrastructure.<br>Maximum height of 6m. |
| **Energy storage** | BESS of 25MW/25MWh, adjacent to the onsite substation and comprising of lithium ion batteries with inverters.<br>Between 12-15 shipping containers (40 foot each).<br>The footprint would be approximately 100m x 150m. |
| **Site access** | Minore Road via Delroy Road approximately 1.9km east of the site. |

| Proposal element | Description |
|---|---|
| | The intersection of Minore Road and Delroy Road will be upgraded; specifically the initial section of Delroy Road (meeting Minore Road) is to be sealed and signage improved. No changes to Minore Road or to the intersection type or alignment are required.<br>The longest vehicle expected on site is a 19m B-Double, with an estimated peak of 24 B-Double movements through the site. |
| **Internal access tracks** | Perimeter tracks; approx. 29,814m.<br>Additional internal tracks; approx. 7,756m.<br>Total: approx. 37,570m.<br>All internal tracks would be approximately 4m wide unsealed gravel. |
| **Operations and maintenance (O&M) buildings** | Permanent O&M site office with staff amenities and vehicle parking.<br>Control room with switch gear.<br>Located within the substation footprint.<br>Maximum height of 5m subject to final design. |
| **Security fencing, lighting and CCTV** | Steel security fence 2.3m high around PV arrays, with necessary gates and CTTV system.<br>Permanent security lighting would be at the substation area. These components subject to final design. |
| **Construction hours** | Subject to council requirements. Expected hours:<br>• Monday to Friday: 7:00am to 6:00pm.<br>• Saturday: 8:00am to 1:00pm<br>• Sundays and Public Holidays: No work.<br>In general, no construction activities would occur outside these hour including Sundays or public holidays; however, in cases of emergency, major asset inspection or maintenance programs may be undertaken outside standard construction hours.<br>Dubbo Regional Council and affected surrounding landholders would be notified of any works expected to be performed outside standard daytime construction hours that may be expected to cause noise exceedance to neighbouring dwellings. |
| **Construction timing** | Approximately 12 to 18 months (Q1 2022 – Q2 2023) |
| **Workforce** | Construction – approximately 150 to 200 staff during 'peak' construction (approximately 10 months).<br>Operation – around 7 to 10 full time equivalent staff. |
| **Operation period** | Expected 35 years of operational life |
| **Decommissioning** | The site would potentially be returned to its pre-works state. All above ground infrastructure would be removed to a depth of 500mm. The site would be rehabilitated consistent with land use requirements.<br>All infrastructure would be removed with the exception of the substation. The site would be rehabilitated consistent with future land use requirements. |
| **Capital investment** | Estimated $185.5 million AUD. |

| Proposal element | Description |
|---|---|
| **Community benefits** | X-Elio will plan, facilitate and implement a Community Benefit Sharing Program (CBSP). Through this plan X-Elio will propose sharing with the community a percentage of gross revenues of the solar farm or gross revenues from implemented Power Purchase Agreements. |

## Community and stakeholder consultation

X-Elio has developed and implemented a Community Consultation Plan (CCP) for the project to date. The local community has been approached for comment throughout the assessment stage via the following mediums:

- Telephone calls to all sensitive receivers and surrounding neighbours where contact details were available.
- Two letter mail outs to all sensitive receivers and surrounding neighbours within 2km of the proposal.
- A dedicated community email and phone number for stakeholders to contact X-Elio with questions, concerns or feedback.
- Door knocking of local residents, neighbours and sensitive receivers within 2km of the proposal.
- A dedicated community webpage for the Forest Glen SF which promoted all engagement activities and how this relates to the planning process detailed the proposed methods for communication. The website also provides details about X-Elio, details of the project, contact details and opportunity to be provided updates about the project by joining the project mailing list. The website can be found at: https://x-elio.com/project/forest-glen/

In total, 66 people were contacted with regarding the project. During the consultation process to date, no objections were raised by the community. The community raised questions regarding the project in reference to:

- The general Location of the site
- If they would have views and experience glare from the project
- Where the site would be accessed from.

The answers to these questions have been provided directly where possible and are also provided within this EIS. Visual impacts and site access would not produce more than negligible impacts for a very limited number of receivers with mitigation measures included for two associated receivers.

Sunrise Energy Metals LTD (Formerly named 'Clean TEQ') hold a mineral exploration licence (EL8961) over the proposal site. Consultation was carried out with the licence holder, the key identified issue was potential for the proposal is sterilised potential mineral resources. The final determination between Sunrise Energy Metals LTD and X-Elio is that the proposal would not have any potential to sterilise potential mineral resources in the area.

No additional relevant exploration licence holders or mineral title holders are relevant to the proposal.

## Key environmental issues

The construction, operation and decommissioning environmental risks of the proposal have been considered in this EIS. The key issues below are those identified in the Scoping Report (NGH 2020) and Secretary's Environmental Assessment Requirements (SEARs) as requiring more detailed investigation. The risk assessment identified five environmental aspects as key risks:

- Visual amenity and landscape character
- Noise and Vibration

- Compatibility with existing land uses
- Social and economic impacts
- Biodiversity
- Traffic, transport and access.

## Visual amenity and landscape character

Visual impact assessments are used to identify and determine the value, significance and sensitivity of a landscape to change. NGH completed a Visual Impact Assessment (VIA) of the proposal in the following stages:

1. Background investigations, including Zone of Visual Influence (ZVI) modelling, identification of Landscape Character Units (LCU's) and identification of key viewpoints.
2. Field survey to validate the modelling and obtain photography from key viewpoints.
3. Community consultation, including understanding community values and documenting community perception.
4. Impact assessment of the potential visual impact during construction and operation of the proposal. An impact assessment per receiver is provided, for all receivers within 2km.
5. Development of a visual impact mitigation strategy (which included consultation with near neighbours assessed to have a view of the proposal from their residence).

Seven representative viewpoints were assessed, taken from publicly accessible roads surrounding the site to represent residents of Minore, and directly adjacent neighbours. The viewpoints which have been included represent the areas from where the development would appear most prominent, either based on the degree of exposure or the number of people likely to be affected. The viewpoints were evaluated based on their land use, likely effect of the development on the viewpoint and overall visual impact.

There are 61 residences within 2km of the proposal, which includes three associated receivers and 57 non-associated receivers. The visual impact of each residence within 2km of the proposal site was also assessed. The visual impact for each receiver concentrated on the potential views of solar farm infrastructure onsite and considers each residences orientation, elevation and existing mitigation present such as topography, structures or screening. The assessment also considers potential glare and glint impacts for each receiver, with the assumption if the residence has views, there is potential for glare and glint.

While the site has a high number of residences within close proximity, the assessment concluded the proposal would result in low visual impacts on the existing landscape and scenic values due to the existing screening in the region and topography in the region. The flat terrain makes screening highly effective for this low profile development, as there are no areas that look over the proposal site and furthermore the proposal site is not elevated above the surrounding area. Existing screening occurs as large pockets of forest surrounding and throughout the 2km buffer zone. One non-associated receiver within 2km of the proposal site was recognised as having potential views of infrastructure. The non-associated receiver is directly north of the site access into the solar farm off Delroy Road. The visual impact for the receiver however was considered low due to the existing vegetation screening that breaks up views of the proposed solar infrastructure. Consultation has been undertaken with the landowner and no concerns have been raised regarding visual impacts or the project. Therefore, no further vegetation screening is proposed. Consultation is proposed to be undertaken throughout construction and life of the project to address any potential concerns that may occur due to their proximity to their site.

The potential for glare and reflectance to impact any receiver is considered low as the assessment considers it highly unlikely the proposal would be visible from any residence or public vantage point. For glimpse views that may be perceived it is noted:

- The proposed solar panels are designed to absorb 82% to 93% of the sun's energy and directly convert it to electricity thus effectively reducing reflectivity. Reflection from the panel survey would be very low.
- Thin slivers of metal stripping on the face of the panels further reduce any potential glare issues that may occur.
- Array mountings (steel or aluminium), PCUs, grid connection transmission line poles, the onsite substation and other site buildings could also produce glare and glint, however not more than is to be expected for any regular infrastructure such as a bridge, house or farm building.

In terms of night lighting, the proposal involves closed-circuit television (CCTV) security cameras, movement sensor lighting. No permanent night lighting is proposed within the array. This also meets Dark Sky Region Guidelines which ensure night lighting does not affect the operation of the Sliding Spring Observatory located in the Warrumbungle National Park near Coonabarabran, NSW 120km from the proposal site.

## Noise and vibration

Noise investigations were undertaken in accordance with *NSW Policy for Industry* (EPA, 2017), NSW *Interim Construction Noise Guideline* (DECC, 2009), the NSW Environment Protection Authority's *Assessing Vibration: A Technical Guideline* (DECC, 2006) and *NSW Road Noise Policy* (DECCW, 2011). The background noise levels of the site were determined by NSW Policy for Industry (NPfI) (EPA 2017). Construction and operational noise generated by the project were modelled using the Transport for NSW construction noise calculator to determine if there would be any noise exceedances during these stages of the project against the criteria. Inputs to the noise calculator assumed the worst case noise generation scenario of all plant and machinery items operating continuously and concurrently.

As above, there are 61 residences within 2km of the proposal that were considered for noise assessment. The assessment predicted noise emissions would exceed relevant criteria during construction of the proposed solar farm for 9 receivers and during the intersection works at Delroy Road for two receivers. It is noted that construction noise levels at all receivers are predicted to be less than the highly noise affected level of 75dB(A). A noise management plan has been developed to guide the management of noise impacts and it is considered that a range of feasible noise mitigation measures (such as increasing the distance of machinery from receivers and noise screening) would limit the potential noise generated to within acceptable levels. As a requirement of the noise management plan ongoing consultation with affected noise receivers would take place throughout construction of the solar farm.

The assessment found no operational noise levels exceedances. No exceedances of noise limits are predicted from traffic. Additionally, there is a very low risk of potential vibration impacts.

## Compatibility with existing landuses

The current land zoning of the proposal site is RU1 Primary Production under the Dubbo LEP. The entire site is class 5 under the Land and Soil Capability Assessment Scheme. The current activities onsite align with class 5, largely used for grazing with occasional cultivation for pastures. Surrounding lands are of similar or better land and soil capability and there is no Biophysical Strategic Agricultural Land (BSAL) located on site.

One mineral exploration licence occurs over the entire proposal site and no mining leases. Surrounding the site, the majority of the lots a medium sized rural lots with single dwellings and farm infrastructure associated with their land use such as silos and farm sheds. The properties are a mix of agriculture including cropping and grazing with large patches of remanent vegetation distributed across the landscape. There are also a number of lifestyle blocks generally along the main roads and closer to Minore village. Other land uses within the locality of the proposal site include:

- Sappa Bulga National Park approximately 3km north
- Other renewable energy projects, the closest solar farm is 45km away

- Dubbo City Regional airport about 8km north east
- Narromine airport about 25km north west
- Industry and commercial land use such as powerlines.

The DPI Land Use Conflict Risk Assessment (LUCRA) system is intended to identify and assess the potential for land use conflict between neighbouring land uses including:

- Agriculture
- Resource extraction/exploration
- Residents
- Aviation.

According to this assessment no land use conflicts exhibited a LUCRA rating over 9 (out of 25 possible points, where values above 10 represent conflicts that require further attention) following relevant mitigation measures. All conflicts identified during construction, operation and decommissioning are expected to be manageable with measures presented within the EIS

## Social and economic impacts

The Dubbo Regional LGA is has a population of 76,563 people. The top three industry sectors in the LGA are Construction, Manufacturing, and Rental, Hiring & Real Estate Services, all of which could contribute to and see benefits from the construction of a solar farm such as Forest Glen SF.

The Forest Glen SF proposal would have both positive and negative socio-economic impacts (refer to the local benefits to regional communities set out above). Additional positive socio-economic impacts from the proposal include:

- Provide direct and indirect employment opportunities during the construction and operating phases of the project.
    - During peak construction, the Forest Glen SF would generate approximately 150 jobs directly contributing to strengthening the economy. Up to 200 workers is a maximum estimation during peak construction (approximately 10months). Local residents would make up approximately between 20% and 50% of the workforce, with the remaining workers moving to the area for the duration of the construction phase.
    - During operation an average of 7 to 10 full time equivalent staff would be employed. Contract staff may also be employed to undertake specific major tasks such as repairs and replacement of equipment.
- The proposal will provide significant participation opportunities for businesses and workers local to the project and provides opportunities that are a good match of skills and resources available.
- Construction workers relocating to the region would be expected to inject additional spending into the economy over the construction phase.
- The proposal would be a new land use thereby diversifying the local land use within the region, providing a drought resilient revenue stream for the agricultural economy.

The key adverse socio-economic impacts to the community relate to amenity impacts during construction (visual, noise, traffic) and compatibility with existing land uses during operation. These are assessed in detail in the EIS.

On balance, the proposal provides far more positive socio-economic impacts than negative. The adverse impacts have been assessed as minimal and highly manageable through the appropriate implementation of the mitigation measures developed specifically for this proposal.

## Biodiversity

A Biodiversity Development Assessment Report (BDAR) was prepared to investigate and assess the potential impacts of the Proposal on biodiversity. Two surveys were undertaken to provide sufficient survey data for the assessment between 9 and 13 November 2020 and 2 and 4 May 2021.

The Development Site is within Interim Biogeographical Regionalisation of Australia (IBRA) subregions *Brigalow Belt South and NSW Western Slopes.* Cleared and highly modified agricultural land occupies the majority of the site.

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

- PCT 255: Mugga Ironbark - Buloke - Pillga Box - White Cypress Pine shrubby woodland on sandstone in the Dubbo region, south-western Brigalow Belt South Bioregion
- PCT 201: Fuzzy Box Woodland on alluvial brown loam soils mainly in the NSW South Western Slopes Bioregion.

The latter is considered a Threatened Ecological Community (TEC) under the NSW *Biodiversity Conservation Act 2016*. It is also a Serious and Irreversible Impact (SAII) candidate. Iterative design refinements have been undertaken to minimise impacts on this community. The final Development Footprint includes:

- 0.37ha of PCT 201 in moderate condition (Vegetation integrity score of 51).

In total, 19 BC Act listed threatened species required targeted survey. None of these species were detected within the Development Site upon completion of targeted surveys and can therefore be deemed absent for the purpose of assessing impacts.

No EPBC Act-listed species were recorded during the field surveys however five were considered to have potential to occur.  Assessments of significance were completed for these species, assuming they did occur onsite. These concluded that a significant impact was unlikely, and therefore, no referral is considered necessary to the Federal Department of Agriculture, Water and the Environment (DAWE).

The Development Site has been selected to avoid or minimise impacts to biodiversity where possible, with a specific focus on PCT 201 SAII. Most areas of TECs in the Development Site have been avoided through the indicative design process. Where biodiversity impacts could not be avoided, an offset credit requirement has been generated:

| Zone ID | PCT name and condition | Area of direct impact (ha) | Ecosystem credits required |
|---|---|---|---|
| 1 | PCT 201-Moderate condition: Fuzzy Box Woodland on alluvial brown loam soils mainly in the NSW South Western Slopes Bioregion | 0.37 | 9 |
| 2 | PCT 255-Poor condition: Mugga Ironbark - Buloke - Pillga Box - White Cypress Pine shrubby woodland on sandstone in the Dubbo region, south-western Brigalow Belt South Bioregion | 48.08 | 0 |
| 3 | PCT 255-Low condition: Mugga Ironbark - Buloke - Pillga Box - White Cypress Pine shrubby woodland on sandstone in the Dubbo region, south-western Brigalow Belt South Bioregion | 3.22 | 53 |
| 4 | PCT 255-Moderate condition: Mugga Ironbark - Buloke - Pillga Box - White Cypress Pine shrubby woodland on sandstone in the Dubbo region, south-western Brigalow Belt South Bioregion | 1.53 | 33 |

| Zone ID | PCT name and condition | Area of direct impact (ha) | Ecosystem credits required |
|---|---|---|---|
| N/A | PCT 255 Scatter tree: Mugga Ironbark - Buloke - Pillga Box - White Cypress Pine shrubby woodland on sandstone in the Dubbo region, south-western Brigalow Belt South Bioregion | N/A (1 scatter tree to be cleared) | 1 |
| Total | | | 96 |

These credits generated above would be retired through one (or a combination) of the three options available under the Biodiversity Conservation Act 2016:

a) Retiring the credits under the Biodiversity Offsets Scheme,

b) Making payments into the Biodiversity Conservation Fund using the offset payments calculator,

c) Funding a biodiversity action that benefits the threatened entity impacted by the development

Investigation of the potential to secure at least some of the offset obligation within lands owned by the involved landowners in a formal Stewardship site agreement is progressing. In addition within the Development footprint considered for construction of the solar farm. Biodiversity exclusion zones have been identified. These exclusion zones include the protection approximately 32.7ha of high constraint biodiversity land to be protected throughout construction and operation of the solar farm.

## Traffic

Vehicles accessing the site are expected to primarily use Golden Highway, and to a lesser extent Mitchell Highway, which both connect with Newell Highway within Dubbo. Vehicles will then use the local road network via Minore Road and Delroy Road to access the site.

It is proposed that Delroy Road would be widened, where required, to ensure a minimum carriageway width of 6.5m is provided to allow simultaneous two-way vehicle movement. The first section of Delroy Road is proposed to be sealed, with no works included on Minore Road. At the intersection of Minore Road, new signage installed and line marking would be undertaken adjacent to the new sealed area at Delroy Road.

Internal access tracks would remain unsealed but would be re-sheeted with gravel or crushed rock, and compacted soil to maintain their condition during the construction phase.

The potential traffic, transport and road safety impacts associated with construction of the proposal relate primarily to the increased numbers of large vehicles on the road network, which may lead to:

- Increased collision risks (other vehicles, pedestrians, stock and wildlife)
- Damage to road infrastructure
- Associated noise and dust (particularly where traffic is on unsealed roads) which may adversely affect nearby receivers
- Disruption to existing services (public transport and school buses)
- Reduction of the level of service on the road network caused by ‘platooning’ of construction traffic.

During operation, vehicles would use the designated public road network to access the site. When within the site, internal roads and designated parking areas would be used. It is estimated that the daily peak travel demand during operation would be approximately 8 light vehicles movements a day. These activities have a minor impact on vehicle movements per day. Activities undertaken during the operation phase would include travelling to the site office or maintenance building via these roads and carrying out maintenance activities on the solar farm infrastructure.

Overall, the additional traffic associated with the construction, operation and decommissioning of the solar farm would be a small component of the existing traffic local and state roads. No substantive increased collision risk, damage to road infrastructure, noise or dust impacts, disruption to existing services or reduced level of service is expected to accompany construction, operation or decommissioning.

Overall, traffic impacts from the proposal are expected to be low and manageable.

## Cumulative impacts

Cumulative impacts relate to the combined effect of impacts from several activities on a particular value or receiver. There are another nine state significant developments within 100km of the proposal, that have the potential to cause cumulative impacts. The most likely cumulative impacts as a result of these developments is haulage route traffic and pressure on local facilities, goods and services during the construction phase of the project which would be undertaken in approximately 12-18months. It is likely that construction timeframes for these projects will be staggered which would reduce the potential for these cumulative impacts. In combination with these other developments and given their distance to the proposal and timing for when they would occur, cumulative impacts on noise, visual and traffic are not expected. During construction, operation and decommissioning, the proposal is most likely to generate positive cumulative socio-economic impacts.

Dubbo is a large regional centre with a population exceeding 36,000 as of the 2016 census. In combination with other towns in the region, it is expected that there would be capacity to supply requirements like housing, public services, materials and accommodation etc. Socio economic benefits are also likely to occur through local direct and indirect employment.

## Other environmental issues

Ten lower risk issues were investigated:

1. Soils
2. Watercourses and hydrology
    a. A specialist assessment was undertaken for this issue (Hydrological and Hydraulic Analysis (Footprint Pty Ltd, 2021))
3. Water use and water quality
4. Bush fire
5. Aboriginal heritage
    a. A specialist assessment was undertaken for this issue (Aboriginal Cultural Heritage Assessment Report (ACHA)(NGH, 2021))
    b. Site surveys indicated no Aboriginal objects or areas of potential archaeological deposits occurring onsite, this determination was made in consultation with Dubbo Local Aboriginal Lands Council (LALC).
6. Historic heritage
7. Resource and waste generation
8. Electric and magnetic fields (EMFs)
9. Hazardous materials and development
10. Air quality and climate.

Management measures have been developed to ensure that impacts are minimised and justifiable.

## Environmental management framework

Specific impact avoidance and minimisation measures have been incorporated into the design of the proposal and form commitments of the project, pending approval. They are largely standard and highly certain strategies to manage the impacts of solar farm development, which has grown significantly as an industry sector in regional Australia over the last 10 years. These measures are considered practical and achievable by the proponent. They are set out for each area of investigation in Sections 7 and 8 and summarised in Section 9.2 of this EIS.

All commitments and environmental safeguards would be managed through the implementation of an Environmental Management Strategy, consisting of a Construction Environmental Management Plan, an Operation Environmental Management Plan and a Decommissioning Environmental Management Plan. These plans (and supporting subplans) would be prepared sequentially and submitted to the Department of Planning, Industry and Environment (DPIE), prior to each stage of works. Key supporting sub-management plans include the following and would be included within the overarching Construction Environmental Management Plan (CEMP):

- Noise Management Plan (NMP)
- Community Consultation Plan (CCP)
- Rehabilitation Plan (land and soil)
- Biodiversity Management Plan (BMP)
- Construction Traffic Management Plan (CTMP)
- Haulage Plan
- Road Dilapidation Report
- Soil and Water Management Plan (SWMP) including the following:
    - Erosion and Sediment Control Plan (ESCP)
    - Groundcover Management Plan.
- Emergency Response Plan including:
    - A Spill and Containment Response Plan
    - A Flood Response Plan.
- Bush Fire Emergency Management and Operations Plan (BFEMOP)
- Waste Management Plan (WMP)
- An Accommodation and Employment Strategy.

These mechanisms ensure that the commitments of the EIS are carried through to on ground activities to ensure effective onsite mitigation of impacts for all project stages.

## Conclusion

The Forest Glen SF would result in numerous benefits, local and regional, and has been developed to ensure the benefits are spread into the longer term, reflecting community expectations specific to this proposal.

The environmental impacts and risks identified are considered manageable with the effective implementation of the measures stipulated in this EIS. Mitigation strategies have been developed with the community and other relevant agencies stakeholders in many cases. This proposal represents an important step towards NSW climate mitigation goals and adding renewable energy infrastructure to the future Central-West Orana Renewable Energy Zone (REZ). The Forest Glen SF will provide the Dubbo Regional LGA with new local construction jobs and would diversify the land use in the region to include renewable energy production, without forfeiting large areas of high value agricultural land or sacrificing significant areas of biodiversity.

# 1. Introduction

## 1.1. Purpose of this report

This Environmental Impact Statement (EIS) identifies and assesses the potential environmental and planning issues associated with the construction, operation and decommissioning of the proposed Forest Glen Solar Farm (henceforth, Forest Glen SF or the proposal). The proposal would have a nominal capacity of up to approximately 110 megawatts (MW, DC) (90MW AC equivalent). The proponent is X-Elio Australia Pty Ltd.

This EIS has been prepared in accordance with Part 4 of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act) to support a Development Application (DA) to be lodged with the NSW Department of Planning, Industry and Environment (DPIE). The objective of this EIS is to fulfil the requirements of Schedule 2 of the Environmental Planning and Assessment Regulation 2000 (EP&A Regulation) and Section 4.15 of the EP&A Act. The structure and content of the EIS addresses the Secretary's Environmental Assessment Requirements (SEARs), provided by DPIE on 30 October 2020 (refer to Section 6.1.1).

This EIS provides a full analysis of all environmental, economic, physical and social implications of the proposal. In consideration of these, the EIS also includes specific commitments to mitigate identified impacts. This EIS has been prepared by NGH Pty Ltd. Specialists were contracted to carry out specialist technical assessments, as required.

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

This EIS will be independently evaluated by the NSW Government, considering input from the community provided during the public exhibition period. The development assessment process places the onus on the proponent to provide the information required for the State Government to make an informed decision. The process provides for public transparency, accountability and participation in development approval decision-making.

## 1.2. Proposal Overview

### 1.2.1. The proponent

X-Elio is a global utility-scale solar developer which is co-owned by Brookfield and KKR. They are developing approximately 5GW of photovoltaic solar projects around the world and, to date, have built 2GW of PV plants in 14 countries. X-Elio Australia is currently developing several large-scale utility solar farms in QLD, NSW and Victoria.

### 1.2.2. Proposal locality

The proposed Forest Glen SF is located approximately 16 kilometres (km) west of Dubbo, NSW (Figure 1-1). It is located within the Dubbo Regional Local Government Area (LGA), which covers an area of 7,536 square kilometres. The Dubbo Regional LGA is bound by the Narromine LGA to the west, Cabonne LGA to the south, Mid-Western Regional LGA to the east and the Gilgandra LGA to the north.

The proposal is within the Central-West Orana region, which has been identified as a future Renewable Energy Zone (REZ). These zones will be developed to encourage new electricity generation projects, supported by existing transmission strength and capacity (AEMO, 2020). The Central-West Orana region has been selected as a pilot REZ as it benefits from relatively low transmission build costs due to its proximity to the existing backbone transmission network, and it has a strong mix of energy resources. The REZ framework aims to be 'shovel ready' by the end of 2022 (NSW Government, 2020).

Dubbo is the closest major regional centre, with a population of 38,943 people (ABS, 2016). The proposal is located within the locality of Minore, which had a population of 153 people (ABS, 2016). Significant features in the locality include the railway station at Minore Village (closed to passengers in 1975) and Minore Falls Reserve on the Macquarie River (8km north of proposal site, a popular recreation area). The Sappa Bulga National Park is 2.9km southeast of the proposal site. The National Park is a small reserve covering 121ha of native remnant forest with no formal recreational areas. The land immediately surrounding the proposal site includes agricultural land with extensive areas of remnant vegetation.

There are several renewable energy projects proposed or already present in the proposed Central West Orana REZ, including:

Constructed or construction pending:

- Gilgandra Solar Farm by Neoen Australia Pty Ltd 40km north of the proposal site.
- Maryvale Solar Farm by Maryvale Solar Farm Pty ltd 45km south west of the proposal site.
- Wellington Solar Farm by Lightsource Development Services Australia Pty Ltd 55km south east of the proposal site.
- Wellington North Solar Farm by Lightsource Development Services Australia Pty Ltd 51km south east of the proposal site.
- Suntop Solar Farm by Photon Energy, Canadian Solar and Polpo investments 88km north east of the proposal site.
- Beryl Solar Farm by First Solar (Australia) Pty Ltd 100km East of the proposal site.
- Nevertire Solar Farm by EPURON 90km north west of the proposal site.
- Wollar Solar Farm by Wollar Solar Development Pty Ltd 150km south east of the proposal site
- Uungula Wind Farm by CWP Renewables Pty Ltd 70km south east of the proposal site.

Proposed, not yet approved:

- Dunedoo Solar Farm by ib vogt GmbH 95km north east of the proposal site.
- Mumbil Solar Farm by EPURON 71km south east of the proposal site.
- Bunrrendong Wind Farm by EPURON 84km south east of the proposal site.
- Suntop Solar Farm Stage 2 by Photon Energy, Canadian Solar and Polpo investments 88km north east of the proposal site.

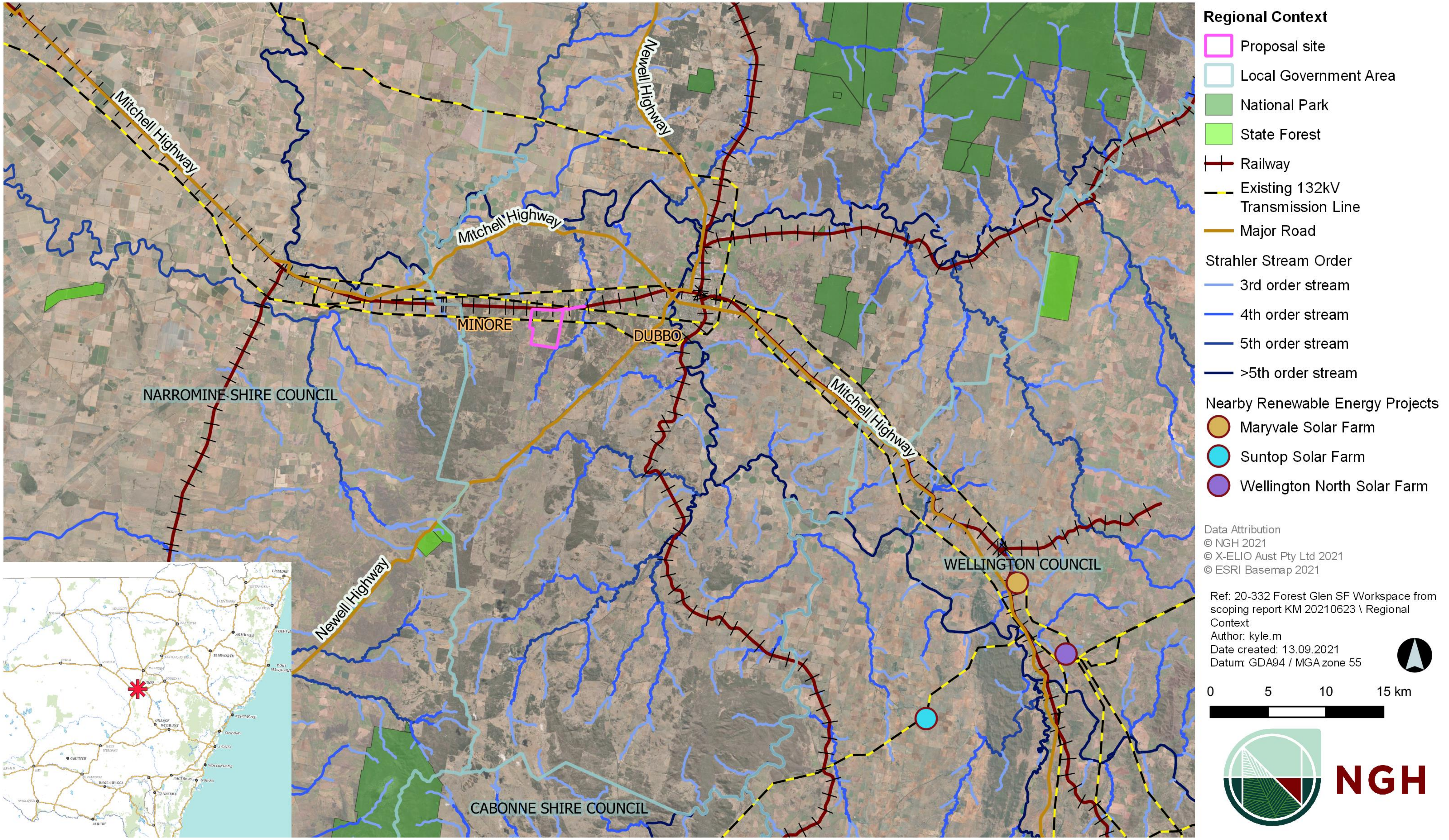



Figure 1-1 Location of proposal site and proximity to closest towns and other renewable projects

### 1.2.3. The proposal site

The proposal site is zoned RU1 Primary Production under the *Dubbo Local Environmental Plan 2011* (refer to Figure 1-7). Approximately 85% of the proposal site has been cleared of woody vegetation and has been highly modified by historical farming practices. It is currently utilised for cropping and grazing (primarily, oats and sheep). The proposal site is generally flat with a central valley which falls from south-west to north-east with elevation ranging from to 283m to 325m Australian Height Datum (AHD).

Remnant woodland is present in the northwest corner and south eastern portion of the site. This would not be impacted by the proposal and provides screening (noise and visual) for the project in the landscape.

There is one existing residence within the southern section of the proposal site. There are additionally two other receivers that are associated with the project, one directly adjacent to western boundary of the proposal site and one west of the proposal site (refer to Figure 1-8).

One minor drainage line traverses the site accompanied by six minor lower order tributaries that flow into it. The central drainage line flows offsite to the northeast of the Development footprint. Approximately 8 dams occur within the proposal site.

An existing Essential Energy 132 kV transmission line traverses the proposal site and would be used for the proposed solar farm to connect to the national electricity grid. Another Essential Energy 132 kV transmission line is located approximately 116m north which runs along Minore Road but would not be considered as an alternative connection point.

The Main Western Railway line is north of the proposal site. Directly adjacent to the proposal site is the Dubbo Model Aero Club and owned by the same landowner as the proposal site. The aero club is used for flying model planes and is used almost every Sunday between 8am and midday. The area includes an informal carpark, grassed runway, sheds and signage.

Example images of the site are also included below Figure 1-2 to Figure 1-6.

Figure 1-2 North eastern section of site

Figure 1-3 North western section of site

Figure 1-4 Central hilltop on site looking south towards the landowner’s property

Figure 1-5 Existing transmission lines on site (preferred connection point)

Figure 1-6 Section of unnamed waterway onsite (which would be avoided in the final Development footprint)

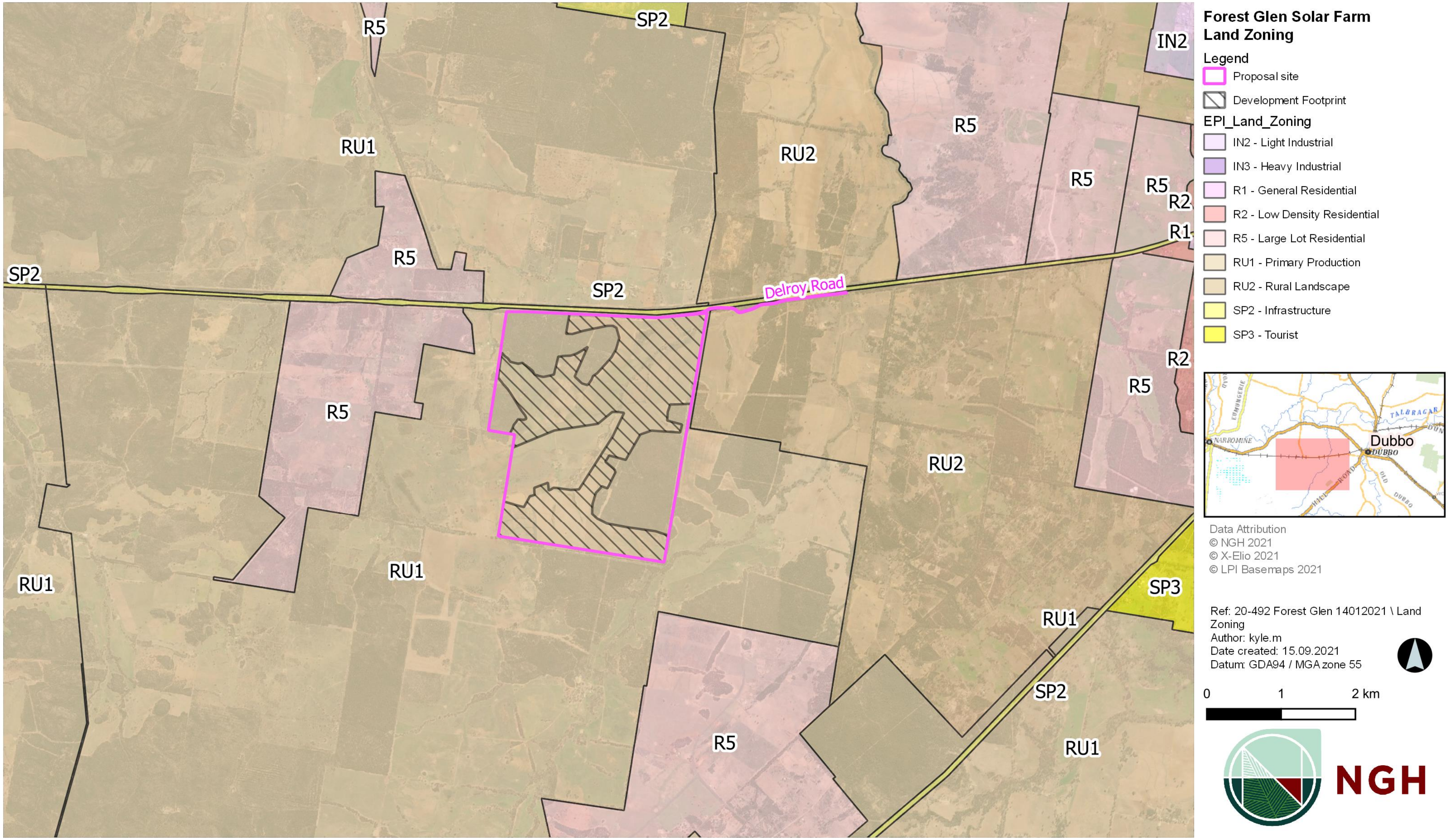



Figure 1-7 Land zoning of proposal site and surrounding areas

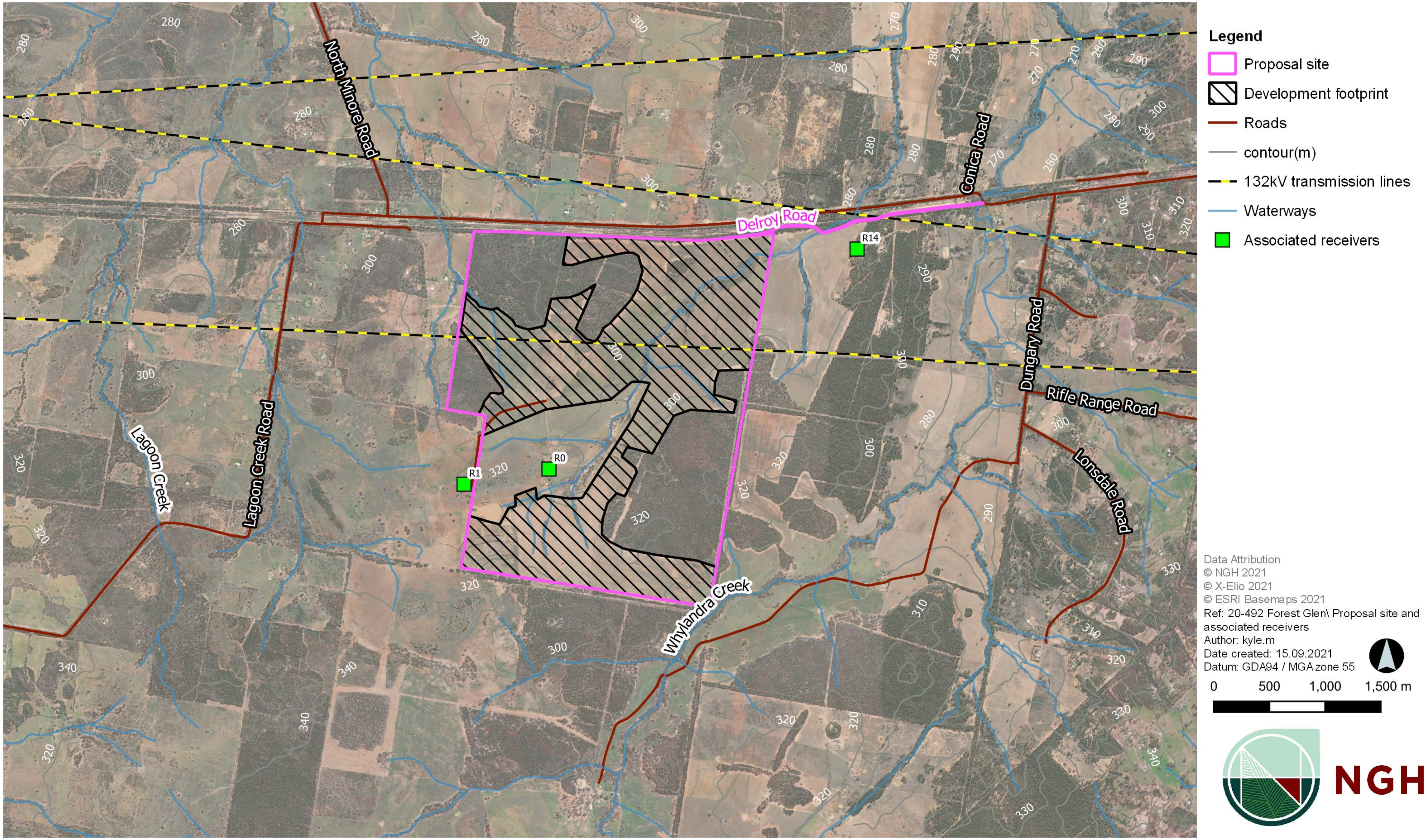



Figure 1-8 proposal site and associated receivers

### 1.2.4. The proposal and key components

#### Proposal summary table

The key features of the proposal are summarised in Table 1-1 Summary of key features of the proposal below. The component specifications are subject to change during detailed design. Where required, upper limit quantities and power level estimates are provided to ensure the assessment and any subsequent approval maintains the flexibility required in the detailed design stage, post approval.

Table 1-1 Summary of key features of the proposal

| Proposal element | Description |
|---|---|
| **Proposal** | Forest Glen Solar Farm |
| **Proponent** | X-Elio Pty Ltd |
| **Capacity** | Approximately 110MW (DC) (90MW AC equivalent) |
| **Proposal site area** | Approximately 789ha |
| **Development footprint area** | Approximately 444ha includes 36.9ha of the following exclusions areas:<br>• 28.5ha of biodiversity<br>• 8.4ha of waterways. |
| **Exclusion zones** | As identified by the environmental investigations, 36.9ha within the DF would be protected from impacts to preserve existing values:<br>• 28.5ha of biodiversity<br>• 8.4ha of waterways.<br>Additionally, no solar panel arrays would be placed within the 10.2ha of electricity easement traversing the site. |
| **Site description** | **Proposal Site:** Lot 6 DP 755102<br>**Site Access:** Delroy Road including Crown Land, Lot 1 DP 1198911, Lot 51 and Lot 52 DP755094. |
| **Local Government** | Dubbo Regional Council. |
| **Subdivision** | Subdivision of land for the location of assets which will become the property of Essential Energy (substation).<br>Subdivision of land for the separation of the projects Development footprint and residual agricultural land for the landowner. |
| **Solar array** | Number of panels: 150,000 – 200,000, 650 W bifacial modules.<br>Area of panels: approximately 275ha fenced.<br>Row spacing: 17.7m.<br>Height: 2.1m.<br>Arrays will be single-axis tracking. |
| **Substation** | Approximately 1.1 ha.<br>Onsite substation 132kV / 33kV to connect onsite to 132kV line. |

| Proposal element | Description |
|---|---|
| | 132/33kV transformers and associated infrastructure.<br>Maximum height of 6m. |
| **Energy storage** | BESS of 25MWh (i.e., 25MW power output for one hour), adjacent to the onsite substation and comprising of lithium ion batteries with inverters.<br>Between 12-15 shipping containers (40 foot each).<br>The footprint would be approximately 2.4 ha. |
| **Site access** | Minore Road via Delroy Road approximately 1.9km east of the site.<br>Intersection of Minore Road and Delroy Road will be upgraded, specifically the section of Delroy Road meeting Minore Road is to be sealed and signage improved. No other intersection treatments or upgrades are required.<br>The longest vehicle expected on site is a 19m B-Double, with an estimated peak of 24 B-Double movements through the site. |
| **Internal access tracks** | Perimeter tracks; approx. 29,814m.<br>Additional internal tracks; approx. 7,756m.<br>Total: approx. 37,570m.<br>All internal tracks would be approximately 4m wide unsealed gravel. |
| **Operations and maintenance (O&M) buildings** | Permanent O&M site office with staff amenities and vehicle parking.<br>Control room with switch gear.<br>Located within the substation footprint.<br>Maximum height of 5m subject to final design. |
| **Security fencing, lighting and CCTV** | Steel security fence 2.3m high around PV arrays, with necessary gates and CCTV system.<br>Permanent security lighting would be at the substation area. These components subject to final design. |
| **Construction hours** | Subject to council requirements. Expected hours:<br>• Monday to Friday: 7:00am to 6:00pm.<br>• Saturday: 8:00am to 1:00pm.<br>• Sundays and Public Holidays: No work.<br>In general, no construction activities would occur outside these hour including Sundays or public holidays; however, in cases of emergency, major asset inspection or maintenance programs may be undertaken outside standard construction hours.<br>Dubbo Regional Council and affected surrounding landholders would be notified of any works expected to be performed outside standard daytime construction hours that may be expected to cause noise exceedance to neighbouring dwellings. |

| Proposal element | Description |
|---|---|
| **Construction timing** | Approximately 12 to 18 months (Q1 2022 – Q2 2023) |
| **Workforce** | Construction – approximately 150 to 200 staff during peak construction (approximately 10 months).<br>Operation – around 7 to 10 full time equivalent staff. |
| **Operation period** | Expected 35 years of operational life. |
| **Decommissioning** | The site would potentially be returned to its pre-works state. All above ground infrastructure would be removed to a depth of 500mm. The site would be rehabilitated consistent with land use requirements.<br>All infrastructure would be removed with the exception of the substation. The site would be rehabilitated consistent with future land use requirements. |
| **Capital investment** | Estimated $185.5 million AUD |
| **Community benefits** | X-Elio will plan, facilitate and implement a Community Benefit Sharing Program (CBSP). Through this plan X-Elio will propose sharing with the community a percentage of gross revenues of the solar farm or gross revenues from implemented Power Purchase Agreements. |

## Defining the project extents and terms

The Forest Glen SF would be located on Lot 6 DP 755102 and accessed via Delroy Road, which includes Crown Land, Lot 1 DP1198911, Lot 51 and Lot 52 DP755094. This is defined as the **proposal site** for the project, which is approximately 789 hectares (ha).

Of the 789ha proposal site, the **Development footprint** would represent approximately 444ha which would be developed for the solar farm and associated infrastructure. X-Elio proposes to lease the Development footprint part of the proposal site for the solar farm. The Development footprint area has been selected in response to the findings of the environmental assessments, site constraints and consultation with relevant government agencies, the community, and other stakeholders in order to minimise the impacts of the project while maximising the yield of solar power generation. Approximately 36.9ha have been identified as exclusion areas which would be protected during construction and operation, not to be developed as part of the project. The exclusion areas include 28.5ha of biodiversity, and 8.4ha of waterways.

The remaining 345ha of the proposal site will likely be used for agriculture in existing cropping and grazing areas by the current landowner.

An **Indicative infrastructure layout** has also presented within this EIS. This layout was used to calculate direct impacts of the project with a 5m buffer and determine biodiversity offset requirements for the project. The Indicative infrastructure footprint for Forest Glen SF is 266ha. The indicative infrastructure layout is shown in Figure 1-10 and the layout of infrastructure in context of the site's identified constraints is shown in Figure 1-11.

The final infrastructure layout would be determined as part of commercial tendering process, as such, some necessary flexibility is included in the EIS proposal description.

The Development footprint assessed in this EIS represents the maximum impact areas that would be required, including potential PV module additions within the exempt areas.

The proposal site showing affected lot boundaries with these definitions outlined above are shown in Figure 1-9, Figure 1-10 and Figure 1-11. Table 1-2 summarises the Lot and DPs affected by the project.

Table 1-2 Affected lots associated with the proposed Forest Glen SF including proposed infrastructure, ownership, existing use and proposed arrangements for the project

| Referred to in this EIS | Lots and DP | Proposed infrastructure | Owner | Existing use | Proposed ownership arrangements |
|---|---|---|---|---|---|
| proposal site<br>Development footprint<br>Indicative infrastructure layout | Lot 6 DP 755102 | All proposed solar farm infrastructure including solar arrays, connection infrastructure, battery storage, internal roads and ancillary infrastructure. | Currently owned by one private landowner (involved landowner). | Agriculture. | X-Elio would lease only the Development footprint area.<br>Residual areas of the proposal site would be used by the landowner for continued agricultural operation. |
| | Lot 1 DP1198911 | Access track. | Currently owned by one private landowner (involved landowner). | Agriculture/ Road easement. | Lease arrangement with landowner. |
| | Lot 51 DP755094 | Access track (Delroy Road). | Currently owned by one private landowner (involved landowner). | Road easement. | Lease arrangement with landowner. |
| | Lot 52 DP755094 | Access track (Delroy Road). | Currently owned by one private landowner (involved landowner | Road easement. | Lease arrangement with landowner. |
| | Delroy Road Crown Land | Access track (Delroy Road). | Crown Land managed by Dubbo Regional Council. | Road easement. | Permit from Crown Lands. |

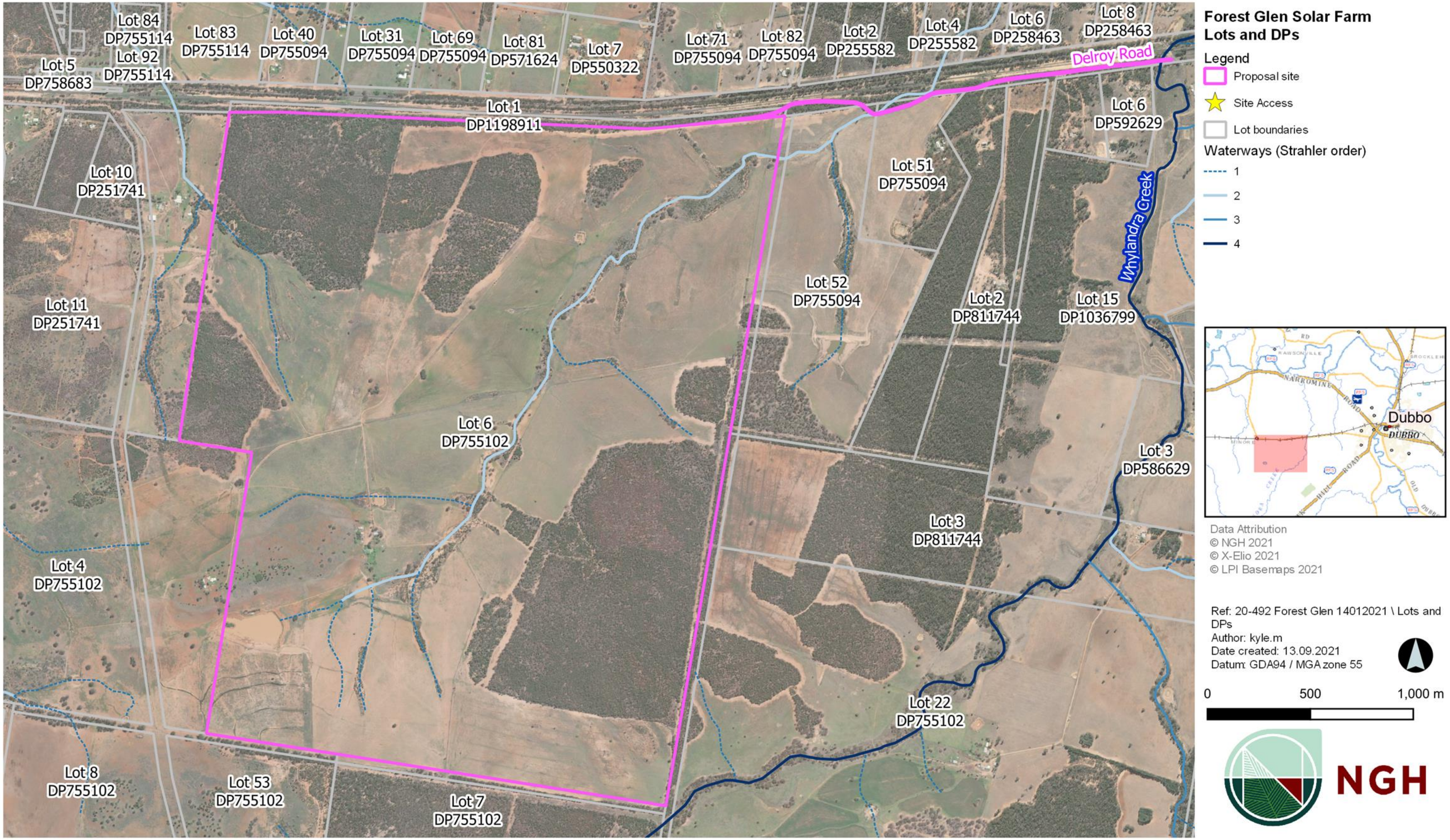



Figure 1-9 Lot and DP's located within the proposal site

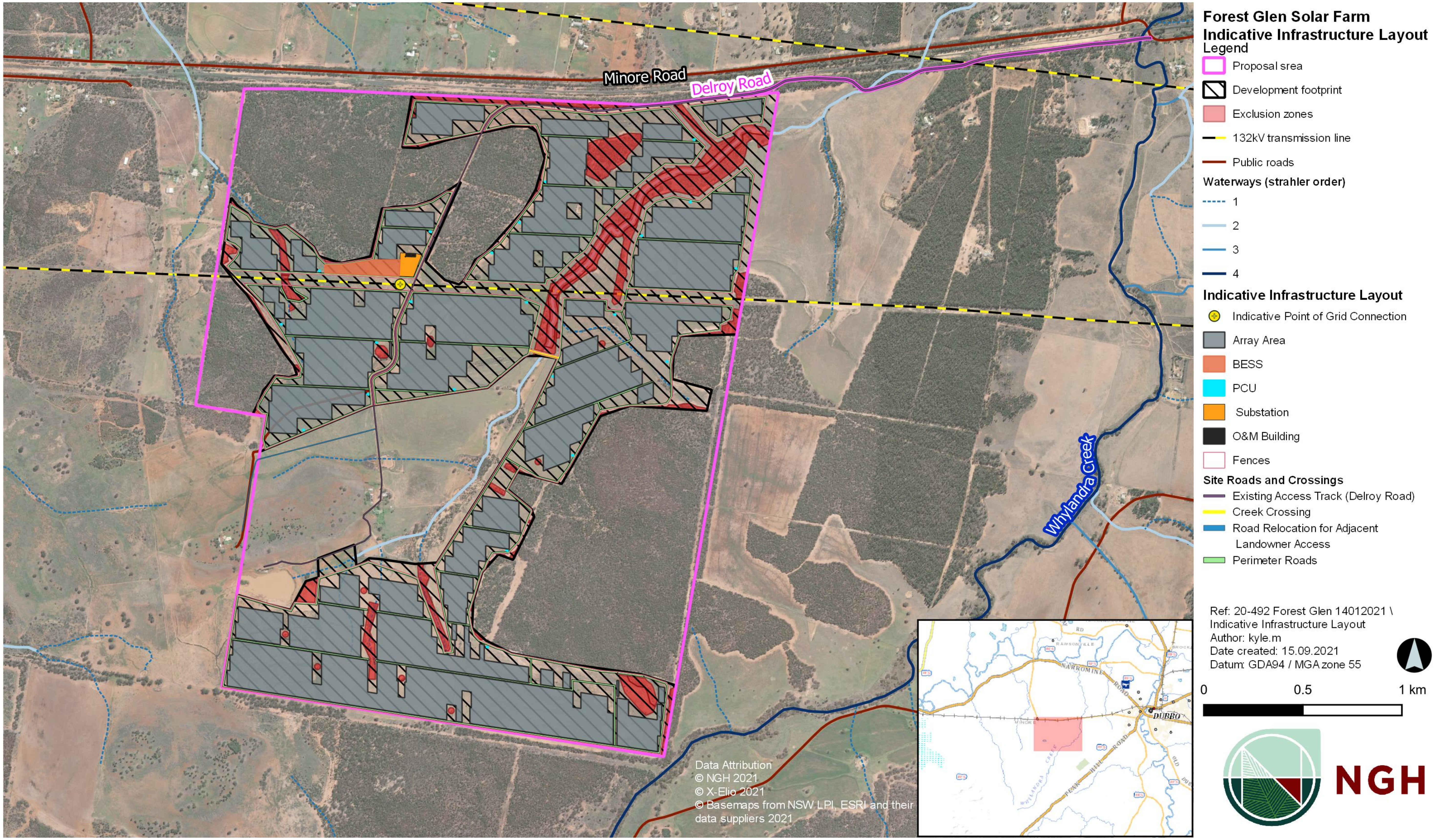



Figure 1-10 Indicative Infrastructure Layout

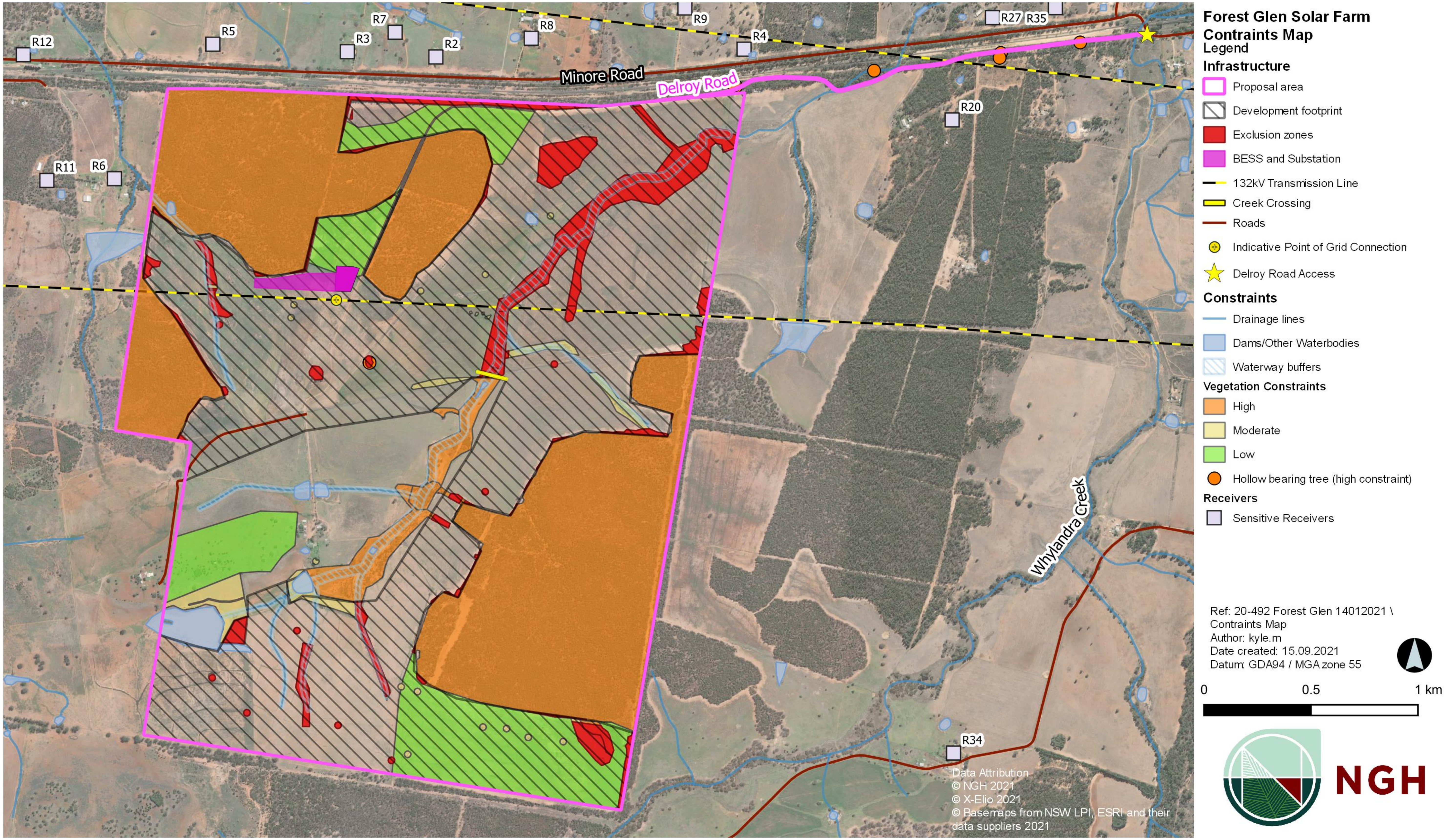



Figure 1-11 Indicative Infrastructure Layout with constraints

# 2. Objectives, project need and benefits

## 2.1. Proposal objectives

The Forest Glen SF has been designed to

- Develop a utility scale solar electricity generation site with the capability for on-site energy storage to support the high voltage transmission network.
- Develop a profitable solar farm with minimal environmental and social impact on the community.
- Work collaboratively with key stakeholders to ensure all relevant requirements are considered in the location, design, construction and operation of the facility.
- Provide local and regional employment opportunities and other social benefits during the construction and operation of the facility.
- To obtain a social license to operate by acting as a responsible member of the local community.

The renewable energy generated by the Forest Glen SF also supports efforts to mitigate the effect of climate change by:

- Assisting the NSW and Commonwealth Governments to meet Australia's renewable energy targets.
- Providing a clean and renewable energy source to assist in reducing greenhouse gas (GHG) emissions.
- Generation of enough clean, renewable energy for about 40,000 average NSW homes per annum.
- Displace approximately 164,000 metric tonnes of carbon dioxide, currently generated by non-renewable sources per annum.

## 2.2. Strategic Need

### 2.2.1. Greenhouse gas emissions and global warming

#### Global context

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

In 2016, global greenhouse gas emissions were 494.4 billion tonnes $CO_2$eq, with energy, agriculture, forestry and land use, waste and industry contributing the largest proportion globally (Figure 2-1).

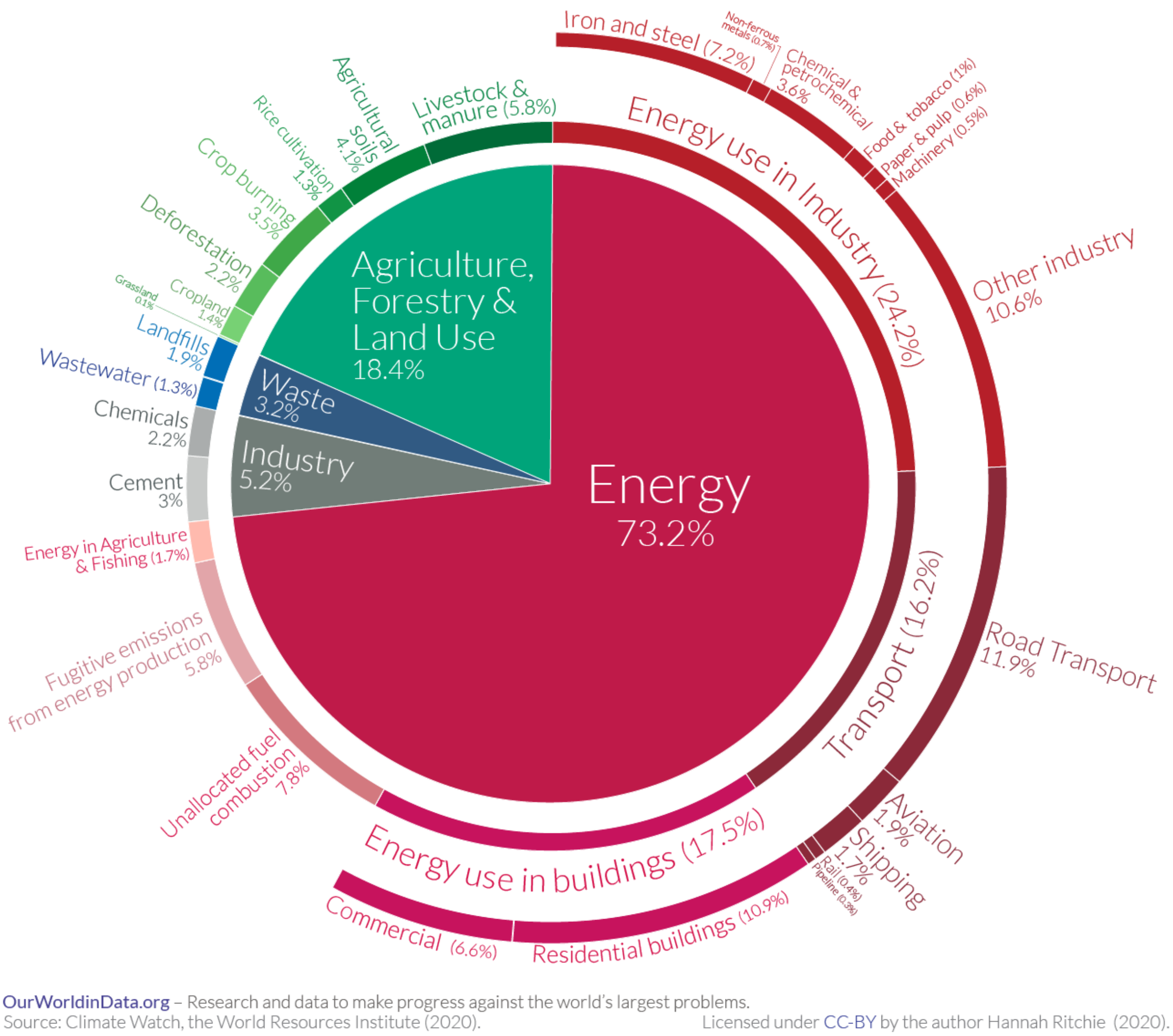



Figure 2-1 Global greenhouse gas emissions by sector (Ritchie, 2020)

## Australian context

In general, electricity generation is experiencing a long term decline in emissions, down 20.9% since the peak in 2009, primarily due to increasing generation from renewable sources (DoISER, 2020). The most recent Quarterly Update of Australia's Greenhouse Gas Inventory: December 2020 (DoISER, 2020) shows that electricity generation is the largest individual contributor of greenhouse gas emissions in Australia, representing 33.6 per cent of emissions in the year up to December 2020. This represents a 4.9% decrease in emissions from the electricity sector when compared with the year up to December 2019. The decrease is mainly due to a 4.4% reduction in coal generation, a corresponding 16.1% increase in supply from renewable sources from the National Energy Market (NEM).

NSW is responsible for almost a quarter of Australia's emissions (DoISER, 2020). In 2017, New South Wales per capita emissions were 16.7 tonnes of $CO_2$ equivalent (DPIE, 2019).

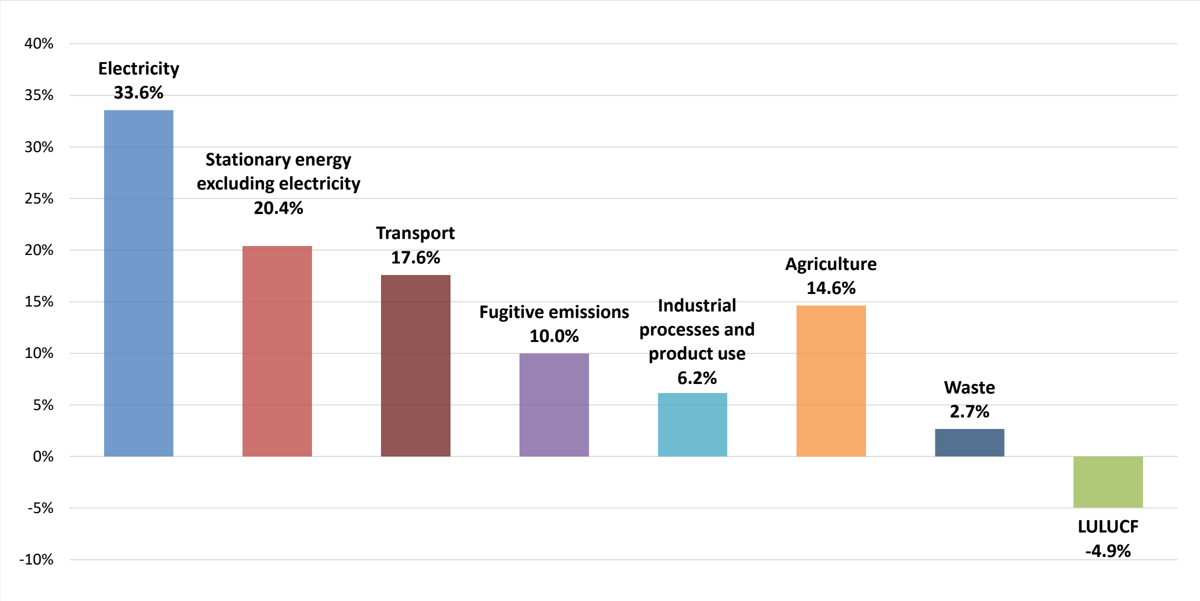



Figure 2-2 Share of total emissions, by sector, for the year to December 2020 (DoISER, 2020)

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

The proposal would generate around 221 GWh per year, saving approximately 164,000 $tCO_2$ e/yr, and contributing to a reduction in global greenhouse gas emissions. This assumes generation would otherwise be made by brown coal with a carbon factor of 0.34 tonnes per MWh (DoEE, 2016). Precise generation figures may change subject to final site design and product selection.

### 2.2.2. Global response

#### Paris agreement

The threat presented by climate change is acknowledged by scientists and politicians around the world, as illustrated by the United Nations Paris Agreement on Climate Change (DEE, 2017). In December 2015, the Australian Commonwealth Government ratified the Paris Agreement and the Doha Amendment to the Kyoto Protocol, reinforcing its commitment to action on climate change. Australia has committed to the following greenhouse gas emission reduction targets:

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

The transition to low carbon renewable energy sources would be critical to enable Australia to meet its Paris commitments.

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

### 2.2.3. NSW response

#### NSW climate change policy framework

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

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

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

#### Climate Change Fund Draft Strategic Plan 2017 to 2022

The Climate Change Fund Draft Strategic Plan sets out priority investment areas and potential actions using $500 million of new funding from the $1.4 billion Climate Change Fund over the next five years (OEH, 2016). Investment in these areas would help NSW make the transition to net zero emissions by 2050 and adapt to a changing climate.

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

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

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

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

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

## Net Zero Plan: Stage 1 2020 – 2030

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

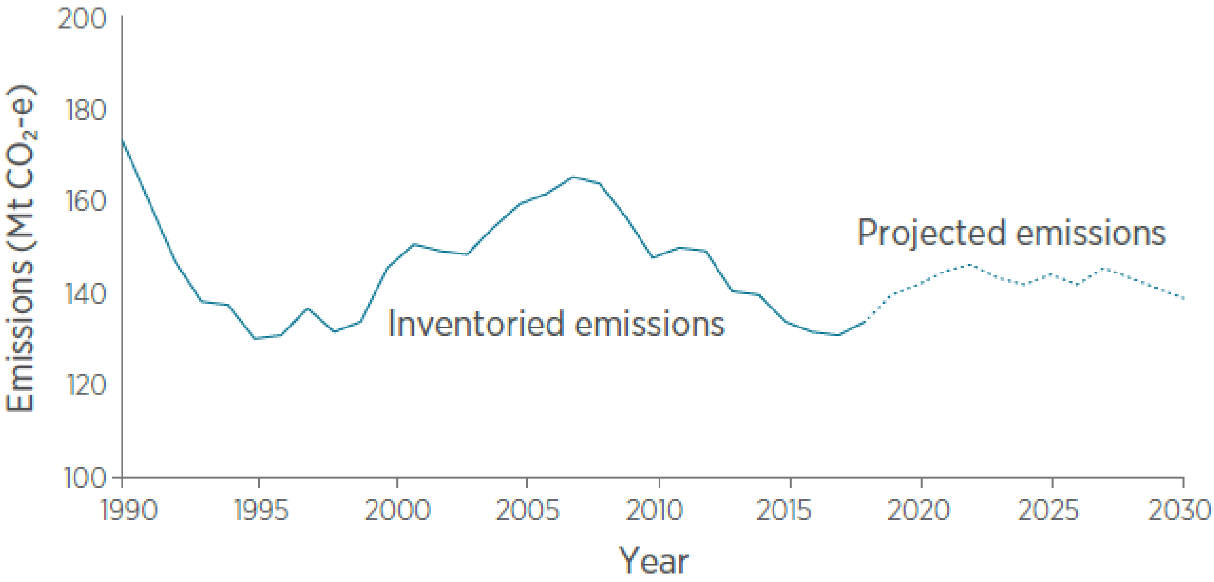



Figure 2-3 NSW total annual emissions to 2030 (MtCO2-e = Megatonnes of carbon dioxide equivalent)

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

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

## NSW Electricity Strategy

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

- Reliability
- Affordability
- Sustainability.

The NSW Government's Electricity Strategy will:

- Improve the efficiency and competitiveness of the NSW electricity market by reducing risk, cost, Government caused delays and by encouraging investment in new price-reducing generation and energy saving technology.

- Prompt Government to act if there is a forecast breach of the Energy Security Target which private sector projects are unlikely to address. This should be done in a way that minimises costs to consumers and taxpayers and does not give rise to moral hazard risk.
- Ensure that there are appropriate powers available for Government to analyse and respond to electricity supply emergencies, if they arise.

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

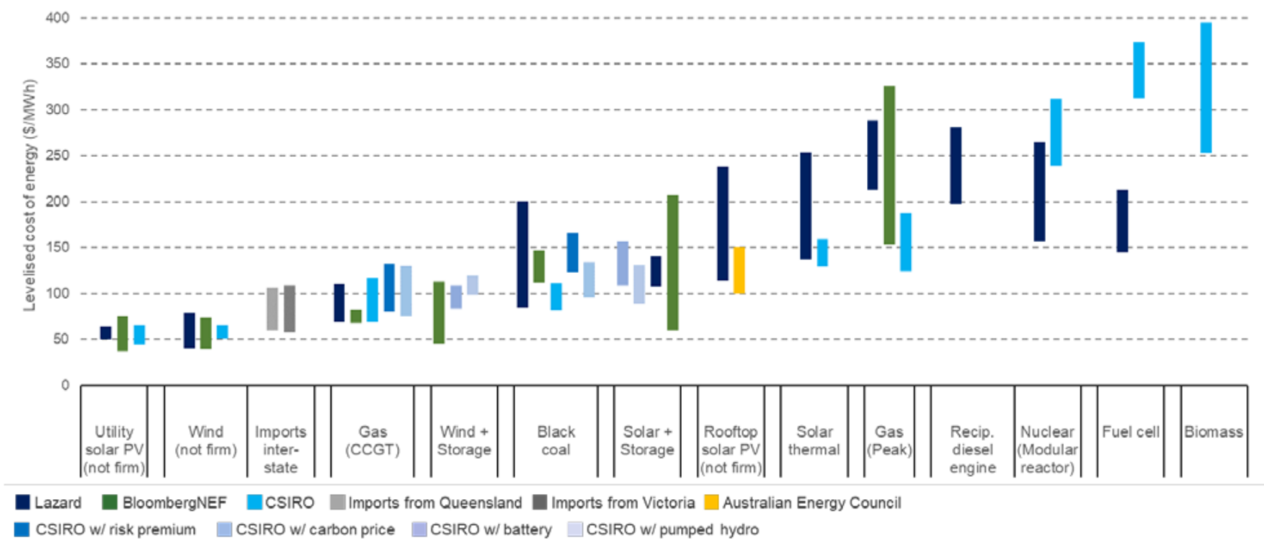



Figure 2-4 Levelised cost of electricity by type (DPIE, 2019)

The Forest Glen SF would contribute to the NSW government's plan to achieve the objectives for the electricity system which include reliability, affordability and economic growth and sustainability. The contribution of the project to local employment and economy is set out in detail in Section 7.4 of this EIS.

## National Electricity Market (NEM)

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

The Central-west Orana region, where the Forest Glen SF is proposed, has been identified in the ISP as a actionable project area (Figure 2-5).

- **Central-West Orana REZ Transmission Link** is a single circuit 500 kV HVAC loop which traverses the Central-West region, cutting in to the existing 500 kV line between Bayswater and Wollar, and returning to Wollar, and including a tie into the existing 330 kV network in the Central-West Orana region. It would involve network augmentations to support the development of the Central-West Orana REZ as defined in the New South Wales Electricity Strategy, and transfer capacity between the Central-West Orana REZ and major load centres of New South Wales. The project completion is due in 2024-25.

## Renewable Energy Zones (REZ's)

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

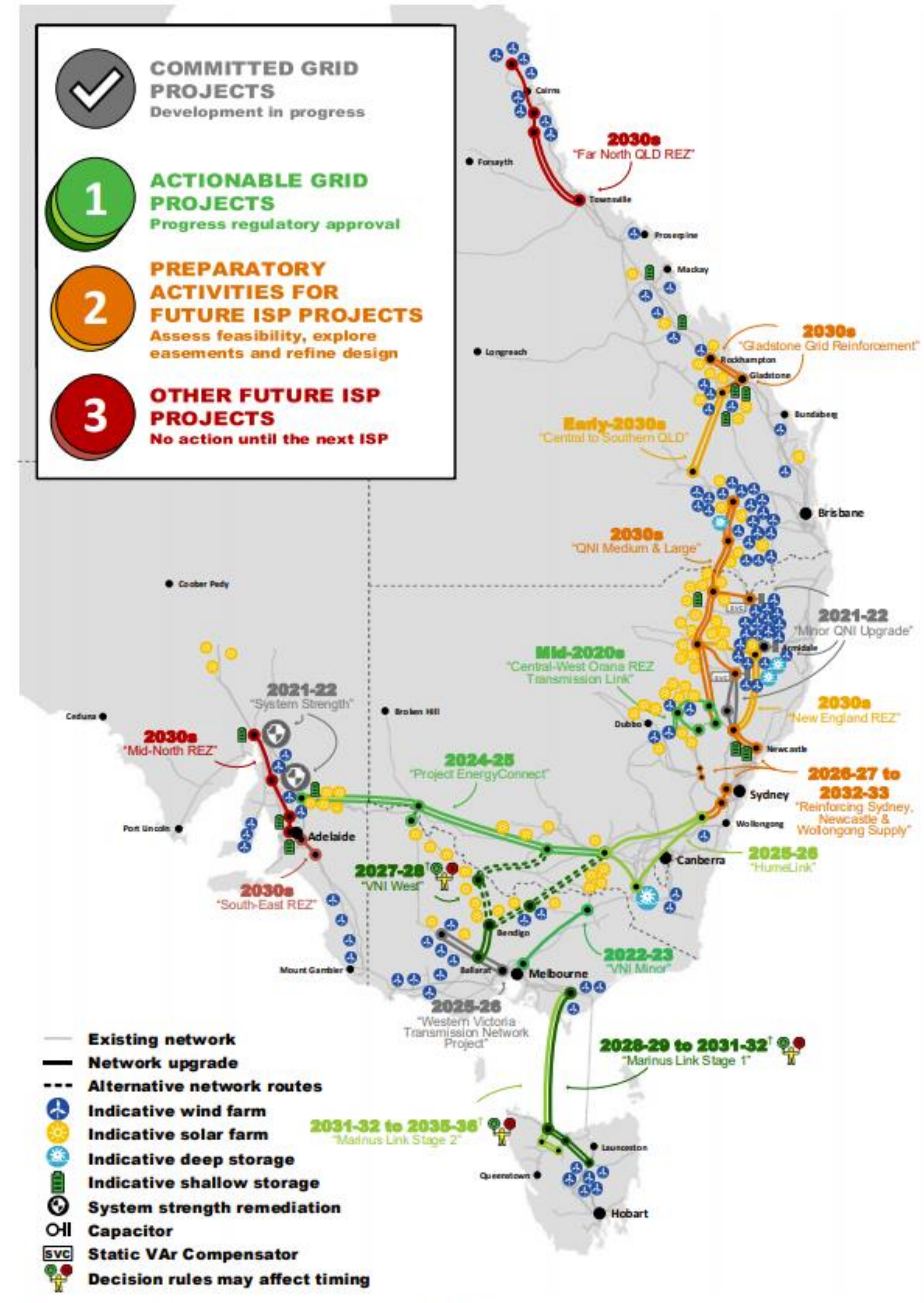
- Reduce the need to build transmission lines into new areas.
- Reduce project connection costs and risks.
- Optimise the mix of generation, storage and transmission line investment across multiple connecting parties.
- Co-locate and optimise the otherwise 'lumpy' investments in network and system support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

The 2020 Integrated System Plan ISP has identified 35 potential REZ after assessing resource, technical and economic parameters during scenario and assumptions consultation (AEMO, 2020). The proposal is located in the N3 Central-West Orana NSW REZ (Figure 2-6) and if approved would be in full operation by 2025. The proposal is therefore in a prime position to realise these infrastructure and economic efficiencies while maximising and information gathering and skill building opportunities for the region.

The Central-West Orana region has some of the highest solar and promising wind resources in NSW with the potential for 3,000MW of renewable energy capacity. The Central-West Orana region is ideally located near the existing interconnector between NSW and Queensland and would be well-suited to capitalise on any upgrades to the existing interconnector or the development of a proposed new interconnector. This zone is also close to demand centres on the NSW North-Coast, which would reduce energy losses from transmission.

The proposal site for the Forest Glen SF is well placed within this REZ.

The Forest Glen SF is located in an optimal solar resource zone with a high solar exposure measuring 10.5MJ/m2 (June) to 29.4MJ/m2 (December) (BOM, 2020).




† The timing of these actionable projects is dependent on decision rules.
All dates are indicative, and on a financial year basis. For example, 2023-24 represents the financial year ending June 2024.

Figure 2-5 Development path for the NEM in the 2020 ISP (AEMO, 2020)

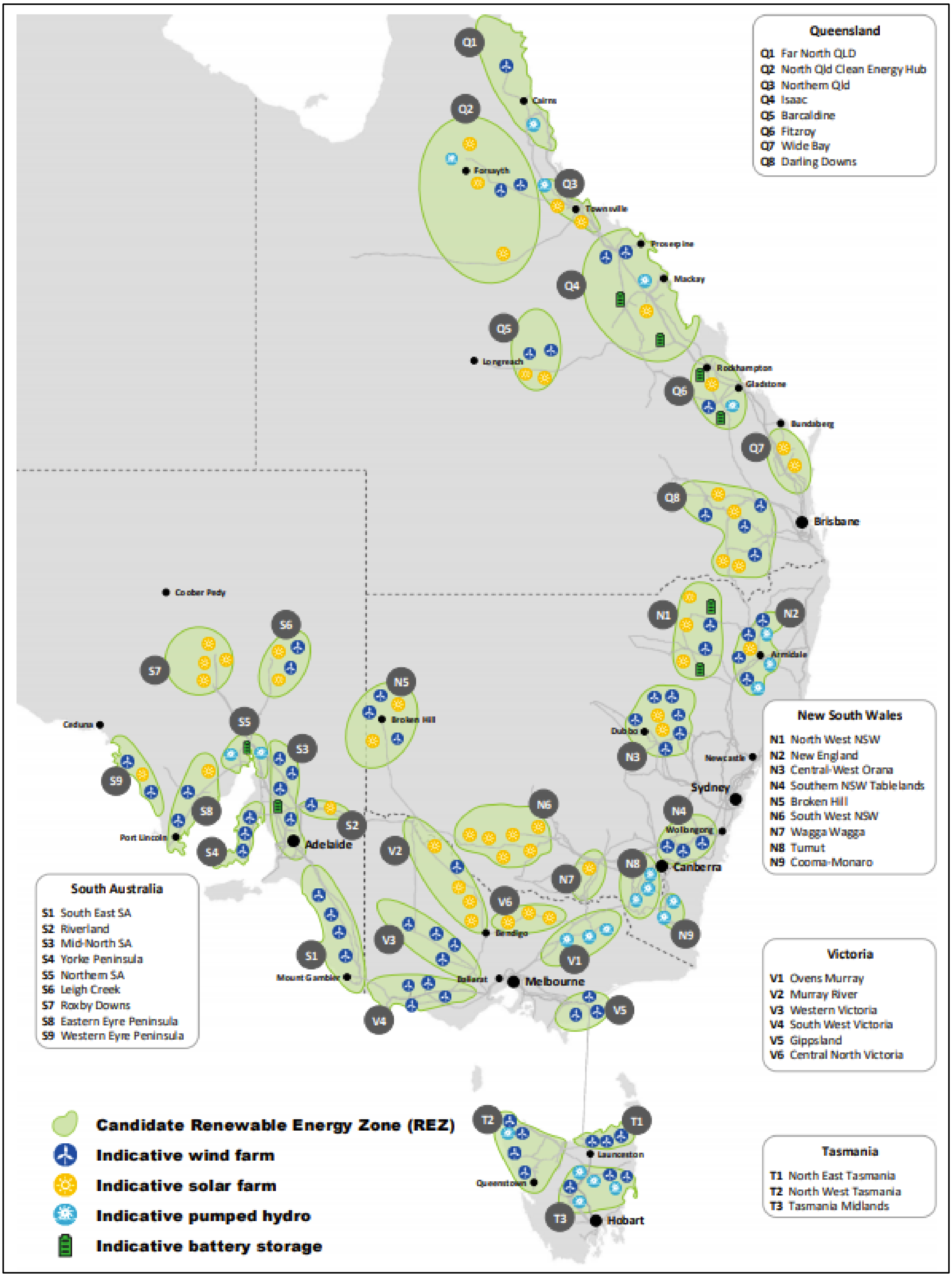



Figure 2-6 Identified potential REZ across the NEM (AEMO, 2020)

## NSW Electricity Infrastructure Roadmap

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

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

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

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

The key benefits of The Roadmap are shown in Figure 2-7.

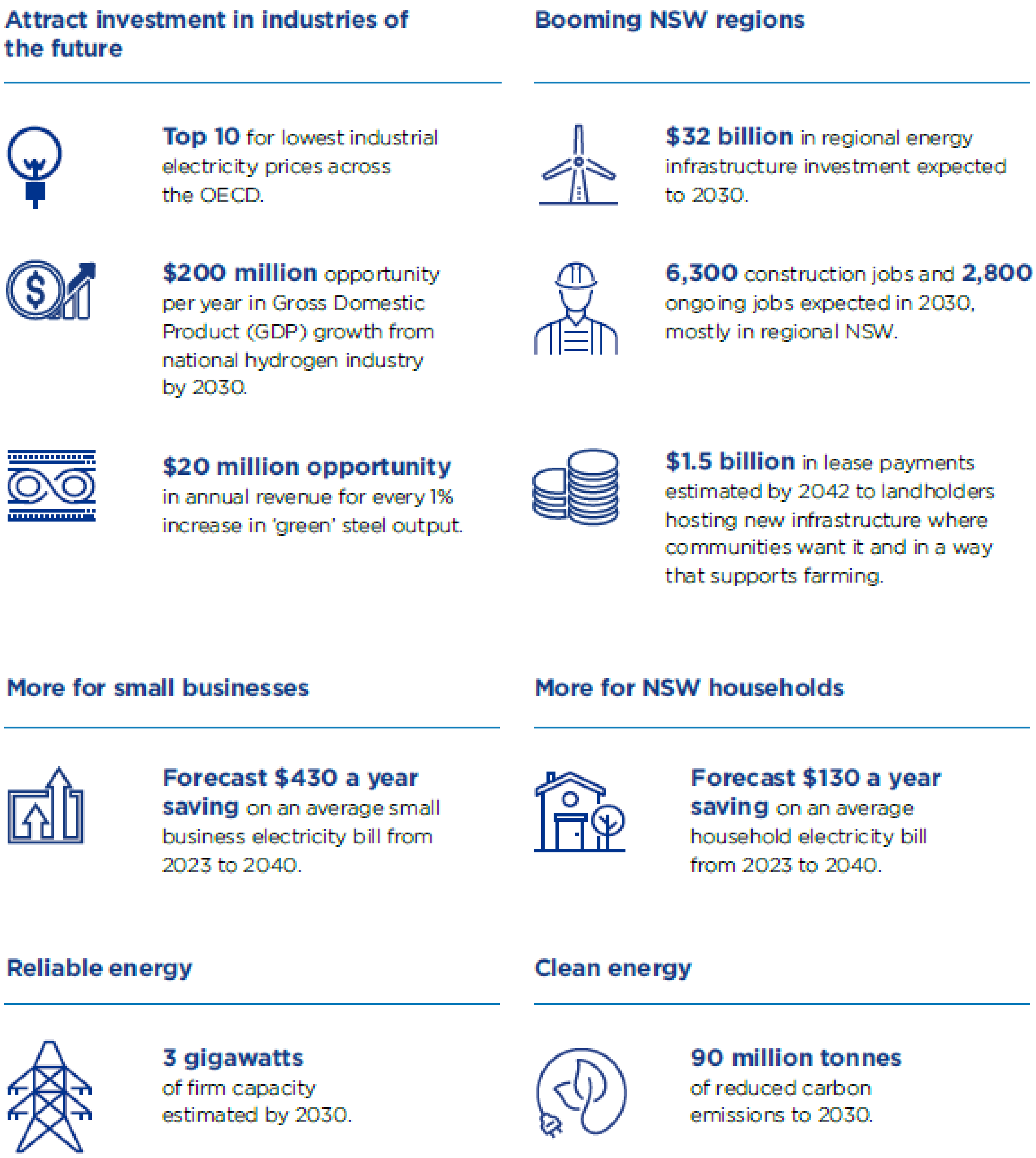



Figure 2-7 Key benefits of implementation of the NSW Electricity Infrastructure Roadmap (DPIE, 2020)

The Forest Glen SF would contribute directly to all five pillars:

1. Driving investment in regional NSW by increasing economic activity during construction and through benefit sharing programs. Economic modelling suggests the proposal could provide around $120 million in direct value add. The proposal could provide around 7-10 full time equivalent jobs during operational phase.
2. Increasing large scale energy storage of 25MW/25MWh, providing stability and reliability to the grid.
3. Achieving REZ goals by unlocking large-scale renewable energy projects within the Central-West Orana REZ and delivering lasting benefits for NSW. These benefits include more reliable energy, energy bill savings for businesses and consumers, emissions reductions and community partnerships.

4. Contributing a combined installed capacity of approximately 110MW DC (90MW AC equivalent) of renewable energy to the grid network, with storage, to support stabilising the supply of electricity to the National Energy Market (NEM).
5. Developing opportunities for industry in planning, design, construction and operation of large-scale renewable energy infrastructure.

### 2.2.4. Local renewable energy targets

#### Central West and Orana Regional Plan 2036

The Forest Glen SF is consistent with the vision and goals of the Central West and Orana Regional Plan (DPIE, 2017). Achieving the vision of "*The most diverse regional economy in NSW with a vibrant network of centres leveraging the opportunities of being at the heart of NSW".* would be supported by contributing to the following goals:

- The most diverse regional economy in NSW:
  - Delivering new green industries to the region.
  - Increase renewable energy generation.
- A stronger, healthier environment and diverse heritage
  - Reduced reliance on fossil fuel-based energy.
- Quality freight, transport and infrastructure networks:
  - Growth in freight and logistics.
- Dynamic, vibrant and healthy communities
  - Providing a new job sector in an agriculture dominated region.

#### Central Orana Regional Economic Development Strategy 2018-2022

Dubbo Regional Council and Narromine Shire Local Government have developed the Central Orana Regional Economic Development Strategy 2018-2022 (Dubbo Regional Council & Narromine Shire Council, 2018). A key aim of the economic strategy is:

*'Capitalise on the growth potential of the Mining and Construction sectors to boost related clusters in Energy, Manufacturing and Transportation'*

A set of 5 key elements of the Economic strategy are identified by the strategy as essential in influencing economic development. The proposed Forest Glen SF would directly contribute to two of these, specifically:

Element 3: Establish Central Orana as an effective and interconnected business centre

- *Increased number of businesses and workers and increased business retention*

Element 4: Capitalise on the growth potential of the Mining and Construction sectors to boost related clusters in Energy, Manufacturing, and Transportation

- *Develop a healthy marketplace for agriculture, manufacturing, mining, transportation, and logistics businesses to increase employment, output and revenue in each of these industries*

Establishing large scale solar in the region such as the Forest Glen SF is highly compatible with these elements. A new innovative technological industry such as solar would strengthen and diversify the local economy by introducing new business opportunities, and increasing the construction workforce in the region.

### Local Strategic Planning Statement (Dubbo Regional Council)

Dubbo Regional Council have developed a Local Strategic Planning Statement (LSPS) to support the future planning of the region for the next 20 years from 2020 – 2040 (Dubbo Regional Council , 2020). The LSPS identifies 20 planning priorities for Dubbo in the next 20 years. Planning priorities that the Forest Glan SF would directly contribute to include:

- Planning Priority 3: Promote renewable energy production
- Planning Priority 19: Create an energy, water and waste efficient city

Forest Glen SF would provide a direct value add the Dubbo area in the above planning priorities by adding a utility scale solar farm to the local grid which would benefit the local energy supply and contribute to promoting renewable energy establishment in the region.

## 2.3. Proposal Benefits

### 2.3.1. Environmental benefits

### Reducing the effects of fossil fuels and transitioning to cleaner energy production

In 2020, the solar sector produced 893MW of new capacity across 22 projects (Clean Energy Council, 2021). Large-Scale Solar energy (Systems larger than 5MW) accounted for 10.9% of Australia's renewable energy.

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

Solar farms are a sustainable energy resource and do not produce any greenhouse gas emissions during electricity generation. As such, developing renewable resources for electricity generation will help meet growing demand while arresting current emission trends. The proposal would generate around 221,000 MWh per year, saving approximately 164,000 t$CO_2$e/yr, and contributing to a reduction in global greenhouse gas emissions. The reduction in emissions as a result of renewable energy development will contribute to slowing the warming of the planet resulting in important flow on effects benefiting the environment. Slowing climate change will reduce ocean acidification, reduce sea level rise, improve air quality and prevent further loss of biodiversity.

### 2.3.2. Socio-economic benefits

### Electricity prices

Household electricity bills increased 61% between 2008-09 and 2012-13, due mainly to network expenditure (Commonwealth of Australia , 2016). Australian households would pay $510 million more for power in 2020 without renewable growth through the RET and up to $1.4 billion more per year beyond 2020 (Roam, 2014). Renewables increase diversity and competition in the wholesale energy market – and as in any market, less competition means higher prices.

The Australian Electricity Market Commission (AEMC) predicts residential electricity prices will fall 7.1% on average between 2019 and 2022, a reduction primarily driven by an 11.6% reduction in wholesale prices as 8,594 MW of new, mostly renewable energy, comes online (CEC, 2020).

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

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

## Electricity reliability and security benefits

While most of Australia's electricity is currently provided by coal-fired power stations, as many as three-quarters of these plants are operating beyond their original design life (DIS, 2015). Nine coal-fired power stations have closed since 2011-2012, representing around 3,600MW of installed capacity (AER, 2015 in Commonwealth of Australia, 2016). The reduction in energy supply from coal-fired power stations requires the development of reliable and sustainable energy supply.

In 2020, almost 2GW of renewable energy made up of 32 projects were constructed and began generating electricity (Clean Energy Council, 2021). Total large-scale solar alone contributed 893MW of new energy at the end of 2020. The equivalent number of households powered annually through large-scale solar in Australia is 1,487,155, and through all renewable energy generation sources totals 13,689,560 households. The beginning of 2020 saw an additional 49 large-scale solar projects under construction, contributing to the 9000 jobs created by renewable projects as a whole in the year.

Electricity consumption in Australia is exceptionally high, resulting in costly electricity bills and frequent disruptions to electricity supply during peak times. The renewable energy sector has responded to this high demand and to the need for viable alternative options for electricity generation contributing to 27.7% of Australia's overall electricity in 2020 (Clean Energy Council, 2021).

The high average daily solar exposure of 10.5MJ/$m^2$ (June) to 29.4MJ/$m^2$ (December) (BOM, 2020) and the site's proximity to existing transmission lines (onsite) and the existing Essential Energy 132kV transmission line greatly reduces the transmission and distribution loss factor risk and represents an ideal location for a solar farm. In this way the Forest Glen SF, once commissioned, would enhance the reliability, security and affordability of the NSW electricity supply.

## Employment

In 2019, over 25,000 Australians were employed in the renewable energy sector and this figure could rise to 44,000 by 2025 (Clean Energy Council , 2020). Large scale renewable projects create long term skilled employment opportunities, which are rare in many rural communities. Employment opportunities would extend through the local supply chain to fuel supply, vehicle servicing, hotels/motels, cafes, hotels catering and cleaning companies, tradespeople, tool and equipment suppliers and many other businesses.

The Forest Glen SF would generate around 150-200 direct jobs during the peak construction phase. It would employ 7-10 service and maintenance jobs during operation and development of new skilled labour in the region within the growing renewable energy industry.

These benefits would mostly be during construction. A smaller proportion would occur during operation mainly in relation to the maintenance and upgrade of infrastructure over the lifetime of the solar farm.

As above, appropriately sited in the Central-west Orana REZ, the Forest Glen SF would be an important part of building regional skill bases for this and other large solar projects to follow; diversifying the regional employment sector for renewable specific skills such as electrical and civil engineering, as well as boosting the existing service sector through the provision of recreation and accommodation services.

**Community benefit sharing program**

For this project X-Elio will plan, facilitate and implement a Community Benefit Sharing Program (CBSP). The goal of this plan is to facilitate meaningful results-based engagement between X-Elio and the local community in order to generate community support for delivering positive and effective outcomes for renewable energy projects through meaningful community engagement and benefit sharing. X-Elio is committed to maintaining and supporting its community engagement and as such will propose sharing with the community a percentage of gross revenues of the solar farm or gross revenues from implemented Power Purchase Agreements.

In conjunction with the local council economic development team X-Elio will identify a number of priority areas for these funds to portioned towards and in the past have included:

- Community Education Centres
- Training
- Renewable Energy Projects
- Sports & Wellbeing.

The CBSP is typically shared with the final decided programs on an annual basis.

# 3. Alternatives

## 3.1. The 'do nothing' option

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

The direct consequence of not proceeding with the proposal would be to forgo the benefits outlined in Section 2.2. This would mean to forgo a meaningful contribution to:

- Climate change mitigation.
- Electricity reliability and security benefits.
- Direct or indirect socio-economic benefits.
- Providing additional generation near high voltage networks.

The environmental impacts associated with the development, operation and decommissioning of the proposed solar farm would be avoided if the 'do nothing' option was selected. Such environmental impacts would include construction noise, Aboriginal heritage and impacts to biodiversity. The land would remain as agricultural land with grazing (sheep) and oat cropping. While local and temporary environmental risks and impacts would be avoided, the benefits of other options would not be met. The 'do nothing' option is not the preferred option.

## 3.2. Alternative site locations

The Forest Glen SF proposal site was selected after an extensive review of alternative sites by the proponent. The proposed sites were considered in accordance with DPIE's Large Scale Solar Energy Guideline for SSD 2018, which provides recommendations regarding selection of suitable proposal sites and areas of constraint that should be identified. Once the broader site was selected, the Development footprint was refined iteratively, in tandem with the environmental assessment and consultation with relevant government agencies, the community and other stakeholders. This process responds appropriately to the site's constraints to produce the most justifiable proposal, which is presented in this EIS and in accordance with the DPIE's Large Scale Solar Energy Guideline for SSD 2018.

This section outlines the alternatives that were considered and justification for the proposed option that is the subject of this EIS.

The proponent, X-Elio, has reviewed a large number of sites within NSW on which to build a solar farm before selecting the Forest Glen SF proposal site. The proposed sites were considered in accordance with DPIE's Large Scale Solar Energy Guideline for SSD 2018, which provides recommendations regarding selection of suitable proposal sites and areas of constraint that should be identified.

X-Elio conducted a detailed grid network assessment which analysed key criteria, such as thermal loading, voltage stability, voltage performance and system strength across several sites in NSW and while it would have been possible to construct and operate the solar farm at some of the sites investigated, X-Elio considers the Forest Glen Solar Farm proposal site to be the most suitable for the construction of a solar farm.

The proposal site's evaluation in terms of the Large-Scale Solar Energy Guideline for State Significant Development (DPIE, 2018) described in Table 3-1 below.

Table 3-1 Evaluation of preferable conditions associated with the proposal site

| Preferable Site Condition | Observation |
|---|---|
| **Optimal solar resources** | The site has a high solar exposure measuring 10.5MJ/m2 (June) to 29.4MJ/m2 (December) (BOM, 2020). |
| **Suitable land** | The proposal site is located within the proposed Central West Orana REZ and the following suitable land characteristics:<br>• Mostly flat to undulating land and well screened.<br>• The land is not mapped as Biophysical Strategic Agricultural Land (BSAL).<br>• The site has already been cleared and heavily disturbed by grazing within the proposed development areas.<br>• The site is a large lot under one landholding. |
| **Capacity to rehabilitate** | Proposal would involve minimal site disturbance and has potential to improve land by giving the site a rest from grazing. Once the solar farm reaches the end of its operational life, the site can be remediated to its existing condition so that grazing and occasional cropping can be resumed. |
| **Community support** | Community consultation has been undertaken as part of the proposal and feedback has been considered within this EIS. The consultation undertaken and results are summarised in Section 6.4.<br>During the consultation process no concerns regarding the project have been raised. |
| **Proximity to electrical network** | An existing Essential Energy 132 kV transmission line traverses the proposal site and would be used as the grid connection between the proposed solar farm and the national electricity grid. Which means the that the connection to the high voltage network can be made onsite without the need to construct any transmission lines. It also reduces the distribution loss factor risk.<br>Forest Glen SF would connect to Essential Energy´s 132 kV which is between the Dubbo South Zone and Narromine Substation. The Dubbo South substation is located approximately 13km to the east of the site. |
| **Connection capacity** | The proposal site is located within the proposed Central West Orana REZ. The Central-West Orana region has been selected as a pilot REZ as it benefits from relatively low transmission build costs due to its proximity to the existing backbone transmission network, and it has a strong mix of energy resources. The REZ is to be ‘shovel ready’ by the end of 2022 (NSW Government, 2020).<br>Connection to the national grid does not require additional power lines as the proposal would connect via an existing 132kV transmission line that traverses the northern section of the site. This reduces the potential for limiting ground clearance and impacting on safe movement of agricultural machinery.<br>Essential Energy’s infrastructure network has the capacity to absorb the total output of the solar farm and deliver it anywhere in the network. |

## 3.3. Alternative technologies and components

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

The critical components of a solar farm include:

- Solar panels to generate DC electricity from sunlight.
- Inverters to convert the DC electricity into AC electricity.
- Energy storage facility.

Over recent years, the underlying technology surrounding solar farm development has been evolving at an increasingly rapid rate. X-Elio would utilise the latest technical and cost-efficient technology available at the time of construction.

### 3.3.1. Generation technology

PV solar technology was chosen for electricity generation because it is cost-effective, low profile, durable and flexible regarding layout and siting. It is a proven and mature technology which is readily available for broad scale deployment at the site. Solar generation is well suited to the particular characteristics of the proposal site and can be rapidly deployed to assist in meeting both state and national climate change targets.

### 3.3.2. Solar farm components

Technology options considered for the proposal include:

- The type of solar panels
- Solar panel mounting system - fixed tilt or tracking
- The type and number of inverters/transformers and BESS.

#### Solar panels

The proposal will require between 150,000 – 200,000 solar panels of, mounted on single axis trackers and in rows, with approximately 3-9 metre row spacing, and with a maximum height of approximately 3 metres above the natural ground level. The PV mounting structure would comprise piles driven approximately 2.5 metres (depending on geotechnical requirements) into the ground using a pile driver.

As solar panel technology evolves rapidly, specification of the exact make of the solar panels will be defined during detailed design. Notwithstanding, solar panels being considered for the proposal would be expected to absorb 82% to 93% of the sun’s light and would involve low reflective surface material that would limit glint and glare.

#### Mounting system array

The PV mounting structure can be fixed or incorporate a mechanism that enable the modules to track the path of the sun:

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

The mounting options are compared in Table 3-2. The mounting system is installed on piles that have been driven or screwed into the ground, with ideally very little ground disturbance or pre-installation preparation. The total production, including generation window, would also be subject to the final solar panel selection. The Forest Glen SF proposes to use a single axis tracking system.

Table 3-2 Comparison of solar array mounting options

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

### 3.3.3. Energy storage technology

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

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

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

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

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

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

## 3.4. Scale of the proposal

The scale of the proposal has been determined after considering the site conditions and the proposal site's evaluation in terms of the Large-Scale Solar Energy Guideline for State Significant Development (DPIE, 2018) as discussed in Section 3.2.

On balance, it is considered appropriate to develop the solar farm with a capacity of approximately 110MW DC (90MW AC equivalent) which is expected to yield around 221GWh (giga-watt hours) of energy each year.

## 3.5. Strategic project justification

The Forest Glen SF proposal is considered justified due to the following:

- Contributions to mitigating climate change
  - It would contribute to meeting Australia's renewable energy targets and greenhouse gas commitments. The proposal would generate enough clean, renewable energy for about 40,000 average NSW homes, displacing approximately 164,000 metric tonnes of carbon dioxide, currently generated by non-renewable sources per annum.
  - The proposal aligns with international, commonwealth and state goals and polices for mitigating climate change and renewable energy projects.
- Improving the grid's reliably and cost of power
  - Being a renewable energy project, it would assist in improving electricity reliability and security benefits within Australia as the energy supply from coal-fired power stations are reduced.
  - Addressing the issue that Solar Farms cannot operate continuously (e.g. they do not operate during the night like a wind farm would) by installing a BESS to store energy during periods of excess generating capacity.
  - It would assist in increasing competition in the wholesale energy marked and therefore assist in reducing electricity prices within Australia.
- Providing local benefits to regional communities
  - It would provide direct and indirect employment opportunities during the construction and operating phases of the project. As well injection of expenditure in the local area.
  - The proposal would be a new land use thereby diversifying the local land use within the region, providing a drought resilient revenue stream for the agricultural economy.
- Meet preferable site conditions as outlined in Large-Scale Solar Energy Guideline for State Significant Development (DPIE, 2018)
  - The proposal site meets the preferable site conditions of a solar farm development outlined by the Large-Scale Solar Energy Guideline for State Significant Development (DPIE, 2018) including optimal solar resources, suitable land, capacity to rehabilitate, proximity to electrical network and connection capacity.
  - Th proposal is a viable scale while responding to site constraints and minimising environmental impacts to the site and surrounding locations.
  - An existing 132kV transmission lines traverses the site which means the that the connection to the high voltage network can be made onsite without the need to construct any transmission lines. It also reduces the distribution loss factor risk.
- Once the solar farm reaches the end of its operational life, the site can be remediated to its existing condition so that grazing, and cropping can be resumed.

# 4. The proposal

## 4.1. Proposal layout

To inform the development of the most appropriate proposal, a Scoping Report (NGH, 2019) for the proposal site was undertaken in the early planning stages to determine environmental constraints associated with the site. The Scoping Report (NGH, 2020) was used to assist with developing the early solar farm layout and planning the detailed environmental assessment methodologies for the EIS.

Environmental constraints can be defined as factors which affect the 'developability' of a site and include physical, ecological, social and planning factors. A map of these constraints was prepared for the Scoping Report (NGH, 2020).

Following the detailed field investigations, the constraints mapping has been further refined for the EIS and informed the delineation of the Development footprint and exclusion zones. This process ensures the proposal has appropriately responded to the site's constraints.

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

- Avoided higher biodiversity value land. Once the broader site was selected, the Development footprint was refined iteratively, in tandem with the detailed biodiversity assessment. The layout has been developed to avoid higher quality areas of native vegetation onsite including:
  - 12.9ha of PCT 201 Fuzzy Box Woodland on alluvial brown loam soils mainly in the NSW South Western Slopes Bioregion
  - 19.6ha of PCT 255 Mugga Ironbark - Buloke - Pillga Box - White Cypress Pine shrubby woodland on sandstone in the Dubbo region, south-western Brigalow Belt South Bioregion
  - 0.1ha of PCT 81 Western Grey Box - cypress pine shrub grass shrub tall woodland.
- Buffered waterways in accordance with their classification and the "Guidelines for Riparian Corridors on Waterfront Land", for 2$^{nd}$ order and above streams, to minimise impacts on hydrology and water quality. Excepting required crossings, these areas will be avoided. Rehabilitation of impacts required in these areas will be with reference to best practice guidelines.
- Avoided existing electricity easements 20m either side of the existing transmission line, approximately 10.2ha.

The proposal indicative infrastructure layout is provided in Figure 1-10 and the layout of infrastructure in context of the site's identified constraints is shown in Figure 1-11. Indicative plans and images of infrastructure components and key areas are described in detail in Section 4.1.

## 4.2. Subdivision

The proposal would require the subdivision of Lot 6 DP 755102 into the following:

- Lot A: Approximately 1ha for the proposed onsite substation, battery storage and associated ancillary facilities. This land with the substation would become the property of Essential Energy.
- Lot B: Approximately 441ha for the Development footprint to be leased by the proponent, including the battery energy storage system and ancillary facilities.
- Lot C: While the remaining area would continue to be used by the existing landowner (346ha).

The indicative subdivision is outlined in Figure 4-1. Pending approval, the subdivision would be administered through consultation with Dubbo Regional Council.

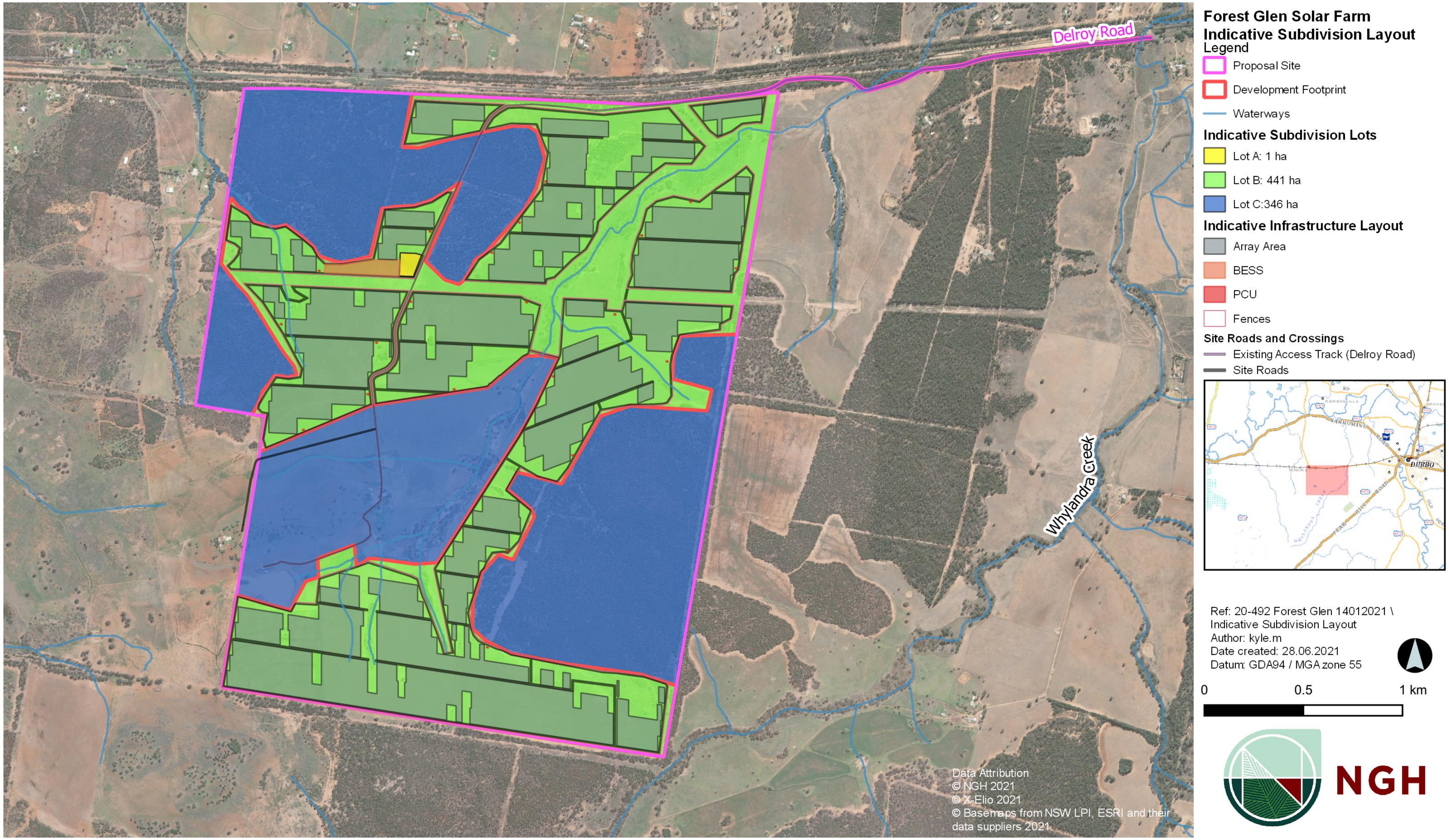



Figure 4-1 Proposed indicative subdivision

## 4.3. Proposed infrastructure

The key features of the proposal are summarised in Section 1.2.4. The component specifications are subject to change during detailed design. Where required, upper limit quantities and power level estimates are provided to ensure the assessment and any subsequent approval maintains the flexibility required in the detailed design stage, post approval. Each component is detailed below.

### 4.3.1. Solar arrays

The solar farm would consist of PV solar panels that would be grouped into arrays. Forest Glen SF would consist of approximately 3,000 single axis tracking structures in rows with approximately 60 bifacial solar panels per structure. Structures would be of 1V/1P configuration [1]being less than 2m high above ground level.

It is anticipated that 150,000 -200,000 solar panels would be installed with the capacity to generate 110MW (DC) (90MW AC equivalent). Panel size would be approximately 2.4 metres by 1.1 metres and the top edge of the panels would be up to 2.1 metres in height. The rows would be approximately 7 metres apart and would be installed parallel to each other. They would be connected to each other by DC electric cabling.

Detailed design, availability and commercial considerations at the time of construction would inform the final quantity of solar panels and layout configuration. Examples are provided in Figure 4-2 and Figure 4-3 below. As shown in the images, no leveling or ground cover vegetation clearing is proposed prior to installing the arrays. The soil will be disturbed in specific areas (during laydown and for trenching and access) as required, but for the arrays, minimal ground disturbance is required to place the mounting system which is installed on piles that have been driven or screwed into the ground.

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

Figure 4-2 Typical single-axis tracking system

Figure 4-3 Typical solar array arrangement

## Power Conversion Units (PCUs)

Arranged throughout the solar array would be 20 to 25 PCUs to convert the DC electricity output from the panels to AC electricity and transform the voltage to the collection system voltage of 33 kV. Each PCU includes four inverters, one transformer and associated control equipment. Each PCU is expected to be 10m x 8m and mounted on a concrete slab or on steel piles. Each PCU would be approximately 6m high.


Figure 4-4 Typical illustration of a PCU within the array (source: SMA Solar Technology)

### 4.3.2. Transmission network connection

The proposal site is traversed by one Essential Energy owned and operated 132kV transmission line (Figure 4-5) that connects to the Dubbo South substation and the Narromine South- South Western switching station. The Dubbo South substation is located approximately 13km to the east of the site. The Forest Glen SF would connect to the national grid via a new substation constructed in the northern portion of the proposal site. Essential Energy would maintain and operate the proposed new substation to be constructed onsite. The onsite substation would connect to the existing 132kV transmission lines onsite via an underground or overhead powerline. Only transmission connections would be permitted within the onsite transmission line easement, no buildings, arrays or roads would be construction within 30m either side of the Transmission line, this is integrated into the Indicative infrastructure layout.  No works are proposed to occur offsite for the transmission network connection.

The onsite 132kV substation would contain transformers, circuit breakers, current transformers and high voltage conductors to facilitate connection to the national electricity grid. The substation would be built in accordance with Australian and Essential Energy standards. The transformers would be used to transform the 33kV energy from the PCUs to 132kV in order to connect to the national grid. The transformers would be oil-fill, with waterproof bunds and other containment measures to ensure that in the event of an oil leakage, the oil is contained and cannot leak into the surrounding environment. The transformers would be located close to the connection point and would be approximately 600m from the nearest waterway (an ephemeral tributary to the west).

Figure 4-5 Existing 132kV transmission lines traversing the proposal site that will connect the solar farm to the Dubbo substation

### 4.3.3. Underground cabling

Underground DC electric cabling would be installed to connect the solar panels to the 20 to 25 PCUs. A collection system of AC cables would connect the PCUs to the site substation. Additional underground cabling would be installed for auxiliary power, data services and communication facilities.

Underground cabling on the site would be designed in accordance with Australian and International standards and the cable routes would be designed to minimise ground disturbance.

The cables would be installed in trenches approximately 900mm deep and the cables may be protected by conduits. A marking tape would be provided to reduce the possibility of accidental damage and ground markers would be provided to identify the cable routes.

Copper conductors would be used wherever necessary to electrically bond the metal structures to earth to protect personnel and equipment in the event of lightning strikes and electrical faults.

### 4.3.4. O&M buildings

In terms of Operations and Maintenance (O&M) buildings, a site office would be installed to house monitoring and control equipment, computers, communications equipment, supplies, spares, and crew facilities. It will be used during commissioning of the solar farm and as a maintenance facility during the operational phase. The O&M building would be approximately 12m long and 6.8m wide and constructed out of colorbond.

A control room to house switch gear would also be construction within the substation footprint. The building would be 14m long x 5m wide and 5m high and constructed out of colorbond.

### 4.3.5. Ancillary infrastructure

The following services and ancillary infrastructure would be constructed at the solar farm site during construction and operation phases.

Construction phase:

- Water – water would be available for staff amenities, construction works and firefighting purposes. Water would be trucked to site by a licenced provider as needed and stored in tanks within the construction area.
- Telecommunications.
- Sewerage – portable toilets would be available in the construction area.
- Electricity – staff buildings and the site offices within the construction area would be powered by generators. Most equipment on site would be diesel powered.

Operation phase:

- Water – a rainwater tank would be incorporated into the control room design and town water may be connected for control room facilities. If water is required for cleaning solar panels or other maintenance activities, it would be trucked to site by a commercial operator.
- Telecommunications – mobile phones would be used, and a landline connection may be established in the control room.
- Sewerage – an on-site effluent disposal system would be connected to the control room in accordance with local council provisions.
- Electricity – electricity would be provided by the solar farm development and the control room may also be connected to mains electricity. All electricity connections would be onsite.

### 4.3.6. Site access and internal tracks

The site will be accessed from the existing Delroy Road entering from Minore Road. Delroy Road would be widened, where required, to ensure a minimum carriageway width of 6.5m is provided to allow simultaneous two-way vehicle movement. The first section of Delroy Road is proposed to be sealed, new signage installed and line marking undertaken. The location of the site access is indicated in Figure 1-9.

Internal access tracks would be constructed around the perimeter of arrays and to the substation for use during the construction of the proposal and to facilitate ongoing maintenance. The internal access tracks would be approximately 4m wide of unsealed gravel to facilitate transport, unloading and mounting of the PCUs. They will be constructed in accordance with the AustRoad Guideline requirements and include suitable drainage features to minimise the risk of polluted water leaving the site or entering the waterways. The final locations of the access tracks would be determined during the detailed design phase of the solar farm. Based on the indicative infrastructure layout, approximately 37,570m of tracks are to be constructed.

Internal access tracks would require one waterway crossing. The most likely location of the crossing is shown on the indicative infrastructure layout (Figure 1-10). Erosion and waterway protection would be ensured by designing waterway crossings in accordance with the following:

- *Why do fish need to cross the road? Fish Passage Requirements for Waterway Crossings* (Fairfull and Witheridge, 2003).
- *Policy and Guidelines for Fish Friendly Waterway Crossings* (NSW DPI, 2003).
- *Guidelines for Watercourse Crossings on Waterfront Land* (NSW DPI, 2012).

The site access road and all internal tracks would be maintained throughout the construction and operation of the solar farm. If required, water trucks would be used to suppress dust on unsealed access roads and tracks during construction. Additional stabilising techniques and/or environmentally acceptable dust control would also be applied if required to suppress dust.

### 4.3.7. Energy storage

The BESS would have a capacity of up to 25MWh (i.e., 25MW power output for one hour) consisting of approximately 12 to 15 containers (40 foot each). The total area would be 2.4ha. The energy storage infrastructure would be installed once the solar farm is in operation and would consist of power packs comprising of lithium-ion batteries with inverters. They would be installed in one location near the substation, and not distributed through the site. The exact location of the future energy storage would be determined during detailed design but would be located within the Development footprint. The indicative location is shown on (Figure 1-10).

### 4.3.8. Security and fencing

The following security measures would be established within the proposal site:

- The infrastructure on the site would typically be enclosed by a 2.3m high chain wire fence with wire strands. This fence type would be confirmed during the design phase and constructed early in the construction phase.
- The 132kV substation would be enclosed by a security fence in accordance with Essential Energy requirements.
- An electronic security system would be established prior to commissioning of the solar farm.
- Security lighting would be installed around the entrance gates and main building areas. These would be motion detected and not on continuously.

### 4.3.9. Temporary construction facilities

Temporary facilities would be located within the Development footprint during the construction phase and would include:

- Material laydown areas.
- Temporary construction site offices.
- Temporary car and bus parking for construction worker's transportation. When the construction work is completed, a small car park would be retained for maintenance staff and occasional visitors.
- Temporary staff amenities.

The staff amenities would be designed to cater for the peak number of construction staff expected to be onsite and would include:

- Sanitary modules with water flush systems connected to holding tanks. The tanks would be fitted with high level alarms, and they would be pumped out regularly.
- Water tanks.
- Changing rooms.
- Lunchrooms.
- Administrative offices.
- Covered walkways.
- Emergency muster point.
- Generator – if required.
- Electrical, data and water reticulation.

A steel or concrete water storage tank would be installed near the entrance to the site for firefighting and other non-potable water uses. Rainwater tanks to be installed beside the site buildings for staff amenities. Suitable fire extinguishers would be maintained at site buildings.

All temporary facilities would be in accordance with X-Elio internal standards and Australian regulations. The indicative location of these facilities is shown in the indicative layout (Figure 1-10). Laydown areas would occur within the Development footprint. It is proposed the construct the arrays within stages, so proposed solar array areas would be used for temporary stockpile and laydown areas during construction.

## 4.4. Proposed implementation and cost

The project would be implemented in four stages, as described below:

1. Preconstruction works
2. Construction
3. Operation
4. Decommissioning.

This section also provides an indicative timeline for each stage and capital investment value of the works.

### 4.4.1. Preconstruction works

The proposed Forest Glen SF may include works prior to construction including installation of fencing, geotechnical drilling and/or surveying and preparation of construction compounds and site facilities.

### 4.4.2. Construction

#### Construction activities

Construction is anticipated to take approximately 12 – 18 months. The main construction activities are described in Table 4-1 below.

Table 4-1 Expected construction activities

| Activity | Details |
|---|---|
| Site establishment and preparation | • Detailed site survey.<br>• Establishment of site access.<br>• Establishment of the construction set out area involving excavation works to level the site and installation of any required drainage infrastructure.<br>• Construction of internal access roads and their associated drainage works.<br>• Delivery of equipment and materials (ongoing).<br>• Installation of security fencing requiring minor excavation works and construction of concrete footings. |
| Installation of solar panels | • Site survey to determine levels and depth of steel posts (part of the mounting structure).<br>• Ramming of steel posts into the ground using specialist pile driving equipment. Depending on site survey results, posts may be driven into the ground up to 2 metres deep.<br>• Installation of mounting structure on posts.<br>• Installation of tracking equipment and solar modules onto the mounting structure. |

| Activity | Details |
|---|---|
| Installation of PCU units | • Excavation works to level the ground at location of the unit only.<br>• Installation of form work and pouring of concrete slab.<br>• Use of crane to lift the PCU units into place. |
| Cabling | • Install low voltage DC wiring electric cable to each solar module and connection to collectors at end of each row of panels. Install underground cabling to the PCUs.<br>• Install medium voltage AC electric cables from the PCUs to the site substation. Cable would be installed either underground in trenches approximately 600mm to 900mm wide and 1m deep, or overhead across water courses to be designed in accordance with HV electrical industry best practice. |
| Substation and control room (works may be undertaken concurrently with the solar panel installation) | • Excavation works to level site area only.<br>• Installation of form work and pouring of concrete slabs.<br>• Installation of road-base to provide level hard standing as required.<br>• Construction of the buildings.<br>• Installation of transformers, switchgear, circuit breakers, electrical equipment and cable structures using cranes where necessary.<br>• Installation of pre-fabricated control room and connecting facilities, including septic tank.<br>• Laying and connection of cables to transformers and switching equipment.<br>• Commissioning. |
| Connection of the solar farm to the 132kV overhead powerline | • Stringing of high voltage cables from the site substation to connect to Essential Energy high voltage overhead line. These will be either above or below ground.<br>• Cable terminations and testing. |
| Testing and commissioning of solar farm. | • This would include testing all cable connections and electrical equipment and progressively connecting stages of the solar farm to the grid as commissioning is completed. Comprehensive regulatory approvals are required at this stage prior to final connection to the grid. |

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

## Site preparation and earthworks

Ground disturbance resulting from earthworks associated with the proposal would be minimal and limited to:

- The installation of piles supporting the solar panels which would be driven or screwed into the ground.
- Establishment of access roads.
- Removal of existing fences and other minor elements
- Cleaning and levelling the ground for buildings and structures.

- Localised areas of earthworks (cut and fill, grading and compacting) may be required in areas where there are sudden, significant changes in ground slope.
- Construction of internal access roads.
- Excavating cable trenches approximately 600mm to 900mm wide and 1m deep.

Groundcover vegetation and topsoil under the footprint of the array area would not be removed during the construction of the solar farm. Topsoil salvaged from the construction of the access tracks and other works would be securely stored for use in site rehabilitation.

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

## Materials and resources

The main construction materials would include:

- Aggregates, road base and concrete.
- Fencing materials.
- Steel footings and frames to support the solar arrays.
- Cables, conduits, junction boxes.
- Steel framing and Colourbond sheeting for permanent buildings.
- Timber and fixtures for building fit-out.

Estimated quantities of required resources are shown in Table 4-2 and would be confirmed during the detailed design stage.

Table 4-2 Estimated material resources required

| Resource | Estimated Quantity |
|---|---|
| **Gravel (access tracks)** | 4,473 $m^3$ |
| **Sand (bedding for cables)** | 4,658 $m^3$ |
| **Concrete (PCU and buildings)** | 663 $m^3$ |
| **Estimated number of solar panels** | 150,000-200,000 |
| **Estimated number of mounting structures (Single Axis Tracker)** | 3,000 |
| **Estimated number of inverters** | 20 - 25 power conversion units (including 4.4 MVA inverters) |

### Water requirements

Non-potable water requirements are anticipated to be at an upper limit of 160 kilolitres (kL)/day and total 36 megalitres (ML) to 42ML for the construction phase in its entirety. Potable water requirements are anticipated to be approximately 1ML during the construction phase. Detailed water requirements would be determined by EPC contractors.

Non-potable water would likely be sourced from rainwater tanks and a local water holder, and potable water would be sourced from a licensed commercial potable water supplier. Water sources would be subject to determination by EPC contractors.

Availability of water is discussed in detail in Section 8.1.

### Labour, machinery and equipment

It is anticipated that up to 120 construction staff comprising of supervisors, tradesmen and labourers would be engaged to complete the work during the peak construction phase (approximately 10 months). Up to 200 workers is a maximum estimation, the number of workers required for proposal would likely be less. Every effort would be made to hire staff locally.

Staff would be accommodated in Dubbo, Narromine or nearby surrounding areas.

Plant to be used during construction would include:

- Small pile driving rig.
- Crane.
- Drum roller.
- Padfoot roller.
- Wheeled loader.
- Dump truck.
- 30t excavator.
- Grader.
- Chain trencher.
- Water truck.
- Telehandler.
- Forklift.

## Transport and access

### Haulage route

Road transport is the preferred option for the delivery of construction infrastructure, as opposed to rail. It is expected that the haulage route for most vehicles, including heavy and over-dimensional vehicles during construction would be from Dubbo, then to the site via Minore and Delroy Road. It is expected that the equipment would be transported from port facilities in either Sydney or Newcastle and delivered to the site in 12m shipping containers or other suitable transport mode. The larger transformers would likely be delivered by low loaders on up to two occasions.

The principal haulage routes would from Port Botany via the Newell Highway to the proposal site (Figure 7-11). The proposed haulage route is an approved 19m B-double route on the Transport for NSW Restricted Access Vehicles Map. The longest vehicle expected on site is a 19m B-Double, with an estimated peak of 24 B-Double movements through the site.

Materials would generally be transported to the site on heavy vehicles up to B-double and would include, but not limited to the following:

- PV solar panels.
- Piles, mounting structures and frameworks.
- Electrical equipment and infrastructure including cabling, auxiliary electrical equipment and machinery, inverters, switchgear, and the onsite substation (and transformer).
- Construction and permanent buildings and associated infrastructure.
- Earthworks, grading and lifting machinery and equipment.

Specialist oversize equipment including the grid connection transformer and 200 Tonne cranes would require oversized vehicles to transport them to the proposal site. This equipment would have ‘Oversize’ transport management in place to transport these items to site. Further, the cumulative impact of the site traffic with nearby developments is expected to be minimal. A design, in accordance with the Traffic Impact Assessment undertaken by Amber Organisation Pty Ltd (2020), for the intersection of the site access with Minore Road, would ensure the access would operate in a safe manner and will be able to accommodate the maximum design vehicle expected to access the site Appendix I.

A Construction Traffic Management Plan would be prepared following project approval to manage haulage traffic during the construction phase.

Transport and access impacts are discussed in detail in Section 7.5.

### Intersection treatments

Two intersections were considered in the Amber traffic report (Appendix I) these were the:

1. Newell Highway / Minore Road intersection.
2. Minore Road / Delroy Road intersection.

*Austroads Guide to Traffic Management Part 6: Intersections, Interchanges, and Crossings* specifies the turning treatments required at intersections. Following a SIDRA analysis of turning volumes at the Newell Highway / Minore Road intersection it was concluded that the intersection was suitable, and no upgrades would be required.

The intersection of Minore Road and Delroy Road is currently in poor condition. As part of this proposal, the intersection would be subject to some minor upgrades to formalise the intersection to ensure vehicle movements are undertaken in a safe manner and to accommodate the increase in traffic generated by the solar farm. The proposed upgrades are shown in Figure 4-6 and the traffic report in Appendix I, the upgrade

includes:

- Providing a minimum carriageway width of 6.5m for Delroy Road
- Sealing the first part of Delroy Road to allow vehicles to safely exit Minore Road
- Providing Give Way signage and line marking for vehicles exiting Delroy Road.

No other intersection treatments or upgrades are required. No changes to intersection alignment or type is proposed.

The majority of Delroy Road is currently greater than 6.5m wide, the widening would only occur in areas required and would likely only require vegetation trimming and pruning and formalisation of verges. Extensive vegetation clearing or earthworks is no required. No works are proposed on Minore Road itself.

Following the recommended upgrades to the Delroy Road intersection is expected to sufficiently service the proposal site during construction.

These upgrades:

- Form part of the proposal
- Have been developed in consultation with the roads authorities (refer to Appendix I and Section 7.5)
- Have been fully assessed for environmental impacts (specifically heritage and biodiversity).


Figure 4-6 Minore Road / Delroy Road Intersection upgrade – minor upgrades, no change to intersection type or alignment.

### Traffic movements

Estimated total and maximum daily traffic movements during construction and peak construction are shown in Table 4-3, and detailed traffic volumes and requirements are shown in Table 4-4.

Table 4-3 Estimated traffic volumes and requirements for the Forest Glen SF

| Vehicle Type | Average Vehicle Movements per Day | | Peak Vehicle Movements per Day | |
|---|---|---|---|---|
| | Daily (vpd) | Peak Hour (vph) | Daily (vpd) | Peak Hour (vph) |
| Light Vehicle (car / 4WD) | 30 | 5 | 80 | 50 |
| Shuttle Bus | 48 | 8 | 9 | 5 |
| Medium Rigid Vehicle (MRV)/ Medium Rigid Vehicle (HRV) | 18 | 3 | 20 | 5 |
| Articulated vehicle (AV) | 18 | 3 | 24 | 6 |
| B-Double | 18 | 3 | 24 | 6 |
| **Total** | **132** | **22** | **157** | **72** |

Table 4-4 Estimated detailed traffic volumes and requirements

| Item | Type of vehicle | Estimated total number of vehicles during construction |
|---|---|---|
| **Equipment** | | |
| **Solar Panels** | B Double | 420 |
| **PCU's** | Semi-Trailer | 14 |
| **Switchboards** | Semi-Trailer | 3 |
| **Transformer and 200 Tonne Crane** | Oversize vehicles | 5 |
| **Total cables** | Semi-Trailer | 26 |
| **30 MWh battery storage** | Semi-Trailer | 5 |
| **Auxiliary electrical equipment and machinery** | Semi-Trailer | 1 |
| **Steel posts, tables and brackets** | Semi-Trailer | 280 |
| **Buildings** | | |
| **Control room** | Semi-Trailer | 3 |
| **Warehouse** | Semi-Trailer | 4 |
| **Offices** | Semi-Trailer | 14 |
| **Water tanks** | Semi-Trailer | 1 |
| | | |
| **Posts and wire mesh** | Semi-Trailer | 25 |
| **Earthworks and grading machine** | Semi-Trailer | 1000 |

| Item | Type of vehicle | Estimated total number of vehicles during construction |
|---|---|---|
| | | |
| **Telehandler** | Semi-Trailer | 8 |
| **Tractors/bulldozers** | Semi-Trailer | 3 |
| **Miscellaneous trucks** | Standard truck | 4 |
| **Water Tankers** | 20000L Tanker | 2 |
| | | |
| **Construction workers** | Shuttle buses | 4 |
| | Cars | 15 |

### Hours of operation during construction

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

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

There may be limited need to work outside these hours, for example:

- To avoid disrupting traffic when delivering bulky equipment
- To avoid taking outages of existing high voltage transmission lines during periods of high load
- To undertake emergency work to avoid serious injury or loss of property.

Any construction outside of these standard construction hours, if required, would only be undertaken with prior approval from relevant authorities.

## 4.4.3. Operation

### Activities during operation

The Forest Glen SF is expected to have an operational life of 35 years.

Once commissioned, the solar farm would be in operation continuously. The solar farm would only generate electricity during sunlight hours, but the energy storage system could be activated at any time.

The solar farm would operate automatically but there would be provision to both locally and remotely monitor the performance of the equipment and to activate the energy storage system.

Activities undertaken during operation would include:

- Monitoring and control of the solar farm. This would be undertaken both by on-site personnel and via a remote-control system accessed from a central off-site facility and providing real time and historical performance information.
- Maintenance activities. General repair and maintenance of all solar farm infrastructure as well as roads, drainage, grass and fences. This would also include occasionally responding to faults in the equipment which would be identified through alarms on the monitoring system.
- Cleaning of solar panels. Details for panel cleaning would be confirmed prior to construction. If required, water would be sourced from local commercial operations and delivered to site by truck as required. Alternatively, panels may be self-cleaning, supported by dry cleaning with high pressure air pistols if necessary.

- Managing grass and weeds under and around the solar support structures. This would involve keeping grass down by slashing or grazing and controlling weeds using local best practice.
- Emergency repair response (24 hours).
- Site security response (24 hours).
- Vegetation management within the Development footprint in accordance with the fire management and biodiversity management plans.

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

Forest Glen SF would employ approximately 7-10 staff members during the operations period and would utilise local commercial entities (nearby quarry, local water suppliers and subcontractors) as required.

### Water requirements

Cleaning materials and spare parts would be made available on site for use by the maintenance staff. Panel cleaning may be required during drought conditions. As such, additional panel cleaning may also be required on occasion. As a 'worst case' upper limit, it is estimated that up to 240kL of water would be required per year which would be sourced from rainwater tanks and dams. If insufficient water is collected on site from rainwater tanks and dams, water would be obtained commercially by a licensed water provider.

### Transport and access

The travel demand during the operation phase of the proposal would be significantly less than the construction phase. It is estimated that the daily peak travel demand during operation would be approximately 8 light vehicles movements a day. Site access would be via Delroy Road.

### Personnel and work hours

A total of 7 to 10 equivalent full time staff would be employed onsite when the solar farm is operational. Associated work would be undertaken during the standard working hours of:

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

Work would only be undertaken outside of these hours in an emergency and would be kept to a minimum.

During the life of the solar farm, it may be necessary to engage contract staff to undertake specific major tasks at which time there could be greater numbers of people onsite. Such work would most likely relate to the replacement/refurbishment of the energy storage system, as it is assumed that the batteries would have to be replaced at least once during the life of the solar farm.

As noted in Section 4.3.2, Essential Energy would be responsible for the operation and maintenance of the 132kV substation and Essential Energy staff would require access to that part of the site.

The Essential Energy owned Dubbo South Substation is approximately 13km from the proposal site so it is expected that the maintenance of the two sites would be coordinated, and, in respect of Essential Energy staff, the presence of the new substation would have minimal impact on traffic in the area.

The standard working hours for Essential Energy staff are:

- Monday – Friday: 7am – 6pm.

### 4.4.4. Lighting and CCTV

There would be no night lighting located around the solar array.

Night lighting would be provided around the buildings, and in the high voltage substation but they would only be used on the rare occasions that staff are working on the site during the hours of darkness.

There may be some security lighting at critical locations around the perimeter of the site, but these would only be activated when the automatic security system senses an unauthorised site entry. Task lighting would be provided at PCU's.

CCTV security cameras would be located at the entrance gate and around the substation and battery storage, and O&M facilities and office areas.

### 4.4.5. Refurbishment and upgrading

It is estimated that the solar equipment would have a life of 30 years and the benefits of refurbishing the equipment would be considered closer to this time, with the total expected life span of the Forest Glen Solar Farm being 35 years.

It is anticipated that the batteries that would be used in energy storage system would have a life of approximately 15 years, it is anticipated that they may need to be replaced during the life of the solar farm.

## 4.5. Decommissioning and rehabilitation

When the solar farm is no longer viable, all above ground infrastructure, with the possible exception of the 132kV substation, would be removed and decommissioning and rehabilitation of the site would commence. It is noted that the 132kV substation would at that time form part of Essential Energy's transmission system. Other works would need to be carried out to re-establish the link if the substation were to be removed.

The solar arrays would be removed and the steel piles on which they are supported, would be removed. Both the steel piles and the solar panels would be recycled, where possible.

All buildings (O&M buildings and control room) would be removed, including the PCUs together with the associated footings.

Cabling would be removed where practical and recycled. Any cabling greater than 500mm below the ground may be left in place since this would not impact on future agricultural activities on the site once the restoration is complete.

Areas disturbed during the decommissioning of the site would be rehabilitated. The objective of this stage is to return the site to its existing land capability, for continued agricultural or other compatible land use options. The soil survey commitments made as a part of this proposal will ensure that baseline soil quality standards can be referenced during rehabilitation of the site to:

- Provide a base line target
- Provide site specific soil parameters that will assist remediation (both post construction as well as during decommissioning).

The Forest Glen SF is therefore considered largely reversible in terms of ongoing land use options.

## 4.6. Indicative timeline

Table 4-5 Indicative timeline

| Phase | Approximate commencement | Approximate duration |
|---|---|---|
| **Pre construction works** | 3Q 2022 | 1 month (if needed) |
| **Construction** | 3Q 2022 | 12 to 18 months |
| **Operation** | 1Q 2024 | 35 years |
| **Decommissioning** | 2Q 2059 | TBC |

## 4.7. Capital investment

The Forest Glen SF would have an estimated capital investment of A$185.5 million (including storage). A quantity surveyor's report confirming the estimated capital investment has been provided to DPIE.

# 5. Planning Context

The legislative planning context for the Forest Glen SF proposal is covered in this section and includes:

- Clarification of the status of the proposal as a NSW State Significant Development (SSD).
- The permissibility of the proposal under relevant State Environmental Planning Policies (SEPPs).
- Evaluation of the proposal against relevant local, NSW and Commonwealth law (Acts and Regulations).

## 5.1. Assessment context

The *Environmental Planning and Assessment Act 1979* (EP&A Act) and its associated regulations and instruments set the framework for development assessment in NSW.

Development assessment provisions are contained in Part 4 of the Act. Section 4.36 of the EP&A Act provides that a development would be SSD if it is declared to be SSD by a State Environmental Planning Policy (SEPP).

The *State Environmental Planning Policy (State and Regional Devel*opment) *2011* (SRD SEPP) declares the Forest Glen Solar Farm to be SSD as it is development for the purpose of electricity generating works with a capital investment value of greater than $30 million (Clause 20, Schedule 1).

Section 4.12 (8) of the EP&A Act requires an SSD development application to be accompanied by an EIS prepared in accordance with the EP&A Regulation. This EIS is intended to meet the objects and assessment requirements of the EP&A Act, the Regulation and *State Environmental Planning Policy (State and Regional Development) 2011*.

The proponent made a written application to the Secretary requesting Secretary's Environmental Assessment Requirements (SEARS) for the proposed Forest Glen Solar Farm as required by Clause 3 of Schedule 2 of the EP&A Regulations. The proponent's application was accompanied by a Scoping Report (NGH, 2020), which provided detailed information about the proposed Forest Glen Solar Farm including key environmental issues.

On 30 October 2020, the Secretary issued the SEARs for the Forest Glen Solar Farm (Section 6.1.1). In formulating the environmental assessment requirements, the Secretary consulted with relevant public authorities and agencies and considered key issues raised by those authorities. Section 6.1.1 outlines the SEARs and provides a cross reference to where each item is addressed within this EIS. This EIS complies with the SEARs and the environment assessment requirements contained in Schedule 2 of the EP&A Regulation.

## 5.2. Environmental planning instruments

Environmental planning instruments (EPIs) are legal documents that are prepared under the EP&A Act to regulate land use and development. EPIs determine the relevant part of the EP&A Act under which a development proposal must be assessed and therefore determine the need or otherwise for development consent. EPIs consist of SEPPs, regional environmental plans (REPs), and local environmental plans (LEPs).

### 5.2.1. State environmental planning policies

#### *State Environmental Planning Policy (State and Regional Development) 2011*

The aims of the *State Environmental Planning Policy (State and Regional Development) 2011* (SRD SEPP) are to identify development that is SSD, which are major projects that require approval from the Minister for Planning and Environment or delegate (Planning Assessment Commission, Secretary or other public authority).

Clause 20 of Schedule 1 of *State Environmental Planning Policy (State and Regional Development) 2011* defines SSD as including:

> *Development for the purpose of electricity generating works or heat or their co-generation (using any energy source, including gas, coal, biofuel, distillate, waste, hydro, wave, solar or wind power) that:*
>
> *a. has a capital investment value of more than $30 million, or*
>
> *b. has a capital investment value of more than $10 million and is located in an environmentally sensitive area of State significance.*

The Forest Glen SF would have an estimated capital investment cost greater than $30 million and is therefore considered SSD under Part 4 of the EP&A Act.

#### *State Environmental Planning Policy (Infrastructure) 2007*

*State Environmental Planning Policy (Infrastructure) 2007* (ISEPP) was introduced to facilitate the effective delivery of infrastructure across the state by improving regulatory efficiency through a consistent planning regime for infrastructure and services across NSW.

Clause 34(1) of ISEPP provides that development for the purpose of electricity generating works may be carried out by any person with consent on any land in a prescribed rural, industrial or special use zone.

The proposed Forest Glen SF would be located within a rural zone (RU1 Primary Production), under the Dubbo LEP. The proposal is therefore permissible with consent under the ISEPP.

#### *Primary Production and Rural Development SEPP 2019*

The Rural Lands SEPP 2008 has been repealed and replaced by the Primary Production and Rural Development SEPP 2019. The aims of this new Policy are as follows:

a) *To facilitate the orderly economic use and development of lands for primary production.*
b) *To reduce land use conflict and sterilisation of rural land by balancing primary production, residential development and the protection of native vegetation, biodiversity and water resources.*
c) *To identify State significant agricultural land for the purpose of ensuring the ongoing viability of agriculture on that land, having regard to social, economic and environmental considerations.*
d) *To simplify the regulatory process for smaller-scale low risk artificial waterbodies, and routine maintenance of artificial water supply or drainage, in irrigation areas and districts, and for routine and emergency work in irrigation areas and districts.*
e) *To encourage sustainable agriculture, including sustainable aquaculture.*
f) *to require consideration of the effects of all proposed development in the State on oyster aquaculture.*
g) *To identify aquaculture that is to be treated as designated development using a well-defined and concise development assessment regime based on environment risks associated with site and operational factors.*

Specific to this proposal, it is anticipated that:

- Construction the Forest Glen Solar Farm would not be detrimental to the economic use of the land in question. Instead, the solar farm would represent a higher value land use diversification with no adverse impacts to future agricultural capacity.
- The land capability of the site would be retained, with reference to baseline soil testing prior to construction and rehabilitation commitments post decommissioning. The proposal site is not mapped as Biophysical Strategic Agricultural Land (BSAL). Post decommissioning the site may return to grazing intermittent cropping (currently oats and sheep grazing).
- For the operational life of the solar farm, the resting/shading impacts of the solar farm combined with operational management to protect groundcover would not significantly alter soil health and capability, in comparison to current agricultural activities, particularly in drought conditions.
- The small size of the site does not represent a significant proportion of the local agricultural economy and would therefore not affect harvest logistics in the locality.
- The Forest Glen SF infrastructure layout is designed to avoid impacts to native vegetation, biodiversity and waterways by avoiding high quality native habitats and riparian areas.
- The economic benefits of the proposal will exceed benefits of the returns received from current agricultural activities in terms of employment during operation, and other economic stimulus, occurring mostly during construction.

The proposal is would not impact on water supply in irrigation areas or aquaculture.

As such the proposal is considered compatible with the relevant aims of this policy.

### *State Environmental Planning Policy (Mining, Petroleum Production and Extractive Industries) 2007*

This SEPP (The Mining SEPP) is designed to provide for the proper management and development of mineral, petroleum and extractive material resources and establish appropriate planning controls to encourage ecologically sustainable development through environmental assessment and management.

In particular, the SEPP outlines land that has been classed as Biophysical Strategic Agricultural Land (BSAL).  BSAL is land with high quality soil and water resources capable of sustaining high levels of productivity.

No land mapped as BSAL would be impacted by the proposal.

### *State Environmental Planning Policy No. 33 – Hazardous and Offensive Development*

This SEPP defines and regulates the assessment and approval of potentially hazardous or offensive development. The SEPP defines 'potentially hazardous industry' as:

> *"…development for the purposes of any industry which, if the development were to operate without employing any measures (including, for example, isolation from existing or likely future development on other land) to reduce or minimise its impact in the locality or on the existing or likely future development on other land, would pose a significant risk in relation to the locality:*
>
> *a. to human health, life or property, or*
>
> *b. to the biophysical environment,*
>
> *and includes a hazardous industry and a hazardous storage establishment"*

'Potentially offensive industry' defined as:

> *…a development for the purposes of an industry which, if the development were to operate without employing any measures (including, for example, isolation from existing or likely future development on other land) to reduce or minimise its impact in the locality or on the existing or likely future*

> *development on other land, would emit a polluting discharge (including for example, noise) in a manner which would have a significant adverse impact in the locality or on the existing or likely future development on other land, and includes an offensive industry and an offensive storage establishment.*

SEPP 33 provides for systematic assessment of potentially hazardous and offensive development for the purpose of industry or storage. For development proposals classified as 'potentially hazardous industry' the policy requires a preliminary hazard analysis (PHA) to determine risks to people, property and the environment.

A checklist and a risk screening procedure developed by DPE is used to help determine whether a development is considered potentially hazardous industry (DOP, 2011). Appendix 3 of the applying SEPP 33 guidelines lists industries that may fall within SEPP 33; the lists do not include solar farms and energy storage facilities. The hazardous development status of the proposal is assessed in Section 8.9. Specifically, the proposed Battery and Energy Storage System has a capacity of approximately 25MW/25MWh and as such the SEARs have not required a PHA as part of this EIS.

### *State Environmental Planning Policy No. 55 - Remediation of Land*

SEPP No. 55 aims to promote the remediation of contaminated land for the purpose of reducing the risk of harm to human health or any other aspect of the environment.

Clause 7 of the SEPP requires that the remediation of land be considered by a consent authority in determining a development application.

A search of the NSW EPA contaminated land public record (NSW Government, 2020b) was undertaken for contaminated sites within the Dubbo LGA on 19 November 2020. Fourteen recorded sites were returned for the LGA, none occur in the vicinity of the proposal site. The online list of NSW contaminated sites notified to the EPA (NSW Government, 2020c) was also searched on 19 November 2020. There are two sites listed in Dubbo and surrounding areas, but none are in the vicinity of the proposal site.

There may be a risk of contamination associated with agricultural activities (e.g. pesticides, petrochemicals, hydrocarbon contamination) or asbestos construction or insulation materials on the proposal site. While there was no evidence of this during the site assessments, unexpected find protocols form part of the proposal.

## 5.2.2. Local Environmental Plans

The proposal site is located within the Dubbo Regional LGA. The proposal site is subject to the provisions of the *Dubbo Local Environmental Plan 2011*.

The proposed solar farm and transmission line route is located across the land zone RU1 Primary Production.

Electricity generation is prohibited within the RU1 zone, however the ISEPP allows the development for the purpose of a solar energy system on any land with consent, which overrides the local provisions. The LEP states that the consent authority must have regard to the objectives for development in a zone when determining a development application. The objectives of this zone are as follows:

a) *To encourage sustainable primary industry production by maintaining and enhancing the natural resource base.*
b) *To encourage diversity in primary industry enterprises and systems appropriate for the area.*
c) *To minimise the fragmentation and alienation of resource lands.*
d) *To minimise conflict between land uses within this zone and land uses within adjoining zones.*
e) *To enable uses of an appropriate scale to facilitate the economic sustainability of primary production.*
f) *To enable function centres, restaurants and appropriate forms of tourist and visitor accommodation to be developed in conjunction with agricultural uses.*

| Objective/s | Response |
|---|---|
| ***a)To encourage sustainable primary industry production by maintaining and enhancing the natural resource base.***<br>***e)To enable uses of an appropriate scale to facilitate the economic sustainability of primary production.*** | The proposal would harness a natural resource (solar energy) for the life of the solar farm. While activities associated with the solar farm would impact on land available for agricultural production, it would diversify the current land use to include electricity generation. Solar energy production is an established sustainable primary production method that mitigates unsustainable energy production methods such as coal fired power. |
| ***b)To encourage diversity in primary industry enterprises and systems appropriate for the area.*** | The Central-West Orana region has been identified as an area with high potential for solar energy production. The region experiences high solar exposures making land in the area highly appropriate for solar power generation. As such adding solar energy generation to Dubbo's primary industry enterprises represents a value addition to the regional economy |
| ***c)To minimise the fragmentation and alienation of resource lands.***<br>***d) To minimise conflict between land uses within this zone and land uses within adjoining zones.*** | This EIS has considered the proposal's impact on agricultural land and land use conflicts onsite and adjacent to the proposal site. Provisions have been made to avoid resource fragmentation by excluding development in within significant creek lines, native habitat and retains some area to remain in use for sheep grazing and cropping.<br>The reversibility of the proposal and limited ground disturbance would result in the availability of the land for primary production or other alternative permissible rural land use at the end of the life of the proposal (expected to be 35 years). |
| ***f) To enable function centres, restaurants and appropriate forms of tourist and visitor accommodation to be developed in conjunction with agricultural uses.*** | N/A |

### 5.2.3. Draft planning instruments

#### Proposed Infrastructure SEPP Amendments: Renewable Energy and Regional Cities

Amendments to the ISEPP were proposed by the NSW DPIE in September 2021 (DPIE, 2021). The changes were on public exhibition Explanation of Intended Effect (EIE) with the submission period closing on 11 October 2021.

The changes, if adopted, will expand the matters that must be taken into consideration in the determination of development applications for some wind and solar energy developments. The purpose of the amendments, according to the EIE published by the DPIE, is to protect land near regional cities from encroaching solar and wind developments and protect the character and visual landscape qualities of these areas.

The additional considerations will apply to wind and solar energy developments that:

1. Are located in or near Albury, Armidale, Bathurst, Dubbo, Griffith, Orange, Tamworth and Wagga Wagga;

2. Located within 10km of land zoned B3 - Commercial Core, or within 5km of any residential land zoned R1 – General Residential, or R3 – Medium Density Residential; and
3. Are 'utility-scale' ie. for the purpose of generating electricity for export to the electricity grid.

The additional considerations that will apply include:

1. Whether the development is located so as to avoid land use conflicts with existing and approved uses of land;
2. Whether the proposed development is likely to have a significant impact on, or conflict with, land that would be required to support the growth of a regional city having regard to any future growth areas identified in Regional Plans and Local Strategic Planning Statements and advice from Council; and
3. Whether the proposed development would significantly impact the scenic quality and landscape character of a regional city, including on any approaches to the city, taking into consideration any values identified by the community and Council.

The Forest Glen SF is within 5km (measured from site access off Delroy Road) of the nearest residential zone (R2 – Low Density Residential), which is located in Dubbo. Specifically, the nearest R2 zoned land is mapped 4.1km west of the proposal site. This is the distance from the site access (Delroy Road/Minore Road intersection upgrade - which would not have any visual influence). R2 zoned land is 6km from the nearest piece of solar farm infrastructure (2.1m solar array) that would have a visual affect, due to this significant distance residents of this land zone would not be impacted by the Forest Glen SF.

Addressing the criteria above:

1. Land use compatibility is investigated in Section 7.3. The proposal is compatible with the existing and adjacent land uses, predominantly agriculture.
2. The proposal site is not currently identified as land required to support the growth of a regional city, under local planning instruments. It is zoned RU1, as above is predominantly used for agriculture. Additionally the Local Strategic Planning statement (Dubbo Regional Council) does not indicate any growth corridors are planned to encroach toward the Forest Glen SF site in the next 20 years.
3. It is considered unlikely there would be any significant visual impact due to the site access being the only proposal infrastructure within the 5km, as the solar components (ie panels, battery and substation) are greater than 5km from the residential zone. This is detailed in the visual impact assessment (Section 7.1). It has considered landscape character and taken into consideration consultation undertaken for this proposal, including with the community and Council.

## 5.3. NSW Acts

### 5.3.1. Legislation to be applied

Under Section 4.42 of the EP&A Act, several authorisations cannot be refused if they are necessary for and consistent with an approved SSD, these are outlined below.

- An aquaculture permit under Section 144 of the *Fisheries Management Act 1994*.
- An approval under Section 15 of the *Mine Subsidence Compensation Act 1961*.
- A mining lease under the *Mining Act 1992*.
- A production lease under the *Petroleum (Onshore) Act 1991*.
- An environment protection licence under Chapter 3 of the *Protection of the Environment Operations Act 1997* (for any of the purposes referred to in Section 43 of that Act).
- A consent under Section 138 of the *Roads Act 1993*.
- Subdivision according to the Conveyancing Act 1919
- A licence under the *Pipelines Act 1967*.

Only the highlighted acts are relevant to the proposal, these are discussed below.

### *Roads Act 1993*

The *Roads Act 1993* (Roads Act) is administered by Transport for NSW, local councils or the Department of Industry - Land. Transport for NSW has jurisdiction for classified roads, local councils for non-classified roads and the Department of Industry - Land for road reserves or Crown roads.

The Roads Act regulates the carrying out of various activities in, on and over public roads. Under Section 138, the consent of the appropriate road's authority is required to:

- *(a) erect a structure or carry out a work in, on or over a public road*
- *(b) dig up or disturb the surface of a public road*
- *(c) remove or interfere with a structure, work or tree on a public road*
- *(d) pump water into a public road from any land adjoining the road*
- *(e) connect a road (whether public or private) to a classified road.*

The proposal includes one site access for its operation and construction as discussed in Section 4.3.6. Consent would be required from Dubbo Regional Council and Department of Industry for Crown Roads for the use of Delroy Road. Consultation has commenced and is summarised in Section 6.1.

### *Conveyancing Act 1919*

The purpose of the Conveyancing Act 1919 is to amend and consolidate the law of property and to simplify and improve the practice of conveyancing, and for such purposes to amend certain Acts relating thereto.

When land is leased from a landowner and the lease affects part of a lot or lots in a current plan, a subdivision under section 7A of the Conveyancing Act 1919 is required when the total of the original term of the lease, together with any option of renewal, is more than five years.

The proposal would require subdivision and consolidation of the existing lots, as described in Section 4.2.

## 5.3.2. Approvals that do not apply

Under Section 4.41 of the EP&A Act, SSD developments do not require the following authorisations:

- *(a) concurrence under Part 3 of the Coastal Protection Act 1979.*
- *(b) a permit under Section 201, 205 or 219 of the Fisheries Management Act 1994.*
- *(c) an approval under Part 4, or an excavation permit under Section 139, of the Heritage Act 1977.*
- *(d) an Aboriginal heritage impact permit under Section 90 of the National Parks and Wildlife Act 1974.*
- *(e) an authorisation referred to in Section 12 of the Native Vegetation Act 2003 to clear native vegetation or state protected land.*
- *(f) a bush fire safety authority under Section 100B of the Rural Fires Act 1997*.
- *(g) a water use approval under Section 89, a water management work approval under Section 90 or an activity approval (other than an aquifer interference approval) under Section 91 of the Water Management Act 2000.*

Even though the proposal doesn't require these authorisations, the potential impact of the proposal on these items such as heritage, waterways and native vegetation are assessed in this EIS and identified impacts will be managed within an environmental management planning framework. Refer to Section 9.1.

### 5.3.3. Other relevant State legislation

#### _Biodiversity Conservation Act 2016_

The _Biodiversity Conservation Act 2016_ (BC Act) establishes a new regulatory framework for assessing and offsetting the biodiversity impacts of proposed developments and activities. The Act contains provisions relating to flora and fauna protection (repealing parts of the _National Parks and Wildlife Act 1974_), threatened species and ecological communities listing and assessment (repealing the _Threatened Species Conservation Act 1995_ and section 5A of the EP&A Act), a biodiversity offsets scheme (BOS), a single biodiversity assessment method (BAM), calculation and retirement of biodiversity credits and biodiversity assessment and planning approvals.

The Act is supported by the Biodiversity Conservation Regulation 2017. This act has been considered in the preparation of this EIS and in the provision of a BDAR. Refer to Section 7.5.

#### _Biosecurity Act 2015_

The _Biosecurity Act 2015_ repealed the _Noxious Weeds Act 1993_ and provides a framework for the prevention, elimination and minimisation of biosecurity risks. The Act and supporting Biosecurity Regulation 2017 provide for the establishment and functions of Local Control Authorities for weeds (LGA or County Councils), and weed control obligations on public and private land.

The EIS provides for the control of priority weeds occurring at the proposal site as part of the proposed works (refer Section 7.5).

#### _Mining Act 1992_

The main objective of the _Mining Act 1992_ is to encourage and facilitate the discovery and development of mineral resources in NSW, having regard to the need to encourage ecologically sustainable development.

A search of the Department of Planning, Industry and Environment MinView on 15 July 2020 identified a mineral exploration licence (EL8961) over the proposal site. The license is held by Sunrise Energy Metals Ltd covering the entire site and expires on 6 April 2023.

X-Elio have consulted with the authority holders and the details and outcomes of the consultation are provided in Section 6. There is a potential to impact exploration activities. However, there is unlikely to be a significant impact on the exploration of mineral resources, which could be explored at the end of the proposal's life if this becomes a preferred land use option at this later stage.

#### _Crown Lands Management Act 2016_

The objective of the Crown Lands Management Act is to ensure that Crown land is managed for the benefit of the people of NSW. The Crown Lands Division, DPIE is responsible for the sustainable and commercial management of Crown Land.

There is no Crown Land in the form of paper roads associated with the proposal site. However, the site access, Delroy Road has been identified as a Crown Road and managed by Dubbo Regional Council.

This would require consultation with DPIE – Crown Lands. Consultation has commenced and is summarised in Section 6.1.

#### _Waste Avoidance and Resource Recovery Act 2001_

Waste management during the proposed works would be undertaken in accordance with the _Waste Avoidance and Resource Recovery Act 2001_ (WARR Act). Waste minimisation and management is addressed in Section 8.4 of the EIS.

## 5.4. Commonwealth Acts

### 5.4.1. *Environment Protection and Biodiversity Conservation Act 1999*

The EPBC Act provides an assessment and approval process for actions likely to cause a significant impact on Matters of National Environmental Significance (MNES). The nine MNES are:

- World Heritage properties.
- National Heritage places.
- Wetlands of international importance (listed under the Ramsar Convention).
- Listed threatened species and ecological communities.
- Migratory species protected under international agreements.
- Nuclear actions (including uranium mines).
- Commonwealth marine areas.
- The Great Barrier Reef Marine Park.
- A water resource, in relation to coal seam gas development and large coal mining development.

Approval by the Commonwealth Environment Minister is required if an action is likely to have a significant impact on MNES. Assessments of significance based on criteria listed in Significant Impact Guidelines 1.1 issued by the Commonwealth (Commonwealth of Australia, 2013) are used to determine whether the proposed action is likely to have a significant impact (i.e. is likely to be considered a ‘controlled action’).

A search of the Commonwealth Protected Matters Search Tool (coordinate search, undertaken on 19 November 2020 indicates that there is no World Heritage or National Heritage areas or items (Gondwana Rainforests of Australia) within 10km of the proposal site. One area of State and Territory reserve was identified in the search, this area relates to Sappa Bulga National Park which is located 2.9km south east of the proposal site. One area of Commonwealth land was identified, and no Commonwealth heritage places were identified. The area of Commonwealth land identified in the Commonwealth Protected Matters Search was the Commonwealth Trading Bank of Australia, which is not within 10km of the proposal site, and is located in the Sydney Central Business District, as such impacts to this area of Commonwealth land has not been considered in this EIS.

A summary of the updated EPBC Act search report is provided in Table 5-1. The full search report and threatened species habitat evaluation is provided in the Biodiversity Development Assessment Report (Appendix D).

No adverse impacts to MNES are anticipated due to the proposal. Specifically, no EPBC listed Threatened Ecological Communities occur and no significant impacts would result to any EPBC listed entity that may occur (none were identified during field surveys). Weed management mitigation is a commitment of the proposal and would address all EPBC listed invasive species.

Table 5-1 Summary of EPBC Act Protected Matters Report search results

| Protected Matter | Entities within the 10km search area |
|---|---|
| **World Heritage Properties** | 0 |
| **National Heritage** | 0 |
| **Wetlands of International Importance (Ramsar)** | 0 |
| **Threatened Ecological Communities** | 6 |
| **Threatened Species** | 29 |

| Protected Matter | Entities within the 10km search area |
|---|---|
| **Migratory Species** | 9 |
| **Listed Marine Species** | 0 |
| **Commonwealth land** | 1 |
| **Commonwealth Heritage places** | 0 |
| **Critical habitats** | 0 |
| **Commonwealth reserves (terrestrial)** | 0 |
| **State and Territory reserves** | 1 |
| **Regional Forest Agreements** | 0 |
| **Invasive species** | 27 |
| **Nationally Important Wetlands** | 0 |

### 5.4.2. *Native Title Act 1993*

The *Native Title Act 1993* provides a legislative framework for the recognition and protection of common law native title rights. Native title is the recognition by Australian law that Indigenous people had a system of law and ownership of their lands before European settlement. Where that traditional connection to land and waters has been maintained and where government acts have not removed it, the law recognises the persistence of native title.

People who hold native title have a right to continue to practice their law and customs over traditional lands and waters while respecting other Australian laws. This could include visiting to protect important places, making decisions about the future use of the land or waters, and hunting, gathering and collecting bush medicines. Further, when a native title claimant application is registered by the National Native Title Tribunal, the people seeking native title recognition gain a right to consult or negotiate with anyone who wants to undertake a proposal on the area claimed.

Native title may exist in areas such as:

- Vacant Crown Land.
- Some national parks, forests and public reserves.
- Some types of pastoral leases.
- Some land held for Aboriginal communities.
- Beaches, oceans, seas, reefs, lakes, rivers, creeks, swamps and other waters that are not privately owned.

A search of the National Native Title Tribunal Registers on 19 November 2020 found no Native Title Claims for the proposal site.

### 5.4.3. *Renewable Energy (Electricity) Act 2000*

The *Renewable Energy (Electricity) Act 2000* (RE Act) aims to:

- Encourage the additional generation of electricity from renewable sources.
- Reduce emissions of greenhouse gases in the electricity sector.

- Ensure that renewable energy sources are ecologically sustainable.

Section 17 of the RE Act defines renewable energy sources eligible under the Commonwealth Government's RET. This includes solar energy.

Certificates for the generation of electricity are issued using eligible renewable energy sources. This requires purchasers (called liable entities) to surrender a specified number of certificates for the electricity that they acquire. In January 2011, renewable energy certificates were reclassified as either large-scale generation certificates or a small-scale technology certificates following changes to the RET scheme.

The Forest Glen SF would need to be accredited as a Renewable Energy Generator to create Renewable Energy Certificates.

## 5.5. Other relevant policies and matters

### 5.5.1. Matters of consideration

Under Section 4.15 of the EP&A Act, the consent authority is required to consider a number of matters when determining a development application under Part 4. These matters are listed in Table 5-2 and assessed in terms of their relevance to the proposal.

Table 5-2 Matters of consideration

| Provision | Relevance to the proposal |
|---|---|
| **Any environmental planning instrument;** | Relevant environmental planning instruments (EPIs) are discussed in Section 5.2.1. They include:<br>• _State Environmental Planning Policy (State and Regional Development) 2011._<br>• _State Environmental Planning Policy (Infrastructure) 2007._<br>• _State Environmental Planning Policy (Primary Production and Rural Development) 2019_<br>• _State Environmental Planning Policy No. 55 - Remediation of Land._<br>• _Dubbo Local Environmental Plan 2011._ |
| **Any proposed instrument that is or has been the subject of public consultation under the EP&A Act and that has been notified to the consent authority;** | There are no draft instruments relevant to the proposal. |
| **Any development control plan;** | Clause 11 of the SRD SEPP provides that development control plans do not apply to SSD. |
| **Any planning agreement that has been entered into under section 7.4, or any draft planning agreement that a developer has offered to enter into under section 7.4;** | There are no planning agreements that have been entered into, nor are any planning agreements proposed, that relate to the proposal. |
| **The regulations (to the extent that they** | Clause 92 of the EP&A Regulation requires consideration of: |

| Provision | Relevance to the proposal |
|---|---|
| **prescribe matters for consideration);** | • The Government Coastal Policy, for development applications in certain local government areas.<br>• The provisions of AS 2601 for development applications involving the demolition of structures.<br>• The provisions of a subdivision order and any development plan for development of land that is subject to a subdivision order.<br>• The provision of development under the *Dark Sky Planning Guideline.*<br>The Forest Glen SF is located on land that is under the provisions of the *Dark Sky Planning Guideline.* The Dark Sky Region Guidelines have been prepared to ensure the night sky is free of light pollution and increased levels of atmospheric dust which may impact on Sliding Spring Observatory located in the Warrumbungle National Park near Coonabarabran, NSW. The guideline is addressed in the visual impact assessment Section 7.1. The proposal does not involve any other types of development and therefore the other provisions provided by the EP&A Regulation are not relevant to the proposal. |
| **The likely impacts of that development, including environmental impacts on both the natural and built environments, and social and economic impacts in the locality;** | The likely impacts of the proposal, including environmental impacts on both the natural and built environments, and the social and economic impacts in the locality, are detailed in Section 7.4 and Section 7.3 of this EIS.<br>This EIS demonstrates that the environmental impacts of the proposal have to the extent, reasonably and feasibly possible, been avoided or minimised through careful proposal design and through the implementation of mitigation measures provided within this EIS. |
| **The suitability of the site for the development;** | As discussed in Section 3.2 various options were considered when selecting an appropriate site for the proposal. The proposal site has a number of characteristics that make it suitable for the development of a solar farm. Most notably, its location is within close vicinity to an existing transmission line and electricity substation with good connection capacity.<br>Other characteristics include:<br>• Excellent solar exposure.<br>• Excellent access to local and major roads.<br>• A low number of non-involved dwellings.<br>Further, the Forest Glen SF is largely reversible; at the end of the life of the solar farm, all above ground infrastructure would potentially be removed and agricultural land use activities could resume. |
| **Any submissions made in accordance with this Act or the regulations; and** | X-Elio would consider and, as necessary, respond constructively to any submission made in relation to the Forest Glen SF. |

| Provision | Relevance to the proposal |
|---|---|
| **The public interest** | The Forest Glen SF is in the public interest for several reasons. Section 3.5 outlines the local benefits to regional communities, which include:<br>• It would provide direct and indirect employment opportunities during the construction and operating phases of the project. As well injection of expenditure in the local area.<br>• The proposal would be a new land use thereby diversifying the local land use within the region, providing a drought resilient revenue stream for the agricultural economy.<br>Several additional benefits assist the public indirectly. As the farm would produce up to 110MW DC (90MW AC equivalent), on an annual basis, the proposed Forest Glen Solar Farm would provide enough clean, renewable energy for about 40,000 average NSW homes while displacing approximately 164,000 metric tonnes of carbon dioxide per annum. Thereby, the project would:<br>• Contribute to helping Australia in meeting the Renewable Energy Target.<br>• Reduce greenhouse gas emissions required to meet Australia's international climate conditions.<br>• Assist in the transition towards cleaner electricity generation. |

## 5.5.2. Ecologically sustainable development

Ecologically Sustainable Development (ESD) involves the effective integration of social, economic and environmental considerations in decision-making processes. In NSW, the concept has been incorporated into legislation including the *Environmental Planning and Assessment Act 1979* and Regulation and the *Protection of the Environment Administration Act 1991*.

Based on the likely costs and benefits of the proposed solar farm, the proposal is considered to comply with the principles of Ecologically Sustainable Development. ESD principles and their relationship to the design, construction and ongoing operations of the proposal are identified below.

Table 5-3 Assessment of the proposal against the principles of Ecologically Sustainable Development.

| |
|---|
| *(a)* ***The precautionary principle—namely, that if there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation. In the application of the precautionary principle, public and private decisions should be guided by:***<br>***(i) careful evaluation to avoid, wherever practicable, serious or irreversible damage to the environment, and***<br>***(ii) an assessment of the risk-weighted consequences of various options.*** |
| The precautionary principle has been adopted in the assessment of impact; all potential impacts have been considered and mitigated where a risk is present. Where uncertainty exists, measures have been included |

| |
|---|
| to address the uncertainty. A 'worst case' impact assessment has been undertaken to account for the uncertainty in the final impact footprint. |
| ***(b) inter-generational equity—namely, that the present generation should ensure that the health, diversity and productivity of the environment are maintained or enhanced for the benefit of future generations.*** |
| Potential impacts of the Forest Glen SF are likely to be localised and would not diminish the options regarding land and resource uses and nature conservation available to future generations. Importantly, the Forest Glen Solar Farm would provide renewable energy that contributes to minimising the risk of climate change to current and future generations by reducing carbon emissions intensity of electricity generation.<br>The Forest Glen Solar Farm would potentially be decommissioned at the end of its operational life, removing all above ground infrastructure with the exception of the onsite substation. Decommissioning would therefore result in returning the site to its existing land capability for future generations. |
| ***(c) conservation of biological diversity and ecological integrity— namely, that conservation of biological diversity and ecological integrity should be a fundamental consideration.*** |
| The impacts of the Forest Glen SF on biodiversity, including EPBC listed species, have been assessed in detail in the Biodiversity Assessment in Appendix D and are summarised in Section 7.5. This has included avoidance of areas of higher conservation value and management prescriptions to minimise and manage residual impacts. |
| ***(d) improved valuation, pricing and incentive mechanisms— namely, that environmental factors should be included in the valuation of assets and services, such as:***<br>***(i) polluter pays—that is, those who generate pollution and waste should bear the cost of containment, avoidance or abatement, and***<br>***(ii) the users of goods and services should pay prices based on the full life cycle of costs of providing goods and services, including the use of natural resources and assets and the ultimate disposal of any waste, and***<br>***(iii) environmental goals, having been established, should be pursued in the most cost effective way, by establishing incentive structures, including market mechanisms, that enable those best placed to maximise benefits or minimise costs to develop their own solutions and responses to environmental problems.*** |
| Attributes of the proposal site such as the existing native vegetation, land capability, soil and hydrology have been valued in terms of their broader contribution to the catchment and catchment processes. Pollution risks have been assessed and would place any cost of remediation solely upon the proponent. |

### 5.5.3. NSW Large-scale Solar Energy Guideline for State Significant Development 2018

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

The objectives of the guideline are to:

a) *Provide guidance to the community, applicants, industry and regulators on how DPIE assesses environmental, social and economic impacts of state significant solar energy projects.*
b) *Encourage industry to select suitable sites for projects to reduce the likelihood and extent of land use conflicts and environmental and social impacts.*
c) *Facilitate better on-ground outcomes by promoting early identification of potential impacts.*
d) *Promote meaningful, respectful and effective community and stakeholder engagement.*

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

| Objective/s | Response |
|---|---|
| ***a) Provide guidance to the community, applicants, industry and regulators on how DPIE assesses environmental, social and economic impacts of state significant solar energy projects.*** | The proposal has been identified as a State Significant Development. This requires the proposal to gain approval by providing evidence that compliance with DPIE standards can be met. This includes provisions for environmental, social and economic impacts (covered in detail in Section 7 and Section 8). |
| ***b) Encourage industry to select suitable sites for projects to reduce the likelihood and extent of land use conflicts and environmental and social impacts.*** | Suitable site selection is set out in Section 3.2 and addresses the Large-Scale Solar Energy Guideline for State Significant Development (DPIE, 2018). In summary the site selected for the development of the Forest Glen SF, is suitable for solar installation due to be following favourable conditions:<br>• Optimal Solar Resources<br>• Suitable existing land condition<br>• High potential for site rehabilitation<br>• Community support<br>• Grid network connection<br>• Connection capacity. |
| ***c) Facilitate better on-ground outcomes by promoting early identification of potential impacts.*** | Early identification of potential impacts were considered as part of the Scoping Report for the Forest Glen SF (NGH, 2019). The scoping report included a constraints map to guide the proponents Development footprint and indicative infrastructure layout. The scoping report assessed the major potential impacts of the proposal prior to the issuing of the DPIE's solar farm potential impact specific SEARs. This EIS provides the full analysis of the proposal's environmental impacts and sets out specific mitigation strategies (including aspects of the project which have been altered to avoid and minimise impacts). |
| ***d) Promote meaningful, respectful and effective community and stakeholder engagement.*** | The proponent has a dedicated team that engages in community and stakeholder engagement. The NSW Large-scale Solar Energy Guideline requirements ensure that all relevant community groups, government agency stakeholders and other interested parties such as mineral title holders are aware and involved in the design and development of the proposal prior to its on ground development. To date the proponent has undertaken consultation with agencies, mineral title holders, the local aboriginal community and engaged with community stakeholders including residents surrounding the proposal site. Consultation completed to date is discussed further in Section 6. |
| ***e) Support the development of a sustainable solar industry*** | Development of large-scale solar farm projects provide an opportunity to contribute directly to the NSW goal of net-zero |

| Objective/s | Response |
|---|---|
| ***in NSW by providing a clear, consistent and responsive policy framework.*** | emissions by 2020. For this the NSW government has developed a Climate Change Policy Framework to be followed as the state adopts sustainable solar energy (NSW Government, 2016a). Policy and framework requirements are addressed throughout Section 5.<br>The proposal has addressed the requirements of the guidelines through the assessment of environmental impacts (Sections 7 and 7.5), site suitability (Section 3.2), community and agency consultation (Section 6) and policy and framework requirements (Section 5). |

## 5.6. Approvals and Licences

Table 5-4 Summary of licences and approvals required for the proposal.

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

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

# 6. Consultation

## 6.1. Agency consultation

### 6.1.1. Secretary's Environmental Assessment Requirements (SEARs)

As the proposal is classified as SSD, a Scoping Report (NGH, 2020) was prepared, and SEARs were requested. These were provided by X-Elio Australia Pty Ltd on 30 October 2020 (Appendix A). The SEARs are intended to guide the structure and content of this EIS and reflect the responsibilities and concerns of NSW government agencies in relation to the environmental assessment of the proposal.

The following sections provide a summary of the SEARs from the various agencies and cross reference where specific issues are addressed within this EIS.

Table 6-1 SEAR's and section they are addressed in this EIS

| Issue summary | Addressed in this EIS |
|---|---|
| **The Environmental Impact Statement (EIS) for the development must comply with the requirements in Schedule 2 of the Environmental Planning and Assessment Regulation 2000. The EIS must include the following:** | |
| • a stand-alone executive summary | An executive summary is provided at the beginning of this EIS. |
| • a full description of the development, including:<br>• details of construction, operation and decommissioning;<br>• a site plan showing all infrastructure and facilities (including any infrastructure that would be required for the development, but the subject of separate approvals process);<br>• a detailed constraints map identifying the key environmental and other land use constraints that have informed the final design of the development. | The proposal is fully described in Section 4 including details of construction, operation and decommissioning.<br>A site plan is included as Figure 1-10. No infrastructure within this plan is part of a separate approvals process.<br>A detailed constraints map updated throughout the assessment process and used to inform the design is provided as Figure 1-11. |
| • a strategic justification of the development focusing on site selection and the suitability of the proposal site with respect to potential land use conflicts with existing and future surrounding land uses (including other proposed or approved solar farms, rural residential development and subdivision potential). | A strategic justification for the proposal is outlined in Section 3.5 including site selection and suitability of the proposal site.<br>Section 7.3 addresses the proposal sites potential land use conflicts with existing and future surrounding land uses. |
| • an assessment of the likely impacts of the development on the environment, focusing on the specific issues identified below, including: | Detailed information regarding environmental legislation relevant to the proposal is included in Section 5. |

| Issue summary | Addressed in this EIS |
|---|---|
| ○ a description of the existing environment likely to be affected by the development;<br>○ an assessment of the likely impacts of all stages of the development, (which is commensurate with the level of impact), including any cumulative impacts of the site and existing, approved or proposed developments in the region and impacts on the site and any road upgrades, taking into consideration any relevant legislation, environmental planning instruments, guidelines, policies, plans and industry codes of practice;<br>○ a description of the measures that would be implemented to avoid, mitigate and/or offset the impacts of the development (including draft management plans for specific issues as identified below); and<br>○ a description of the measures that would be implemented to monitor and report on the environmental performance of the development; | Commensurate with the level of risk, detailed assessment, existing environment, mitigation and monitoring are included in Section 7 and Section 7.5. |
| • a consolidated summary of all the proposed environmental management and monitoring measures, identifying all the commitments in the EIS; | A consolidated set of mitigation measures is included in Section 9.2. These commitments form part of the proposal. |
| • the reasons why the development should be approved having regard to:<br>○ relevant matters for consideration under the *Environmental Planning and Assessment Act 1979*, including the objects of the Act and how the principles of ecologically sustainable development have been incorporated in the design, construction and ongoing operations of the development;<br>○ the suitability of the site with respect to potential land use conflicts with existing and future surrounding land uses; and<br>○ feasible alternatives to the development (and its key components), including the consequences of not carrying out the development. | Key matters under the EP&A Act and ESD principles are addressed in Section 5.5.<br>A summary of feasible alternatives and why the proposal should be approved is included in Section 3.<br>A summary of suitability of the proposal with respect the potential land use conflicts and surrounding land use is included in Alternative site locations Section 3.2 and Compatibility with existing land uses Section 7.3. |

| Issue summary | Addressed in this EIS |
|---|---|
| • A detailed consideration of the capability of the project to contribute to the security and reliability of the electricity system in the National Electricity Market, having regard to local system conditions and the Department's guidance on the matter. | Consideration of the proposal's capability to contribute to the National Electricity Market is addressed in Section 2.2.3. |
| • The EIS must also be accompanied by a report from a suitably qualified person providing:<br>○ a detailed calculation of the capital investment value (CIV) (as defined in clause 3 of the Regulation) of the proposal, including details of all assumptions and components from which the CIV calculation is derived<br>○ certification that the information provided is accurate at the date of preparation. | The Capital Investment Report has been provided separately to DPIE. Refer to Section 4.7 for the estimated value.<br><br>Certification by the authors precedes the Executive Summary, following the cover page |
| • The development application must be accompanied by the consent in writing of the owner/s of the land (as required in clause 49(1)(b) of the Regulation). | Landowners consent has been provided separately to DPIE. |
| **The EIS must address the following specific issues:** | |
| • **Biodiversity** – including:<br>• an assessment of the biodiversity values and the likely biodiversity impacts of the project in accordance with Section 7.9 of the *Biodiversity Conservation Act 2016* (NSW), the Biodiversity Assessment Method (BAM) and documented in a Biodiversity Development Assessment Report (BDAR), unless OEH and DPE determine that the proposed development is not likely to have any significant impacts on biodiversity values;<br>• the BDAR must document the application of the avoid, minimise and offset framework including assessing all direct, indirect and prescribed impacts in accordance with the BAM.<br>• If an offset obligation is required, details of the measures proposed to address the offset obligation | A Biodiversity Development Assessment Report (BDAR) has been completed and is summarised in Section 7.5. The BDAR is provided in full in Appendix D. The credit calculations will be submitted concurrent with the acceptance of the EIS for public exhibition. |
| • **Heritage** – including an assessment of the likely Aboriginal and historic heritage (cultural and archaeological) impacts of the development, including consultation with the | An Aboriginal Cultural Heritage report (ACHA) has been completed and is summarised in Section 8.5 The ACHA is provided in full in Appendix G. |

| Issue summary | Addressed in this EIS |
|---|---|
| local Aboriginal community in accordance with the *Aboriginal Cultural Heritage Consultation Requirements for Proponents*; | Consultation undertaken as part of the ACHA is included in Section 6.3.<br>Historic heritage is addressed in Section 8.6. |
| • **Land** – including:<br>• an assessment of the potential impacts of the development on existing land uses on the site and adjacent land, including:<br>▪ a consideration of agricultural land, flood prone land, Crown lands (including Delroy Road), mining, quarries, mineral or petroleum rights, (including mineral exploration rights licence EL 8961)<br>▪ a soil survey to determine the soil characteristics and consider the potential for erosion to occur; and<br>▪ a cumulative impact assessment of nearby developments;<br>• an assessment of the compatibility of the development with existing land uses, during construction, operation and after decommissioning, including:<br>▪ consideration of the zoning provisions applying to the land, including subdivision, and;<br>▪ completion of a Land Use Conflict Risk Assessment in accordance with the Department of *Industry's Land Use Conflict Risk Assessment Guide*; | An assessment of agricultural land impacts is included in Section 7.3.<br>An assessment on the impact of flood prone land is included in Section 8.2.<br>An assessment of the impacts on Crown Lands has been included in Section 7.3.<br>An assessment of the potential for erosion to occur is included in Section 8.1 and a soil survey is committed to prior to construction to inform remediation of impacts from construction, operation and decommissioning.<br>Cumulative impacts are considered in Section 8.11.<br>Consideration of the zoning provisions including subdivision is provided in Section 5.2.2. A subdivision is required for the substation to be operated by essential energy onsite and lease requirements with the current landowner.<br>A Land Use Conflict Risk Assessment is included in Section 7.3.<br>Land remediation following decommissioning is addressed in Section 5.2.1 and Section 7.3. |
| • **Visual –** including a detailed assessment of the likely visual impacts (including any glare, reflectivity and night lighting) of all components of the project (including arrays, transmission lines, substations and any other ancillary infrastructure) on surrounding residences and key locations, scenic or significant vistas, air traffic and road corridors in the public domain and adjacent areas of large lot residential and rural landscape land zoning (including a draft landscaping plan for on-site perimeter planting, with evidence it has been developed in consultation with affected landowners); | An assessment of visual impact has been included in Section 7.1 and Appendix E.<br>A draft landscaping plan has not been proposed based on the findings of the visual impact assessment. Onsite vegetation planting to screen visual impacts is not considered to be required and does not form part of the proposal. Consultation with affect landowners is summarised in Section 6.4. |
| • **Noise –** including an assessment of the construction noise impacts of the development in accordance with the Interim *Construction Noise Guideline* (ICNG), operational noise | A Construction and Operational Noise and Vibration assessment has been completed in Section 7.2. A draft noise management plan has been provided in Appendix H. |

| Issue summary | Addressed in this EIS |
|---|---|
| impacts in accordance with the *NSW Noise Policy for Industry 2017* and a draft noise management plan if the assessment shows construction noise is likely to exceed applicable criteria; | |
| • **Transport** – including:<br>• an assessment of the construction, operational and decommissioning traffic impacts of the development<br>• an assessment of the peak and average traffic generation, including over-dimensional vehicles and construction worker transportation<br>• an assessment of the likely transport impacts to the site access route (including Mitchell Highway, Newell Highway, Minore Road, Delroy Road and the adjacent Main Western Line rail corridor), site access point, any Crown land, particularly in relation to the capacity and condition of the roads, road safety and intersection performance and impacts to the rail corridor<br>• a cumulative impact assessment of traffic from nearby developments<br>• provide details of measures to mitigate and / or manage potential impacts including a schedule of all required road upgrades (including resulting from heavy vehicle and over mass / over dimensional traffic haulage routes), road maintenance contributions, and any other traffic control measures, developed in consultation with the relevant road and rail authorities | A Traffic Impact Assessment (TIA) was completed and is summarised in Section 7.6. The full TIA is provided as Appendix I.<br>Proposed intersection upgrades and access road upgrades are outlined in Section 7.6.3. |
| • **Water** – including:<br>• an assessment of the likely impacts of the development (including flooding) on surface water and groundwater resources (including Whylandra Creek, Macquarie River and other watercourses traversing or surrounding the site, drainage channels, wetlands, riparian land, farm dams, key fish habitat, groundwater dependent ecosystems and acid sulfate soils), related infrastructure, adjacent licensed water users and basic landholder rights, and measures proposed to monitor, reduce and mitigate these impacts | An assessment if water impacts is provided in Section 8.2 and Section 8.3.<br>Details of water requirements and supply are detailed in Section 8.3.<br>A description of erosion and sediment control measures are provided in Section 8.3.3. |

| Issue summary | Addressed in this EIS |
|---|---|
| • details of water requirements and supply arrangements for construction and operation; and<br>• a description of the erosion and sediment control measures that would be implemented to mitigate any impacts in accordance with *Managing Urban Stormwater: Soils & Construction* (Landcom 2004); | |
| • **Hazards** including:<br>• potential hazards and risks of the development<br>• bushfire risks of the development against the RFS Planning for Bushfire Protection 2019; and<br>• the proposed transmission line and substation against the International Commission on Non-Ionizing Radiation Protection (ICNIRP) Guidelines for limiting exposure to Time-Varying Electric, Magnetic and Electromagnetic Fields | A preliminary risk screening is provided in Section 8.9.<br>An assessment of potential hazards is included in Section 8.9.<br>An assessment of bush fire risks is included in Section 8.4<br>An assessment of electric and magnetic fields is included in Section 8.8. |
| • **Socio-Economic** – including an assessment of the likely impacts on the local community and a consideration of the construction workforce accommodation; | An assessment on potential socio-economic impacts of the proposal is included in Section 7.4. |
| • **Waste** - identify, quantify and classify the likely waste stream to be generated during construction and operation, and describe the measures to be implemented to manage, reuse, recycle and safely dispose of this waste. | An assessment on potential waste impacts of the proposal is included in Section 8.7. |
| **Legislation, Policies & Guidelines** | |
| • A list of some of the legislation, policies and guidelines that may be relevant to the assessment of the project can be found at:<br>• https://www.planningportal.nsw.gov.au/major-projects/assessment/policies-and-guidelines; and<br>• http://www.environment.gov.au/epbc/publications#assessments | Legislation, policies and guidelines are considered as part of the Solar Farm's Planning context in Section 5. |
| **The EIS consultation process includes:** | |
| During the preparation of the EIS, you should consult with relevant local, State or Commonwealth | Consultation is summarised in Section 6. |

| Issue summary | Addressed in this EIS |
|---|---|
| Government authorities, infrastructure and service providers, community groups, affected landowners and any exploration licence and/or mineral title holders.<br><br>In particular, you must undertake detailed consultation with affected landowners surrounding the development and Dubbo Regional Council.<br><br>The EIS must describe the consultation process and the issues raised and identify where the design of the development has been amended in response to these issues. Where amendments have not been made to address an issue, a short explanation should be provided. | Issues raised during consultation and how they are addressed in this EIS are included in Section 6.<br><br>A community consultation plan is included in Appendix C. |
| • If you do not lodge a development application and EIS for the development within 2 years of the issue date of these SEARs, you must consult further with the Secretary in relation to the preparation of the EIS. | The EIS has been lodged within this timeframe. |

### 6.1.2. Relevant guidelines

Table 6-2 Guidelines and section they are addressed in this EIS

| Guideline | How the guideline has been addressed? |
|---|---|
| **Biodiversity** | |
| Biodiversity Assessment Method (OEH) | Biodiversity Assessment, Section 7.5 and Appendix D. |
| Threatened Species Assessment Guidelines - Assessment of Significance (OEH) | |
| *Biosecurity Act 2015* | |
| Why Do Fish Need to Cross the Road? Fish Passage Requirements for Waterway Crossings (DPI) | Water assessment and mitigation measures, Section 8.2.4 and Section 8.3.3. |
| Policy and Guidelines for Fish Habitat Conservation and Management (DPI) | |
| **Heritage** | |
| Aboriginal Cultural Heritage Consultation Requirements for Proponents (OEH) | Heritage assessment, Section 8.5, Section 8.6, and Appendix G. |

| Guideline | How the guideline has been addressed? |
|---|---|
| Code of Practice for Archaeological Investigations of Objects in NSW (OEH) | |
| Guide to investigating, assessing and reporting on aboriginal cultural heritage in NSW (OEH). | |
| NSW Heritage Manual (OEH) | |
| **Land** | |
| Primefact 1063: Infrastructure proposals on rural land (DoI – L&W) | Land use, Section 7.3. |
| Establishing the social licence to operate large scale solar facilities in Australia: insights from social research for industry (ARENA) | Social and economic impacts, Section 7.4 |
| *Local Land Services Act 2013* | Biodiversity assessment, Section 7.5 and Appendix D. |
| Australian Soil and Land Survey Handbook (CSIRO) | Land and soil assessment Section 8.1<br>Land use, Section 7.3. |
| Guidelines for Surveying Soil and Land Resources (CSIRO) | |
| The land and soil capability assessment scheme: second approximation (OEH) | |
| Land Use Conflict Risk Assessment Guide (DoI – L&W) | Land use, Section 7.3. |
| **Noise** | |
| NSW Noise Policy for Industry (EPA) | Construction and Operational Noise and Vibration assessment, Section 7.2 and draft noise management plan in Appendix H. |
| Interim Construction Noise Guideline (EPA) | |
| NSW Road Noise Policy (EPA) | |
| **Light** | |
| Dark Sky Planning Guideline: Protecting the observing conditions at Siding Spring (DPE) | The Proposal is within the Dark Sky Planning Guideline Region Section 7.1. |
| **Transport** | |

| Guideline | How the guideline has been addressed? |
|---|---|
| Guide to Traffic Generating Developments (RTA) | Proposal description, Section 4<br>Traffic assessment, Section 7.6 and Appendix I. |
| Austroads Guide to Road Design & relevant Australian Standards | |
| Austroads Guide to Traffic Management | |
| **Water** | |
| Managing Urban Stormwater: Soils & Construction (Landcom) | Land and soil assessment Section 8.1<br>Land use, Section 7.3<br>Water assessment and mitigation measures, Section 8.2.4 and Section 8.3.3. |
| Floodplain Development Manual (OEH) | Proposal description, Section 4<br>Water and flooding assessment and Section 8.2 and Section 8.3. |
| Guidelines for Controlled Activities on Waterfront Land (DPI Water) | |
| Water Sharing Plans (DPI Water) | |
| Floodplain Management Plan (DPI Water) | |
| Guidelines for developments adjoining land and water managed by OEH (OEH) | |
| Guidelines for Watercourse Crossings on Waterfront Land (DPI Water) | |
| **Hazards and Risks** | |
| Hazardous Industry Planning Advisory Paper No. 6 – Guidelines for Hazard Analysis (DPE) | Hazard assessment, Section 8.9. |
| Multi-Level Risk Assessment (DPE) | |
| State Environmental Planning Policy No. 33 – Hazardous and Offensive Development and Applying SEPP 33 (DoP, 2011) | |
| **Waste** | |
| Waste Classification Guidelines (EPA) | Resource use and waste generation, Section 8.7. |
| **Electric and Magnetic Interference** | |

| Guideline | How the guideline has been addressed? |
|---|---|
| ICNIRP Guidelines for limiting exposure to Time-varying Electric, Magnetic and Electromagnetic Fields | Electric and magnetic fields, Section 8.8. |

### 6.1.3. Agencies consultation

During the preparation of this EIS, a number of agencies have been consulted with in regard to the Forest Glen SF to ensure:

- SEARs requirements were fully understood, to guide the assessment in this EIS
- To seek input into key issues, prior to finalising the impact assessment in this EIS.

A summary of this proactive agency consultation is summarised in Table 6-3.

Table 6-3 Agency consultation results

| Agency | Date | Consultation comments |
|---|---|---|
| **Dubbo Regional Council** | 16/06/2021 | Dubbo Regional Council confirmed via teleconference and email that Delroy Road as it extends to the eastern boundary of Lot 6 DP 755102 is public road and no consent of Council for its use is necessary. |
| **DPI Crown Lands** | July 2021 | As a result of direct consultation, Crown Lands transferred management of Delroy Road to Dubbo Council. |
| **Dubbo Regional Council** | 17/08/2021 | Council advised basic vehicle access is no issue, Larger heavy vehicles will require approval through the National Heavy Vehicle Regulator (NHVR). |
| **National Heavy Vehicle Regular (NHVR)** | 19/08/2021 | Application for heavy vehicle access along Minore and Delroy Road submitted and waiting assessment. |
| **NHVR** | 08/08/2021 | Application for heavy vehicle access approved. Permit covers vehicle sizing specified in Section 7.6. |
| **Biodiversity Conservation Science Division** | 11/05/2021 – LCA provided for review<br>18/05/2021 – Comments received back on LCA | NGH sent through the Land Category Assessment (LCA) for the project to BCS for review.<br>In response to comments, NGH completed additional BAM plots and updated the LCA and vegetation zones. The updated LCA is provided as an appendix of the BDAR. |
| **Dubbo Regional Council (Traffic Assessment refer to Section 7.6** | 13/11/2020 – Phone call consultation between Amber Pty Ltd and Dubbo Regional Council | Amber Pty Ltd called Dubbo Regional Council to discuss the solar farm project and to obtain initial direction regarding the potential traffic impact and access arrangements of the Proposal. Amber Pty Ltd provided proposed access route and traffic volumes. In summary, the following comments were made by Council:<br>• Minore Road is not a B-Double approved and may need to be included in a Construction Traffic Management Plan.<br>• Minore Road floods at the railway overpass.<br>• The Minore Road and Delroy Road intersection may require upgrading. |

| Agency | Date | Consultation comments |
|---|---|---|
| | | • Alternative access routes were discussed but the assessed route was considered the most appropriate.<br>• Over-Sized Overmass vehicles should not access the site during peak times to avoid school buses and congestion<br>Amber Pty Ltd was provided a list of school bus operators to confirm peak times and bus routes. These issues are now reflected in the traffic assessment and mitigation strategies set out in this EIS, Section 7.6. |
| **Transport for NSW (Traffic Assessment refer to Section 7.6)** | 16/11/2020 – Phone call consultation between Amber Pty Ltd and TfNSW | Amber Pty Ltd called TfNSW to discuss the Proposal, including the proposed access route and traffic volumes. In summary, the following comments were made:<br>• TfNSW noted that the intersection of Minore Road and Newell Highway currently has a right turn lane and has two lanes travelling northbound. Therefore, the current turn facilities were probably sufficient;<br>• TfNSW would like to see some data and analysis for the intersection to prove that the right turn lane could accommodate the queue lengths as this was a busy intersection during peak times;<br>• Discussed that most traffic would be going in the opposite direction to the construction traffic which should limit the impact;<br>• TfNSW noted about larger plant such as the Oversize-Overmass vehicles and where they would be coming from. Amber Pty Ltd indicated this was proposed from Sydney but the details of these vehicles was not known at this time so would likely be assessed as part of the CTMP;<br>• TfNSW noted the use of shuttle buses is preferred and Amber Pty Ltd noted that these were being used, with some private vehicles still be adopted. TfNSW wanted to know whether there was any way we could commit to the use of shuttle buses, so this doesn't change later. Amber Pty Ltd suggested this was more a potential permit condition or part of the CTMP and that the traffic report was based on information provided by the client;<br>• TfNSW raised a number of matters relating to the CTMP. Amber Pty Ltd ran through some of the recommendations Amber is providing within our report and TfNSW seemed comfortable |

| Agency | Date | Consultation comments |
|---|---|---|
| | | with what was being proposed, with a detailed CTMP to be prepared by the appointed contractor;<br>TfNSW noted there was a lot of work going on in the area and the need to consider the cumulative impact. Amber Pty Ltd noted there was little Over Size Over Mass (OSOM) vehicles which was a positive. Amber Pty Ltd also noted the projects that were currently being considered as part of the traffic report. Noted that a lot of it was not to the west of Dubbo (where the proposal is located) but there would be interaction of the vehicles within Dubbo itself.<br>These issues are now reflected in the traffic assessment and mitigation strategies set out in this EIS, Section 7.6. |

## 6.2. Mineral title Holder, Exploration Licence Holder Consultation

Sunrise Energy Metals LTD hold a mineral exploration licence (EL8961) over the proposal site. A letter and email were sent to Sunrise Energy Metals LTD outlining the proposal and where to obtain further information.

Sunrise Energy Metals (Formerly named 'Clean TEQ') replied on 6th October 2020 outlining the type of mineral deposit within our proposal site is usually deep underground, so the impact of the proposed development on any potential future mining development is not likely to be significant. However, Sunrise Energy Metals also mentioned if at all possible, it would be preferable to if any plant and infrastructure could be sited away from the western and southern parts of Lot/DP 6/755102 to avoid any potential sterilisation of any ore deposit that may lie within the skarn system.

X-Elio called Sunrise Energy Metals on 27 May 2021 to provide an update on the project and discuss any further concerns they may have regarding the project. Email follow up was undertaken by X-Elio on 31 May 2021; the indicative solar farm layout was sent along with an answer of Sunrise Energy Metals concern regarding land sterilisation. The email sent to Sunrise Energy Metals LTD explains that solar farm infrastructure would not be installed at depths which would have sterilisation potential to deep mineral deposits and that solar farms are largely reversable, allowing the site to be restored to its previous condition following decommission. X-Elio received a response from Sunrise Energy Metals on 4th August 2021 with no further comments and queries, giving X-Elio consent to continue their development on the licenced land.

No additional relevant exploration licence holders or mineral title holders are relevant to the proposal.

## 6.3. Aboriginal community consultation

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

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

The full list of consultation steps, including those groups and individuals who were contacted, and a consultation log is provided in Appendix A of the ACHA. A summary of actions carried out in following these stages is as follows.

### Stage 1

Letters outlining the development proposal and the need to carry out an ACHA were sent to the Dubbo LALC and various statutory authorities including the Biodiversity and Conservation Division within DPIE (formally OEH, now integrated to Heritage NSW), as identified under the ACHCRP. An advertisement was placed in the local newspaper, the *Dubbo Daily Liberal*, on the 23 January 2021 seeking registrations of interest from Aboriginal people and organisations. A further series of letters was sent to other organisations identified by the Biodiversity and Conservation Division within DPIE in correspondence with NGH. In each instance, the closing date for submission was 14 days from receipt of the letter.

As a result of this process, two (2) Aboriginal groups registered their interest in the proposal.

These were:

- Dubbo Local Aboriginal Land Council (DLALC); and
- Peter Chatfield (Tubbagah Aboriginal Co-op).

No other party registered their interest.

As a courtesy to all the registered parties we have only included brief summaries of correspondence for this project. However, detailed information and correspondence logs can be provided on request to DPIE and/or Heritage NSW. The Consultation Log in Appendix A of the ACHAR (Appendix G) will be redacted in all public versions of this report.

### Stage 2

On the 22 March 2021, an *Assessment Methodology* document for the Forest Glen Solar Farm was sent to the two (2) Registered Aboriginal Parties (RAPs) listed above. This document provided details of the background to the proposal, a summary of previous archaeological surveys, and the proposed heritage assessment methodology for the proposal. The document invited comments regarding the proposed methodology and sought any information regarding known Aboriginal cultural significance values associated with the proposal site and/or any Aboriginal objects contained therein. A minimum of 28 days was allowed for a response to the document.

None of the registered parties raised any objections to the methodology. NGH also contacted both groups to discuss participation in the fieldwork aspect of the project.

### Stage 3

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

The survey fieldwork was organised, and DLALC were selected for fieldwork participation by the Proponent. The survey fieldwork was carried out from 4$^{th}$ May – 6$^{th}$ May 2021 by two (2) archaeologists from NGH and two (2) local Aboriginal representatives from the LALC. The Aboriginal community representatives who participated in the fieldwork were:

- Gregory Kennedy; and
- Dean Kennedy.

Due to weather conditions on the 4$^{th}$ May 2021, the two (2) local Aboriginal representatives from the DLALC attended site, but determined that they would not like to undertake survey whilst there was potential for rain. NGH communicated that they would be welcome back to site at any time during the day if they would like, and that we would continue with the survey in their absence. When the DLALC representatives returned to site the following day, NGH staff informed the representatives what had occurred on site whilst they were not present, what areas had been surveyed, and discussed the conclusions of the day.

NGH also identified the sensitive landforms across the site that had been surveyed the previous day and as a group these sites were attended to ensure that the representatives agreed with NGH's assessment of the area.

### Stage 4

On the 7$^{th}$ of June 2021, a draft version of this *Aboriginal Cultural Heritage Assessment Report* for the proposal (this document) was forwarded to the RAPs inviting comment on the results, the significance assessment and the recommendations. A minimum of 28 days was allowed for responses to the document.

## 6.3.1. Aboriginal community feedback

A specialist Aboriginal Cultural Heritage Assessment (ACHA) was undertaken by NGH (Appendix G), prepared in line with the *Aboriginal cultural heritage consultation requirements for proponents 2010* (ACHCRP) (DECCW, 2010b). Registered Aboriginal Parties (RAPs) were involved in finalising the field methods, participated in field assessment and have reviewed the draft ACHA report.

No comments were received from any of the RAP groups on the draft ACHA report.

## 6.4. Community consultation

### 6.4.1. Community Consultation Plan (CCP)

X-Elio has developed a Community Consultation Plan (CCP) using the following guiding principles.:

Best practice community consultation involves the community in all decision-making stages of a project. The community plays a role from project inception, through the assessment process and on to project development. Effective community consultation has three important functions:

1. Facilitate deeper understanding of potential issues and decisions required for the project.
2. Enhance the quality of decisions made for the project.
3. Allow people to contribute to decisions that affect their lives.

Effective community consultation includes six important community engagement principles:

- Openness – combats assumptions and misinformation.
- Inclusiveness - consultation should be diverse and representative, not responding only to the most vocal stakeholders.
- Effective communication – requires tools appropriate to the task to build trust between parties.
- A communication strategy – clearly setting out what the project is fully about to:
  - Inform: one-way communication to deliver information about the project.
  - Consult: two-way communication to seek input into the project.
  - Collaborate and involve seek participation in elements of the project design and implementation.
- Early rather than late communication - to maximise engagement opportunities.
  - Accountability – monitoring and evaluation to ensure consultation aims are being achieved.

### 6.4.2. Community and stakeholder consultation activities to date

The local community has been approached for comment throughout the development timeline of the project via the following mediums and dates outlined in the table below.

Table 6-4 Community and stakeholder consultation chronology

| Date | Activity |
|---|---|
| July-August 2020 | Telephone calls to all sensitive receivers and surrounding neighbours where contact details were available. In total six calls were answered or returned from 21 available phone numbers. |
| September 2020 | Letter mail out to all sensitive receivers and surrounding neighbours. This included 66 letters.<br>The Forest Glen Solar Farm webpage went live on 11th September 2020 on X-Elios website. |
| February 2021 | Letter mail out to all sensitive receivers and surrounding neighbours. This included 65 letters. |
| March-April 2021 | Telephone calls to all sensitive receivers and surrounding neighbours where contact |

| Date | Activity |
|---|---|
| | details were available. In total, six calls were answered or returned from 21 available phone numbers. |
| May 2021 | X-Elio development team trip to local area for door knocking of local residents, neighbours and sensitive receivers. The goal was to meet with landowners who could not be contacted by phone or who had not responded to mail outs. Eighteen new landowners were met with during this visit. |

### 6.4.3. Results and response to community consultation

In total, 66 people were contacted via mail out and 24 people were contacted via phone or in person regarding the project. The community mostly had questions regarding the project in reference to:

- The general location of the site
- If they would have views and experience glare from the project
- Where would the site be accessed from (Delroy Road).

A full consultation log for the project has been provided to DPIE as part of this EIS.

### 6.4.4. Continued engagement

The CCP further aims to ensure that there is ongoing effective liaison with the community. Engagement activities in the CCP extend throughout the determination period, and emphasis would be placed on submissions received during the EIS exhibition period.

The CCP would be reviewed regularly, as well as at key transition phases of the proposal development (e.g. prior to construction or operation). The Plan would continue to guide engagement activities at all phases of the proposal, ensuring that engagement is appropriate and in line with good practice and proactive in maximising the benefits of the proposal to the local community.

## 6.5. Airport and service provider consultation

### 6.5.1. Dubbo Regional Airport / Civil Aviation Safety Authority

Consultation with the Australian nation Civil Aviation Safety Authority (CASA) was initiated through an X-Elio email on 1 October 2021 requesting agency consent for the Forest Glen SF in relation to its proximity to Dubbo Regional Airport. CASA provided a reply on 13 October 2021 notifying that the application is under assessment. Consultation will be ongoing throughout the proposal.

### 6.5.2. Essential Energy

X-Elio submitted a Preliminary Connection Enquiry to Essential energy for the Forest Glen SF on 27 May 2020, receiving a response on 7 June 2020. X-Elio entered into a Connection Investigation Agreement with Essential Energy with a Detailed Connection Enquiry sent out on 7 October 2020 with an Essential Energy response received on 5 January 2020.

X-Elio engaged Jacobs Engineering Group as an external consultant to conduct a grid connection feasibility study which showed remaining capacity to connect the proposed Forest Glen Solar Farm at the existing Essential Energy network via the existing Dubbo South to Narromine South 132 kV line (943/2), after considering Forest Glen plus existing, committed and publicly announced projects.

Consultation with Essential Energy will be ongoing throughout the development of the project.

# 7. Assessment of key issues

The key issues below are those identified in the Scoping Report (NGH 2020) and SEARs as requiring more detailed investigation:

- Visual amenity and landscape character
- Noise and Vibration
- Social and economic impacts
- Compatibility with existing land uses
- Biodiversity
- Traffic, transport and access.

For each key issue, the approach (usually by specialist assessment), existing environment (specific to each issue only as a general proposal site description is provided in Section 1.2.3), impact assessment and recommendations to manage each impact are detailed. The management recommendations form commitments of the project, pending project approval, and are summarised in Section 9.

The remaining issues, assessed generally by desktop assessment and have been verified to be highly manageable, are set out more briefly in Section 8. Where required, management recommendations for these issues are also included in Section 9.

To ensure transparency, the SEARs requirement is stated at the beginning of each section.

## 7.1. Visual amenity and landscape character

**SECRETARY'S REQUIREMENTS**

*The EIS must also address the following specific issues:*

- ***Visual –*** *including a detailed assessment of the likely visual impacts (including any glare, reflectivity and night lighting) of all components of the project (including arrays, transmission lines, substations and any other ancillary infrastructure) on surrounding residences and key locations, scenic or significant vistas, air traffic and road corridors in the public domain and adjacent areas of large lot residential and rural landscape land zoning (including a draft landscaping plan for on-site perimeter planting, with evidence it has been developed in consultation with affected landowners);*

### 7.1.1. Approach

NGH completed a Visual Impact Assessment (VIA) of the proposal in the following stages:

1. Background investigations, including Zone of Visual Influence (ZVI) modelling, identification of Landscape Character Units (LCU's) and identification of key representative viewpoints.
2. Field survey including reconnaissance, ground truthing and photography of key representative viewpoints.
3. Community consultation including understanding community values and documenting community perception regarding solar farms generally and this proposal in particular.
4. Impact assessment of the potential visual impact during construction and operation of the proposal on the local area and specifically on:
   a. Representative viewpoints, in consideration of their sensitivity to the visual impact
   b. Dwellings that may have a view of infrastructure, in consideration of their sensitivity, proximity, orientation, mitigating factors (topography, structures, vegetation).

5. Development of a visual impact mitigation strategy, in consultation with near neighbours where a moderate or higher impact was anticipated.

These steps are outlined below.

## Background information

Background investigations of existing literature and aerial photographs were undertaken to identify key landscape features within the locality that may be affected by the visual characteristics of the proposal.

Mapping and modelling were undertaken to:

- Identify LCUs within 5km of the proposed solar farm. LCUs consider topography, vegetation, land use, and other distinct landscape features. They are a way to summarise differences in the receiving environment that may affect the visual impact of the proposed solar farm at different locations. This was undertaken using aerial imagery and later validated during a field survey.
- Define areas in which the infrastructure may be visible, using ZVI modelling. A map identifying the ZVI (or viewshed) of the proposed solar farm was produced. This method models proposed infrastructure heights against topographic information to determine areas in which views of infrastructure may be visible, and to what degree. The infrastructure was modelled as 5m high for array modules and 6m high for ancillary infrastructure and the substation. Topography was based on the best available resolution Digital Elevation Model (DEM) that could be sourced (elevation data processed in 5m squares sourced from Elevation and Depth Foundation Spatial Data, (NSW Government 2019). Viewers were considered at 1.5m height. Modelling does not take into account screening that may be provided by existing vegetation or structures. The transmission line was not considered in the viewshed due to the height of the infrastructure and it not being a new visual feature in the landscape, transmission lines are a common feature within the study area.
- Identify key viewpoints such as major travel routes, public recreation areas, potential receivers (dwellings and other structures), and built up areas. This excluded areas deemed not to be visible from the ZVI modelling.

The results were used to select representative viewpoints to focus the field survey in areas where the proposal would be most visible.

## Field survey

With reference to the background information above, a field survey was undertaken to:

- Validate and document the existing LCUs in the study area.
- Provide photographs from representative viewpoints within the LCUs.
- Understand the likely extent of visibility and sensitivity of the LCUs to views of the proposed solar farm.

The field survey consisted of driving along publicly accessible roads, investigating and documenting dominant visual character elements and potential views to the proposed infrastructure. Photographs were taken at representative locations. Nearby roadside viewpoints have been tagged ‘residential’ where they occur near a residence.

Representative viewpoint locations are provided in Table 7-4 and shown in Figure 7-1 and Figure 7-2.

## Community consultation

Community consultation specific to this assessment of visual impacts was required to:

- Understand how the community values existing visual amenity in the study area.
- Document the perceptions of the community to solar farms in general and the proposal specifically.

Community consultation was undertaken as part of the environmental impact assessment process, in accordance with a Community Consultation Strategy (refer to Section 6.4), it has included letters, phone calls and door knocks to all sensitive receivers within 2km of the proposal site.

## Impact assessment

The impact assessment methodology used is based on the Bureau of Land Management (BLM) Visual Resource Management System, developed by the BLM, US Department of the Interior (Bureau of Land Management, n.d.). The BLM developed a systematic process to analyse the visual impact of proposed developments. The basic philosophy states that the degree to which a development affects the visual landscape depends on the visual contrast imposed by the proposal.

To quantify the visual impact of a development the following criteria are considered:

- The scenic quality of the study area's LCUs.
- The expected sensitivity at representative viewpoints and sensitive receiver.
- The proximity of each representative viewpoint and sensitive receiver.
- Evaluate the degree of contrast or visual effect of the solar farm would result in at representative viewpoints and sensitive receiver.
- The elevation, orientation, topography and any existing mitigation measures (i.e. screening and infrastructure) of each representative viewpoint and sensitive receiver.

The criteria for sensitivity, effect and visual impact as used for this assessment are described below.

This visual impact considers all components of the proposal as outlined in Section 4 including solar panels, frames, substation, buildings, invertors, battery storage and tracks. It is considered during the construction of the solar farm some receivers may have views of equipment and machinery onsite, this would be limited to the 12-18 month construction phase.

**Visual sensitivity**

Visual sensitivity is a measure of how critically a change to the existing landscape is viewed by people from different areas. The assessment is based on the number of people affected, land use, and the distance of the viewer from the development (EDAW, 2000). Sensitivity ratings are defined as high, moderate or low and a typical example of how the type of use and proximity affects the potential sensitivity are shown in Table 7-1.

Table 7-1 Visual sensitivity criteria.

| Land use | Distance from site | | | | |
|---|---|---|---|---|---|
| | 0-1km | 1-2km | 2-4.5km | 4.5-7km | >7km |
| Tourist/Recreation | High | High | High | Moderate | Low |
| Residential: Rural or Urban | High | High | High | Moderate | Low |
| Main Travel Corridor | Moderate | Moderate | Low | Low | Low |
| Minor/Local Roads | Moderate | Moderate | Low | Low | Low |
| Railway Line (Freight) | Low | Low | Low | Low | Low |
| Industrial Areas | Low | Low | Low | Low | Low |

### Visual effect

Visual effect is the interaction between a proposal and the existing visual environment. It is often expressed as the level of visual contrast of the proposal against its setting or background in which it is viewed. The visual effects are assessed as:

- Low visual effect occurs when a proposal blends in with its existing viewed landscape due to a high level of integration of one or several of the following: form, shape, pattern, line, texture or colour. It can also result from the use of effective screening often using a combination of landform and landscaping.
- Moderate visual effect: occurs where a proposal is visible and contrasts with its viewed landscape however, there has been some degree of integration (e.g. good siting principles employed, retention of significant existing vegetation, provision of screen landscaping, appropriate colour selection and/or suitably scaled development).
- High visual effect: results when a proposal has a high visual contrast to the surrounding landscape with little or no natural screening or integration created by vegetation or topography.

### Visual impact

Visual impact is the combined effect of visual sensitivity and visual effect. Various combinations of visual sensitivity and visual effect would result in differing visual impacts as suggested in Table 7-2 (URBIS, 2009).

Table 7-2 Visual impact criteria

| Visual sensitivity levels | Visual effect zone | | |
|---|---|---|---|
| | **High** | **Moderate** | **Low** |
| **High** | High | High | Moderate |
| **Moderate** | High | Moderate | Low |
| **Low** | Moderate | Low | Low |

Mitigation measures are considered warranted for ‘high impact’ receivers, for whom unmitigated impacts are considered greater than what is acceptable.  For ‘medium impact’ receivers, the contrast is considered acceptable although mitigation is sometimes suggested.  For low impact receivers, the contrast is deemed unlikely to be perceived and no mitigation is considered to be required.

Additional considerations for visual impacts may be included in ISEPP legislation if amendments currently on display are passed (DPIE, 2021) (refer to Section 5.2.3). The proposal is within 5km (measured from site access off Delroy Road) of the nearest R2 – Low Density Residential, which is located near Dubbo. As such this assessment has considered these proposed amendments and assessed whether the proposed development would significantly impact the scenic quality and landscape character of a regional city, including on any approaches to the city, taking into consideration any values identified by the community and Council.

## 7.1.2. Existing environment

### Proposal site and surrounds

The proposal site is located within the Central West and Orana region which is characterised by higher elevation and hills in the east and drier and flatter landscapes in the west. The plains and lower slopes are mostly utilised for agriculture and evidence of medium to large scale cropping and extensive grazing is present in the landscape. The visual values of the area to receivers, including locals and motorists, would be open paddocks with remanent woodland.

Lands immediately surrounding the site to the east, south and west are predominately used for agriculture (cropping and extensive grazing of sheep). Minore is a village 3km west of the proposal site and includes an old railway station, silos and small number of residences.

The proposal site is zoned RU1 Primary Production under the *Dubbo Local Environmental Plan 2011*. Approximately 85% of the proposal site has been cleared of woody vegetation and has been highly modified by historical farming practices. It is currently used for cropping and grazing including oats and sheep. Remanent woodland is present in the north west corner and south eastern portion of the site. One minor drainage line traverses the site accompanied by six minor order tributaries. An existing Essential Energy 132 kV transmission line traverses the proposal site. The Main Western Railway line is directly north of the proposal site.

The proposal site is generally flat with a central valley which falls from south-west to north-east with elevation ranging from to 283m to 325m AHD. The majority of receivers within 2km of the Forest Glen SF are lower in the landscape or a similar elevation to the proposal site.

There are 61 residences within 2km of the proposal, which includes three associated receivers (R0, R1 and R14) and 58 non-associated receivers. Twenty of these receivers are within 1km of the proposal site.

## Community consultation findings

A high percentage (77%) of Australian's believe that large scale solar farms could supply a significant source of Australia's energy requirements (ARENA, 2015). Community consultation specific to this assessment of visual impacts identified one receiver within 2km was concerned about potential views and glare from solar farm infrastructure.

## Landscape Character Units (LCUs)

Three LCUs were identified within Forest Glen Solar Farm and surrounding areas:

- Rural (including agricultural lands, with low density dwellings and sheds).
- Industrial and commercial (major roads, electrical and other built infrastructure).
- Forest (surrounding remanent forest, conservation areas, reserves and recreational areas).

The three LCUs identified are characterised in Table 7-3 in terms of their scenic quality. LCUs were assessed as low to moderate. None were rated high, which would describe areas with outstanding, unusual or diverse features.

Table 7-3 Key features of LCUs within Forest Glen Solar Farm and surrounds

| **Landscape Character Unit – Rural** |
|---|
| The land within and immediately surrounding the proposal site is rural agricultural land mostly used for sheep grazing and cropping for feed. Land surrounding the proposal site is up to 335m ASL and is well treed. The topography of the proposal site is gently undulating, with some small hills such as the outstanding hillslope in the centre of the site and the south eastern forest, the range of elevation on site is 285 – 325m ASL. The paddocks within the proposal site are generally comprised of native vegetation consisting of pockets of forest, scattered trees and pasture. Expansive views within the rural LCU are generally limited given the undulating relief and screening provided by vegetation.<br>Sealed roads in the study area include Minore Road, North Minore Road, Panai Avenue, Dungary Road and Lagoon Creek Road. As well as the unsealed local roads including Narromine Street and Delroy Road, are the main vantage points to from which to view agricultural and rural areas. Agricultural and grazed land can be viewed openly from road corridors, where this is no existing screening. Patches of native and |

| **Landscape Character Unit – Rural** | |
|---|---|
| planted vegetation is common in this LCU and can screen views of agricultural land from roads.<br>Residences within this landscape are sparsely distributed and commonly associated with additional landscape plantings and agricultural sheds, silos and buildings. Low paddock fencing and overhead transmission lines represent a linear pattern over the more organic pattern of the terrain.<br>In the flat areas, views are limited across the landscape due to the existing vegetation screening and patches. While in the undulating areas views can either be restricted or expansive depending on the viewer's location within dips or rises. This is consistent across the entire study area.<br>This LCU includes the village of Minore which has a population of approximately 150 people. The township is not considered a 'village' LCU as there is no defined town centre or associated town facilities such as schools and churches. Members of this township live on rural properties and are better distinguished under the Rural LCU.<br>Scenic quality is considered moderate.<br>A moderate scenic quality rating applies to areas with the features and variety normally present in the character type. Elements have subtle variety and contrast and feature naturally pleasing elements such as scattered native vegetation remnants. Built elements including fencing and agricultural buildings are production related.<br>This LCU is common in the study area, but has features and variety. The proposed solar farm is located within this LCU. | |
|  |  |

| Landscape Character Unit – Rural |
| --- |
|  |
| **Landscape Character Unit – Industrial and commercial** |
| Industrial and commercial areas within the vicinity of the proposal site include an aeroclub, silos, railway line and one overhead transmission line (132 kV). Common features include dual lane sealed road, road reserve, fencing, railway line, overhead transmission lines and regular small and large vehicles.<br>An aeroclub is adjacent to the proposal site and owned by the same landowner as the proposal site. The aeroclub is used for flying model planes and is used almost every Sunday between 8am and midday. The area includes an informal carpark, grassed runway, sheds and signage.<br>The silos in the village of Minore are significant features of the landscape. The silos can be seen from elevated vantage points across the region. The village of Minore also includes an old railway station, which is part of the Main Western Railway line that runs through the landscape and is located directly north of the proposal site.<br>Scenic quality is considered low,<br>A low scenic quality rating is given to areas lacking features and variety. Features matching the land use. Screening is present for the majority of surrounding roads, with broken views of surrounding rural land visible through existing native vegetation. The flat landform also breaks up expansive views of surrounding rural land. This LCU is not common in the study area, with the proposal site located away from major roads and but adjacent to the major overhead transmission line and railway line. |

**Landscape Character Unit – Rural**

| **Landscape Character Unit – Rural** |
| --- |


| **Landscape Character Unit – Forest** |
| --- |

The area surrounding the proposal site are well forested. Many properties in the region engage in forestry and thus many rural properties have large stands of trees.

The closest National Park is Sappa Bulga National Park 2.9km south east of the proposal site. It is a small reserve covering 121ha of native remnant forest.

Recreational infrastructure is limited and access to native forests would be limited by privately owned lots and fences.

<u>Scenic quality is generally moderate</u>.

A moderate scenic quality rating applies to areas with the features and variety normally present in the character type. Colour variation is low. Forms are generally uniform, lacking variety. Areas that appear untouched by settlement provide a pleasing visual contrast to the rural, industrial and commercial LCUs. Limited recreation space is located in the region.

This LCU is common in the study area.

### 7.1.3. Potential impacts

### Viewpoint analysis

The viewpoint analysis considers the likely impact that development would have on the existing landscape character and visual amenity by selecting prominent sites, otherwise referred to as viewpoints. The development includes all proposed new infrastructure including site access and tracks, panels and buildings.

Representative viewpoints within each LCU were identified on the ground using ZVI modelling to ensure all viewpoints are located in the 'viewshed' of the proposed solar farm; that is, viewpoints were not selected in areas predicted to be shielded from views of the gravel pit expansion by topography. This is a conservative approach, as existing vegetation is not taken into account by the ZVI modelling and renders the proposal invisible from additional locations.

The ZVI modelling (provided as Figure 7-1 and Figure 7-2) assumes infrastructure heights being up to 5m high for arrays and 6m high for ancillary infrastructure (i.e. inverters). The modelling undertaken is based on the final infrastructure layout provided. The visibility is then modelled based on the number of points of the infrastructure block that can be seen. 100% means all points can be seen and equates to the highest visibility. The lowest score is 0%; none of the points of the infrastructure block can be seen. Transmission lines were not included in the ZVI model, they have been considered in Table 7-4, due to the central location of the substation and transmission line connection point within the infrastructure footprint, it is unlikely views of this area would be perceived by any sensitive receivers.

Seven representative viewpoints were identified using the ZVI mapping (refer to Figure 7-2 and Table 7-4). The predicted sensitivity of each viewpoint can be determined, considering its proximity to the proposal site and factors such as use, scenic quality and regional significance. The viewpoints were taken from publicly accessible roads within the study area. Table 7-4 provides the evaluation of the representative viewpoints (V1-V7) based on their land use and proximity (sensitivity), the visual effect and ground truthing of the ZVI modelling resulting in a visual impact rating.

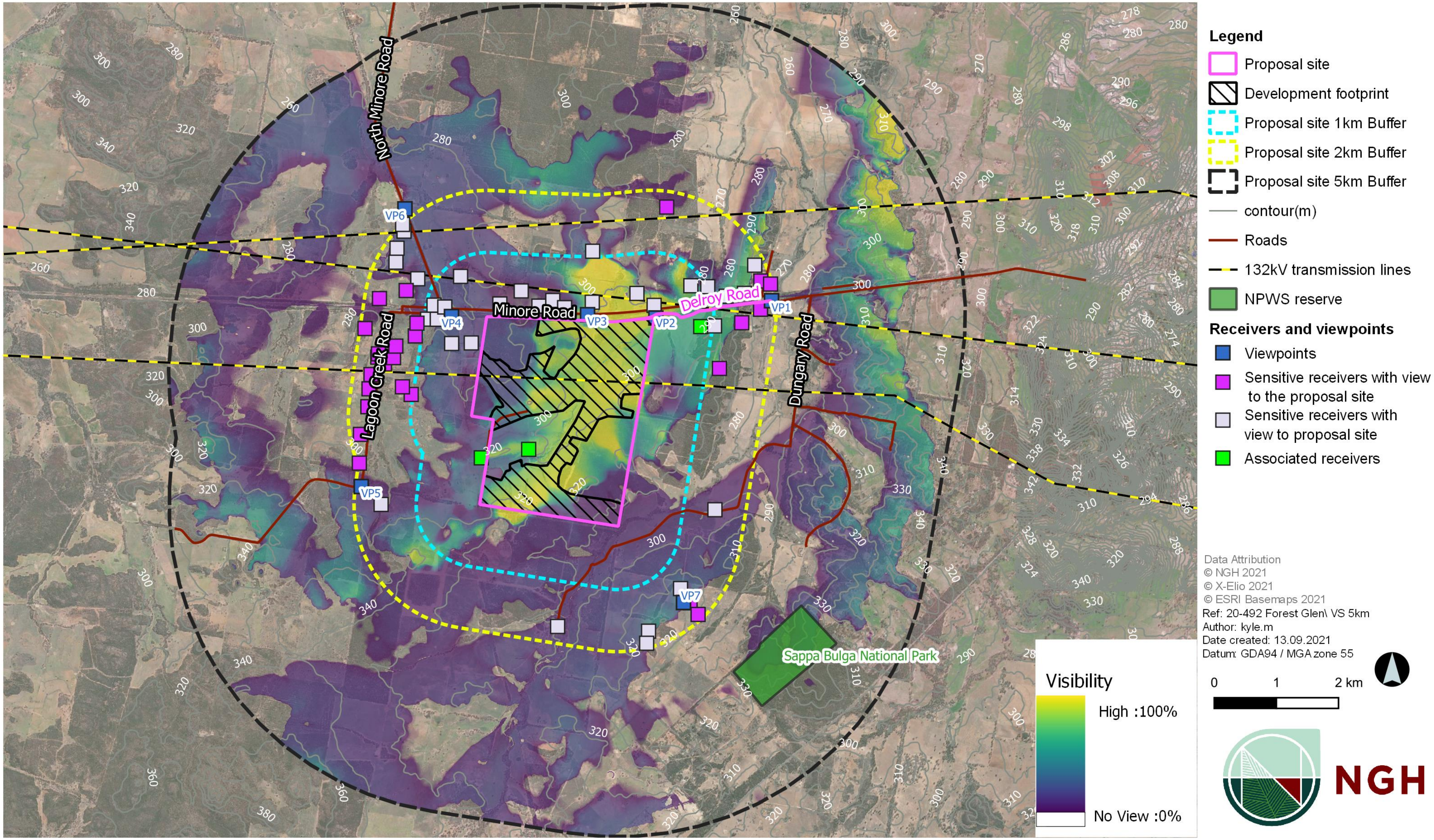



Figure 7-1 ZVI showing existing residential receivers and local roads and the visibility of the proposed solar farm site to these within 5km (does not take into account effect of vegetation screening)

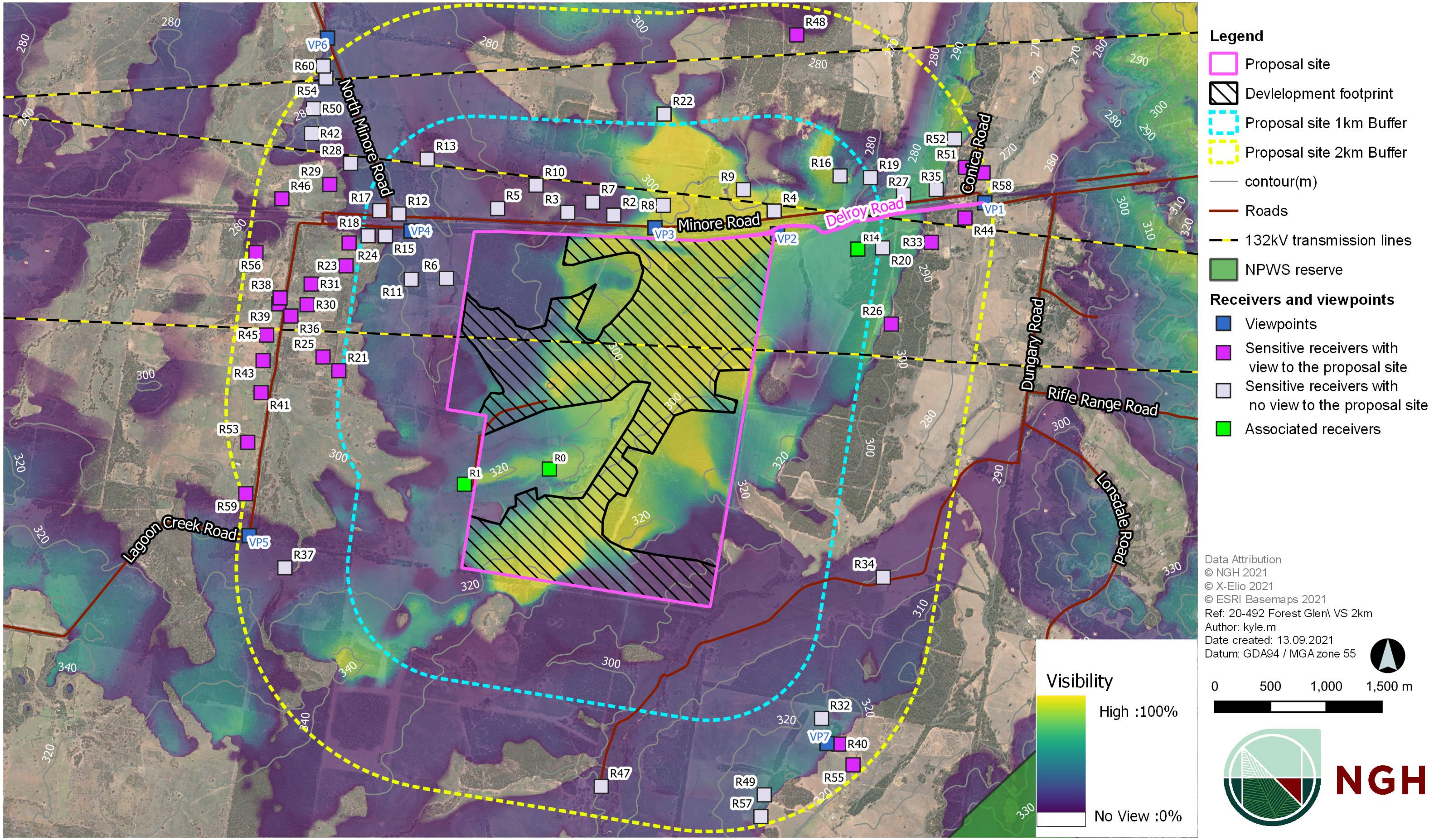



Figure 7-2 ZVI showing existing residential receivers and local roads and the visibility of the proposed solar farm site to these within 2km (does not take into account effect of vegetation screening)

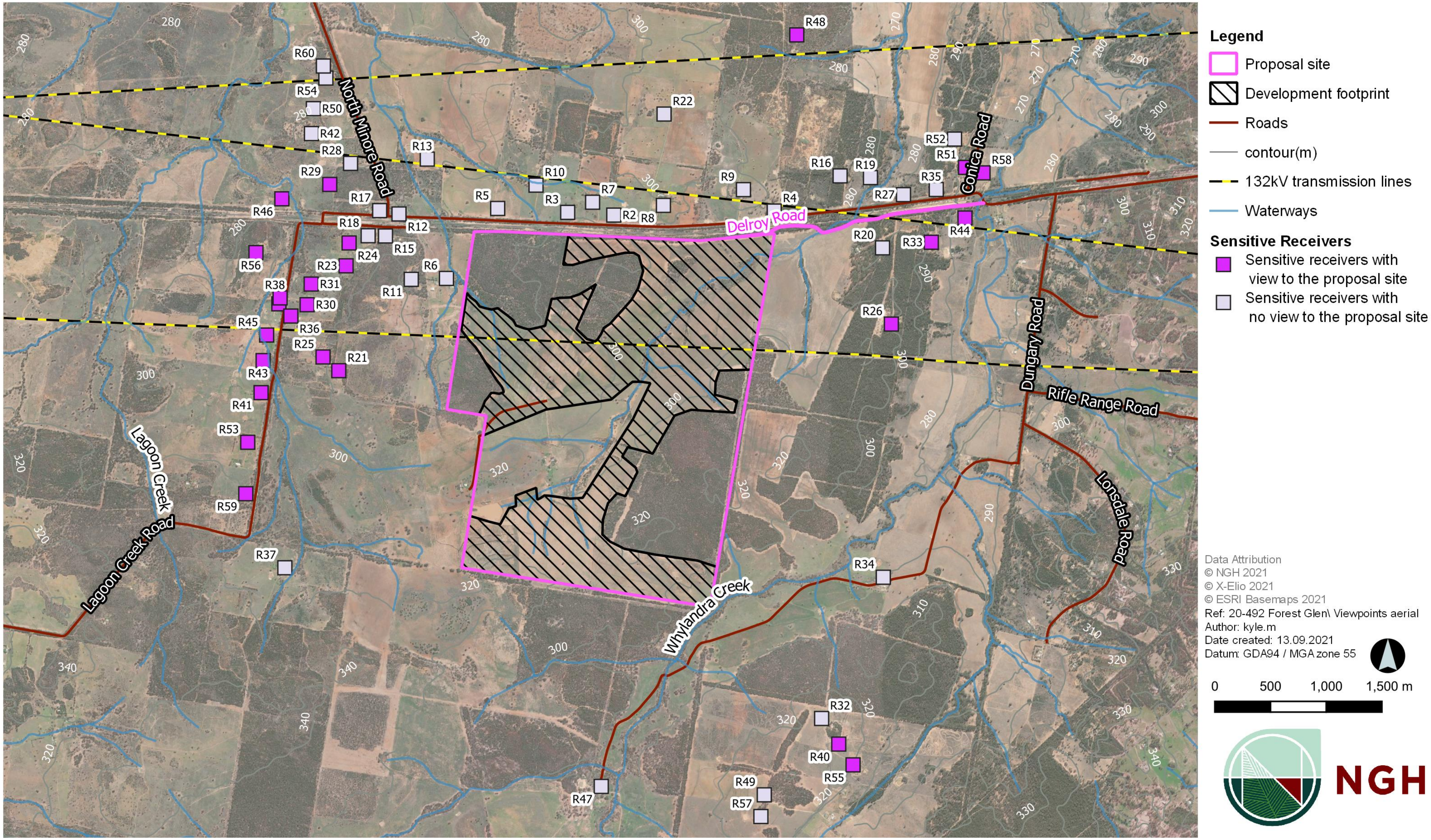



Figure 7-3 Existing vegetation screening within the study area means the receivers noted will not have views of the proposal.

Table 7-4 Visual impact at representative viewpoints with reference to the Forest Glen SF, in order of highest impact

| VP ID | Location | LCU | Distance to site | Elevation (AHD) and viewing direction | Representative receivers | Visual sensitivity | Visual effect | Visual impact<br>The proposed solar farm or proposal refers to all components including panels, **invertors,** battery, substation, tracks and site access |
|---|---|---|---|---|---|---|---|---|
| 2 | Delroy Road, Aero Club and proposal site access | Rural Commercial | 30m | 293m West | Users of Dubbo Model Aero Club | High – recreation site/rural within 1km | High – no screening or integration | The proposed solar farm would be visible from this viewpoint due to the proximity to the site and limited screening. The viewpoint is located at the end of Delroy Road, which is only accessed by the landowners of the proposal site and visitors to the Aero Club. The Dubbo Model Aero Club is an involved landowner.<br>**The visual sensitivity and effect is high resulting in a high visual impact.**<br>Consultation with the Dubbo Model Aero Club outlines they have no concerns, therefore no screening is proposed. A commitment to keep club members informed about the timing and extent of visual impacts anticipated forms part of this proposal. |

| VP ID | Location | LCU | Distance to site | Elevation (AHD) and viewing direction | Representative receivers | Visual sensitivity | Visual effect | Visual impact<br>The proposed solar farm or proposal refers to all components including panels, **invertors,** battery, substation, tracks and site access |
|---|---|---|---|---|---|---|---|---|
| 1 | Public Road. Intersection of Delroy Road and Minore Road | Industrial<br>Commercial<br>Rural | 1.8km | 276m<br>West – South West | Traffic along Minore Road and Delroy Road.<br>Residences travelling along Delroy Road | Moderate – local road within 2km of site | Nil– existing screening blocking views | No part of the proposal is visible from this viewpoint due the topography and vegetation screening.<br>**The visual effect is assessed as nil and the resulting visual impact rating is nil.** |

| VP ID | Location | LCU | Distance to site | Elevation (AHD) and viewing direction | Representative receivers | Visual sensitivity | Visual effect | Visual impact<br>The proposed solar farm or proposal refers to all components including panels, **invertors,** battery, substation, tracks and site access |
|---|---|---|---|---|---|---|---|---|
| 3 | Minore Road | Rural | 20m | 306m<br>South | Traffic along Minore, residences along Minore across from the site | High – local road and rural residences within 1km | Nil – no views due screening | No part of the proposal is visible from this viewpoint due the topography, elevation of the existing railway track and vegetation screening.<br>**The visual effect is assessed as nil and the resulting visual impact rating is nil.** |

| VP ID | Location | LCU | Distance to site | Elevation (AHD) and viewing direction | Representative receivers | Visual sensitivity | Visual effect | Visual impact<br>The proposed solar farm or proposal refers to all components including panels, **invertors,** battery, substation, tracks and site access |
|---|---|---|---|---|---|---|---|---|
| 4 | Lagoon Creek Road | Rural | 575m | 292m<br>East | Traffic and residences along Lagoon Creek Road. | High – local road and rural residences within 1km | Nil – no views due screening | No part of the proposal is visible from this viewpoint due the topography and vegetation screening.<br>**The visual effect is assessed as low due to existing screening and the resulting visual impact rating is low.** |

| VP ID | Location | LCU | Distance to site | Elevation (AHD) and viewing direction | Representative receivers | Visual sensitivity | Visual effect | Visual impact<br>The proposed solar farm or proposal refers to all components including panels, **invertors,** battery, substation, tracks and site access |
|---|---|---|---|---|---|---|---|---|
| 5 | Lagoon Creek Road | Rural | 1.9km | 312m<br>East | Traffic and residences along Lagoon Creek Road. | High - rural residences within 2km | Nil – no views due screening | No part of the proposal is visible from this viewpoint due the topography and vegetation screening.<br>**The visual effect is assessed as nil and the resulting visual impact rating is nil.** |

| VP ID | Location | LCU | Distance to site | Elevation (AHD) and viewing direction | Representative receivers | Visual sensitivity | Visual effect | Visual impact<br>The proposed solar farm or proposal refers to all components including panels, **invertors,** battery, substation, tracks and site access |
|---|---|---|---|---|---|---|---|---|
| 6 | North Minore Road | Rural Commercial | 2.1km | 277m<br>South east | Traffic and residences along North Minore Road | High - rural residences with 2-4.5km | Nil – no views due screening | No part of the proposal is visible from this viewpoint due the topography and vegetation screening.<br>**The visual effect is assessed as nil and the resulting visual impact rating is nil.** |

| VP ID | Location | LCU | Distance to site | Elevation (AHD) and viewing direction | Representative receivers | Visual sensitivity | Visual effect | Visual impact<br>The proposed solar farm or proposal refers to all components including panels, **invertors,** battery, substation, tracks and site access |
|---|---|---|---|---|---|---|---|---|
| 7 | 23-39 Panai Avenue, Dubbo | Rural | 1.6km | 332m<br>North west | Traffic and residences along Panai Avenue | High - rural residences within 2km | Nil – no views due screening | No part of the proposal is visible from this viewpoint due the topography, elevation of existing railway track and vegetation screening.<br>**The visual effect is assessed as nil and the resulting visual impact rating is nil.** |

Of the seven viewpoints assessed above, one viewpoint would have views of the proposal site and resulted in a high visual impact rating:

- Viewpoint 2 is located adjacent to the proposal and the site entry along Delroy Road. The viewpoint represents recreation users of the Dubbo Model Aero Club. The viewpoint doesn't represent any other residences or traffic along Delroy Road, as the road ceases at the entry to the proposal site. Dubbo Model Aero Club is owned and operated by the landowner of the proposal site. The club is used almost every Sunday by approximately 10 people. During consultation with the operator (who is an involved landowner), no concerns were raised about the proposal. Given there will be limited exposure for club members and given the type of activity would not be impeded and is not based on visual characteristic, no screening is recommended. However it is recommended that consultation continues with the club during construction and operation so club members are fully informed about the timing of the impacts.
- Viewpoints 1 and 3-7, would not have views of the proposal due to topography and existing screening. Therefore, these viewpoints had a nil visual impact rating resulting in no mitigation requirements.

### Visual impacts from public land

Overall, the proposed development would result in the modification of the existing visual landscape. However due to the relatively small vertical scale (5-6m high), existing landscape features including vegetation and topography screen the proposal from a distance. Therefore, the highest visual effect is likely to be from areas within close proximity to the site.

Publicly accessible viewing locations are generally limited to the minor roads, such as Minore Road, North Minore Road, Delory Road and Lagoon Creek Road which transverse the landscape. These roads have a very low frequency of use, providing access to isolated residences and farmland. There are limited views due to the topography and extensive screening along the road and rail corridors and on private properties (refer to Figure 7-2 and Figure 7-3).

### Visual impact on Sappa Bulga National Park

The proposal site is approximately 3km north west of the Sappa Bulga National Park. The national park was made a reserve in January 2011 due to it being an important patch of remanent native vegetation. There are no formal recreational areas in the park. Visitors to the park would have no views of the proposal site due to topography, there is a range in between the two sites as well as extensive patches of forest; existing topography and vegetation screen the site from all areas of the park and access roads to it (refer to Figure 7-2 and Figure 7-3).

### Visual impact on residences

There are 61 residences within 2km of the proposal, which includes three associated receivers (R0, R1 and R14) and 58 non-associated receivers. Table 7-5 below provides a summary of the potential visual impact for each residence within 2km of the proposal site. The full assessment for each residence is provided within Appendix E.1. During the site inspection, where possible a photo was taken to represent each residence's view toward the proposal site at the closest public vantage point. These photos and map of where the photos were taken are provided in Appendix E.2. Considering the extensive vegetation screening flat topography and noted lack of nearby residents residing on top of elevated vantage points the representative photos included in Appendix E.2 are considered conservative and representative of receivers in the area.

Visual impact concentrates on the potential views of solar farm infrastructure onsite and considers each residences orientation, elevation and existing mitigation present such as topography, structures or screening. The assessment also considers potential glare and glint impacts for each receiver, with the assumption if the residence has views, there is potential for glare and glint. These potential impacts are discussed below.

Based on the assessment provided in Appendix E.1 and summarised in Table 7-5, there is only one non-associated receiver within 2km of the proposal site that has potential for any views of infrastructure. R4 is directly north of the site access into the solar farm off Delroy Road. Vegetation screening is present within the Minore Road and railway corridor, however due to the proximity of the site (163m) and the vegetation type (minimal mid storey) there is potential for broken of views of the site entry and solar farm infrastructure in the northeast of the site. The potential impact is likely to be greater during construction due to the traffic using the site entry and the visual impact that could be created by increased traffic, noise and dust. These impacts are proposed to be managed through mitigation measures proposed in Sections 7.2, 7.5 and 8.10. The visual impact is considered low due to the existing vegetation screening breaks up views of the proposed solar infrastructure (refer to Figure 7-4). Consultation has been undertaken with the landowner and no concerns have been raised regarding visual impacts or the project. Therefore, no further vegetation screening is proposed. Consultation is proposed to be undertaken throughout construction and life of the project to address any potential concerns that may occur due to their proximity to their site.

Figure 7-4 Photo from public viewpoint for R4 towards the proposal site

The other 56 non-associated receivers are considered unlikely to have views of the solar farm due to topography and existing screening. The proposal site is between 283 – 325m AHD, based on the topography of all the receivers they would lower in the landscape or similar elevation to the proposal site. The proposal site and surrounds are also well vegetated with large patches of remanent woodland. These patches of vegetation provide effective screening in the flat landscape. The extensive vegetation screening in regard to the receivers can be seen in Figure 7-3. Vegetation can be an unreliable visual screen in some cases, as landowners can clear trees providing visual screening or fires can temporarily reduce the effectiveness of the vegetation to provide a screen. In the context of the Forest Glen SF however, vegetation is extensive and traverses land owned by numerous private and public landholders. It is unlikely that significant losses to vegetation would occur as no single landholder or proposed development would eliminate a vegetative screen, therefore there is high confidence that vegetation screening would persist and be reliable in the long term.

It is also noted that the receivers along Delroy Road (R20, R26, R33 and R44), are also unlikely to have views from their dwellings of the site access road. They would only have intermittent views of the project’s traffic when they are using Delroy Road during the project’s construction and operational hours.

Table 7-5 Visual impact of each associated and non-associated receivers within 2km of the proposal site. The photos were taken from the closest public viewpoint.

| Receiver ID | Orientation of dwelling[2] | Distance (m) and direction from proposal site | Distance (m) from closest piece of permanent infrastructure | Elevation (AHD) | Mitigation factors (consideration of topography and existing structures and vegetation)<br>Solar farm and ancillary infrastructure includes solar panels, invertors. battery, substation, tracks and site access.<br>Glint and glare refers to any potential reflective item onsite such as panel, frames, buildings etc. | Visual impact rating | Mitigation Measures |
|---|---|---|---|---|---|---|---|
| R2 | South | 153m west of proposal boundary | 237m | 297m | **Solar farm and ancillary infrastructure**<br>Existing topography and vegetation mean this receiver would not have a view of solar farm infrastructure.<br>**Glint and glare**<br>Existing topography and vegetation would screen this receiver from any potential glint or glare. | **Nil** | **No mitigation required.** |
| R3 | South -east | 160m north of proposal boundary | 242m | 296m | **Solar farm infrastructure**<br>Existing topography and vegetation mean this receiver would not have a view of solar farm infrastructure.<br>**Glint and glare**<br>Existing topography and vegetation would screen this receiver from any potential glint or glare. | **Nil** | **No mitigation required.** |

[2] Orientation is based on aerial imagery and assumes the house entry or any visible viewpoints out to the landscape.

| Receiver ID | Orientation of dwelling[2] | Distance (m) and direction from proposal site | Distance (m) from closest piece of permanent infrastructure | Elevation (AHD) | Mitigation factors (consideration of topography and existing structures and vegetation)<br>Solar farm and ancillary infrastructure includes solar panels, invertors. battery, substation, tracks and site access.<br>Glint and glare refers to any potential reflective item onsite such as panel, frames, buildings etc. | Visual impact rating | Mitigation Measures |
|---|---|---|---|---|---|---|---|
| R4 | South | 163m north of the proposal boundary | 248m | 298m | **Solar farm infrastructure**<br>Existing topography and vegetation mean this receiver would have broken up views of the solar farm and site access. The receiver is likely to have views of traffic along Delroy Road entering the site. Consultation has been undertaken with this landowner (refer to Section 6.4). They have no concerns with the proposed project. Consultation is recommended to continue during the life of the project to address any potential concerns that may occur due to their proximity to the site.<br>**Glint and glare**<br>Existing topography and vegetation would break up any potential for this receiver from glint or glare. | **Low** | **Mitigation recommended – Ongoing consultation** |
| R5 | South and north | 165m north of the proposal site | 712m | 289m | **Solar farm infrastructure**<br>Existing topography and vegetation mean this receiver would not have a view of solar farm infrastructure.<br>**Glint and glare**<br>Existing topography and vegetation would screen this receiver from any potential glint or glare. | **Nil** | **No mitigation required.** |

| Receiver ID | Orientation of dwelling[2] | Distance (m) and direction from proposal site | Distance (m) from closest piece of permanent infrastructure | Elevation (AHD) | Mitigation factors (consideration of topography and existing structures and vegetation)<br>Solar farm and ancillary infrastructure includes solar panels, invertors. battery, substation, tracks and site access.<br>Glint and glare refers to any potential reflective item onsite such as panel, frames, buildings etc. | Visual impact rating | Mitigation Measures |
|---|---|---|---|---|---|---|---|
| R6 | South | 180m west of the proposal site | 306m | 287m | **Solar farm infrastructure**<br>Existing topography and vegetation mean this receiver would not have a view of solar farm infrastructure from their dwelling or sheds.<br>It is noted, the landowner would have views of the solar array and substation at their dam in the centre of their property. This due to the proximity of the infrastructure to the property, and limited screening along the properties shared fence line. Due to the topography the views would be limited to this north west portion of the proposal site. There is no buildings or structure around the dam that could be used as accommodation or regularly for recreation.<br>**Glint and glare**<br>Existing topography and vegetation would screen this receiver from glint or glare. | **Low** | **No mitigation required.** |
| R7 | South and north | 260m north of the proposal site | 341m | 295m | **Solar farm infrastructure**<br>Existing topography and vegetation mean this receiver would not have a view of solar farm infrastructure.<br>**Glint and glare**<br>Existing topography and vegetation would screen this receiver from any potential glint or glare. | **Nil** | **No mitigation required.** |

| Receiver ID | Orientation of dwelling[2] | Distance (m) and direction from proposal site | Distance (m) from closest piece of permanent infrastructure | Elevation (AHD) | Mitigation factors (consideration of topography and existing structures and vegetation)<br>Solar farm and ancillary infrastructure includes solar panels, invertors. battery, substation, tracks and site access.<br>Glint and glare refers to any potential reflective item onsite such as panel, frames, buildings etc. | Visual impact rating | Mitigation Measures |
|---|---|---|---|---|---|---|---|
| R8 | South | 261m north of the proposal site | 395m | 302m | **Solar farm infrastructure**<br>Existing topography and vegetation mean this receiver would not have a view of solar farm infrastructure.<br>**Glint and glare**<br>Existing topography and vegetation would screen this receiver from any potential glint or glare. | **Nil** | **No mitigation required.** |
| R9 | West | 381m north of the proposal site | 448m | 303m | **Solar farm infrastructure**<br>Existing topography and vegetation mean this receiver would not have a view of solar farm infrastructure.<br>**Glint and glare**<br>Existing topography and vegetation would screen this receiver from any potential glint or glare. | **Nil** | **No mitigation required.** |
| R10 | South | 390m north of the proposal site | 577m | 289m | **Solar farm infrastructure**<br>Existing topography and vegetation mean this receiver would not have a view of solar farm infrastructure.<br>**Glint and glare**<br>Existing topography and vegetation would screen this receiver from any potential glint or glare. | **Nil** | **No mitigation required.** |

| Receiver ID | Orientation of dwelling[2] | Distance (m) and direction from proposal site | Distance (m) from closest piece of permanent infrastructure | Elevation (AHD) | Mitigation factors (consideration of topography and existing structures and vegetation)<br>Solar farm and ancillary infrastructure includes solar panels, invertors. battery, substation, tracks and site access.<br>Glint and glare refers to any potential reflective item onsite such as panel, frames, buildings etc. | Visual impact rating | Mitigation Measures |
|---|---|---|---|---|---|---|---|
| R11 | North west | 499m west of the proposal site | 552m | 301m | **Solar farm infrastructure**<br>Existing topography and vegetation mean this receiver would not have a view of solar farm infrastructure.<br>**Glint and glare**<br>Existing topography and vegetation would screen this receiver from any potential glint or glare. | **Nil** | **No mitigation required.** |
| R12 | South | 677m north west of the proposal site | 1,026m | 285m | **Solar farm infrastructure**<br>Existing topography, vegetation and structures mean this receiver would not have a view of solar farm infrastructure.<br>**Glint and glare**<br>Existing topography and vegetation would screen this receiver from any potential glint or glare. | **Nil** | **No mitigation required.** |
| R13 | West and east | 737m north west of the proposal site | 1,367m | 297m | **Solar farm infrastructure**<br>Existing topography, vegetation and structures mean this receiver would not have a view of solar farm infrastructure.<br>**Glint and glare**<br>Existing topography and vegetation would screen this receiver from any potential glint or glare. | **Nil** | **No mitigation required.** |

| Receiver ID | Orientation of dwelling[2] | Distance (m) and direction from proposal site | Distance (m) from closest piece of permanent infrastructure | Elevation (AHD) | Mitigation factors (consideration of topography and existing structures and vegetation)<br>Solar farm and ancillary infrastructure includes solar panels, invertors. battery, substation, tracks and site access.<br>Glint and glare refers to any potential reflective item onsite such as panel, frames, buildings etc. | Visual impact rating | Mitigation Measures |
|---|---|---|---|---|---|---|---|
| R15 | North | 783m west of the proposal site | 962m | 293m | **Solar farm infrastructure**<br>Existing topography, vegetation and structures mean this receiver would not have a view of solar farm infrastructure.<br>**Glint and glare**<br>Existing topography and vegetation would screen this receiver from any potential glint or glare. | **Nil** | **No mitigation required.** |
| R16 | North and south | 784m north east of the proposal site | 868m | 294m | **Solar farm infrastructure**<br>Existing topography and vegetation mean this receiver would not have a view of solar farm infrastructure.<br>**Glint and glare**<br>Existing topography and vegetation would screen this receiver from any potential glint or glare. | **Nil** | **No mitigation required.** |
| R17 | North and south | 892m north west of the proposal site | 1,159m | 288m | **Solar farm infrastructure**<br>Existing topography, vegetation and structures mean this receiver would not have a view of solar farm infrastructure.<br>**Glint and glare**<br>Existing topography and vegetation would screen this receiver from any potential glint or glare. | **Nil** | **No mitigation required.** |

| Receiver ID | Orientation of dwelling[2] | Distance (m) and direction from proposal site | Distance (m) from closest piece of permanent infrastructure | Elevation (AHD) | Mitigation factors (consideration of topography and existing structures and vegetation)<br>Solar farm and ancillary infrastructure includes solar panels, invertors. battery, substation, tracks and site access.<br>Glint and glare refers to any potential reflective item onsite such as panel, frames, buildings etc. | Visual impact rating | Mitigation Measures |
|---|---|---|---|---|---|---|---|
| R18 | North | 983m west of the proposal site | 1,086m | 289m | **Solar farm infrastructure**<br>Existing topography and vegetation mean this receiver would not have a view of solar farm infrastructure.<br>**Glint and glare**<br>Existing topography and vegetation would screen this receiver from any potential glint or glare. | **Nil** | **No mitigation required.** |
| R19 | North | 970m north east of the proposal site | 1,084m | 287m | **Solar farm infrastructure**<br>Existing topography and vegetation mean this receiver would not have a view of solar farm infrastructure.<br>**Glint and glare**<br>Existing topography and vegetation would screen this receiver from any potential glint or glare. | **Nil** | **No mitigation required.** |

| Receiver ID | Orientation of dwelling[2] | Distance (m) and direction from proposal site | Distance (m) from closest piece of permanent infrastructure | Elevation (AHD) | Mitigation factors (consideration of topography and existing structures and vegetation)<br>Solar farm and ancillary infrastructure includes solar panels, invertors. battery, substation, tracks and site access.<br>Glint and glare refers to any potential reflective item onsite such as panel, frames, buildings etc. | Visual impact rating | Mitigation Measures |
|---|---|---|---|---|---|---|---|
| R20 | North | 1,004m east of the proposal site | 1,052m | 295m | **Solar farm infrastructure**<br>Existing topography and vegetation mean this receiver would not have a view of solar farm infrastructure.<br>This receiver is accessed off Delroy Road. They have no views of the access track from the dwelling due to existing screening.<br>**Glint and glare**<br>Existing topography and vegetation would screen this receiver from any potential glint or glare. | **Nil** | **No mitigation required.** |
| R21 | South west | 1,014m west of the proposal site | 1,324m | 301m | **Solar farm infrastructure**<br>Existing topography and vegetation mean this receiver would not have a view of solar farm infrastructure.<br>**Glint and glare**<br>Existing topography and vegetation would screen this receiver from any potential glint or glare. | **Nil** | **No mitigation required.** |

| Receiver ID | Orientation of dwelling[2] | Distance (m) and direction from proposal site | Distance (m) from closest piece of permanent infrastructure | Elevation (AHD) | Mitigation factors (consideration of topography and existing structures and vegetation)<br>Solar farm and ancillary infrastructure includes solar panels, invertors. battery, substation, tracks and site access.<br>Glint and glare refers to any potential reflective item onsite such as panel, frames, buildings etc. | Visual impact rating | Mitigation Measures |
|---|---|---|---|---|---|---|---|
| R22 | South west | 1,083m north of the proposal site | 1,215m | 311m | **Solar farm infrastructure**<br>Existing topography and vegetation mean this receiver would not have a view of solar farm infrastructure.<br>**Glint and glare**<br>Existing topography and vegetation would screen this receiver from any potential glint or glare. | **Nil** | **No mitigation required.** |
| R23 | West | 1,092m west of the proposal site | 1,214m | 291m | **Solar farm infrastructure**<br>Existing topography and vegetation mean this receiver would not have a view of solar farm infrastructure.<br>**Glint and glare**<br>Existing topography and vegetation would screen this receiver from any potential glint or glare. | **Nil** | **No mitigation required.** |
| R24 | West | 1,098m west of the proposal site | 1197m | 287m | **Solar farm infrastructure**<br>Existing topography and vegetation mean this receiver would not have a view of solar farm infrastructure.<br>**Glint and glare**<br>Existing topography and vegetation would screen this receiver from any potential glint or glare. | **Nil** | **No mitigation required.** |

| Receiver ID | Orientation of dwelling[2] | Distance (m) and direction from proposal site | Distance (m) from closest piece of permanent infrastructure | Elevation (AHD) | Mitigation factors (consideration of topography and existing structures and vegetation)<br>Solar farm and ancillary infrastructure includes solar panels, invertors. battery, substation, tracks and site access.<br>Glint and glare refers to any potential reflective item onsite such as panel, frames, buildings etc. | Visual impact rating | Mitigation Measures |
|---|---|---|---|---|---|---|---|
| R25 | West | 1,171 west of the proposal site | 1,344m | 300m | **Solar farm infrastructure**<br>Existing topography and vegetation mean this receiver would not have a view of solar farm infrastructure.<br>**Glint and glare**<br>Existing topography and vegetation would screen this receiver from any potential glint or glare. | **Nil** | **No mitigation required.** |
| R26 | East | 1,174m east of the proposal site | 1,250m | 309m | **Solar farm infrastructure**<br>Existing topography and vegetation mean this receiver would not have a view of solar farm infrastructure.<br>This receiver is accessed off Delroy Road. They have no views of the access track from the dwelling due to existing screening.<br>**Glint and glare**<br>Existing topography and vegetation would screen this receiver from any potential glint or glare. | **Nil** | **No mitigation required.** |

| Receiver ID | Orientation of dwelling[2] | Distance (m) and direction from proposal site | Distance (m) from closest piece of permanent infrastructure | Elevation (AHD) | Mitigation factors (consideration of topography and existing structures and vegetation)<br>Solar farm and ancillary infrastructure includes solar panels, invertors. battery, substation, tracks and site access.<br>Glint and glare refers to any potential reflective item onsite such as panel, frames, buildings etc. | Visual impact rating | Mitigation Measures |
|---|---|---|---|---|---|---|---|
| R27 | South | 1,209m north east of the proposal site | 1,298m | 284m | **Solar farm infrastructure**<br>Existing topography and vegetation mean this receiver would not have a view of solar farm infrastructure.<br>**Glint and glare**<br>Existing topography and vegetation would screen this receiver from any potential glint or glare. | **Nil** | **No mitigation required.** |
| R28 | South | 1,244m west north west of the proposal site | 1,651m | 282m | **Solar farm infrastructure**<br>Existing topography, vegetation and structures mean this receiver would not have a view of solar farm infrastructure.<br>**Glint and glare**<br>Existing topography and vegetation would screen this receiver from any potential glint or glare. | **Nil** | **No mitigation required.** |
| R29 | South | 1,335m west north west of the proposal site | 1,644m | 282m | **Solar farm infrastructure**<br>Existing topography, vegetation and structures mean this receiver would not have a view of solar farm infrastructure.<br>**Glint and glare**<br>Existing topography and vegetation would screen this receiver from any potential glint or glare. | **Nil** | **No mitigation required.** |

| Receiver ID | Orientation of dwelling[2] | Distance (m) and direction from proposal site | Distance (m) from closest piece of permanent infrastructure | Elevation (AHD) | Mitigation factors (consideration of topography and existing structures and vegetation)<br>Solar farm and ancillary infrastructure includes solar panels, invertors. battery, substation, tracks and site access.<br>Glint and glare refers to any potential reflective item onsite such as panel, frames, buildings etc. | Visual impact rating | Mitigation Measures |
|---|---|---|---|---|---|---|---|
| R30 | West | 1,388m west of the proposal site | 1,436m | 289m | **Solar farm infrastructure**<br>Existing topography and vegetation mean this receiver would not have a view of solar farm infrastructure.<br>**Glint and glare**<br>Existing topography and vegetation would screen this receiver from any potential glint or glare. | **Nil** | **No mitigation required.** |
| R31 | South | 1,400m west of the proposal site | 1,410m | 289m | **Solar farm infrastructure**<br>Existing topography and vegetation mean this receiver would not have a view of solar farm infrastructure.<br>**Glint and glare**<br>Existing topography and vegetation would screen this receiver from any potential glint or glare. | **Nil** | **No mitigation required.** |
| R32 | South | 1,415m south west of the proposal site | 1,459m | 326m | **Solar farm infrastructure**<br>Existing topography and vegetation mean this receiver would not have a view of solar farm infrastructure.<br>**Glint and glare**<br>Existing topography and vegetation would screen this receiver from any potential glint or glare. | **Nil** | **No mitigation required.** |

| Receiver ID | Orientation of dwelling[2] | Distance (m) and direction from proposal site | Distance (m) from closest piece of permanent infrastructure | Elevation (AHD) | Mitigation factors (consideration of topography and existing structures and vegetation)<br>Solar farm and ancillary infrastructure includes solar panels, invertors. battery, substation, tracks and site access.<br>Glint and glare refers to any potential reflective item onsite such as panel, frames, buildings etc. | Visual impact rating | Mitigation Measures |
|---|---|---|---|---|---|---|---|
| R33 | South | 1,429m east of the proposal site | 1,490m | 294m | **Solar farm infrastructure**<br>Existing topography and vegetation mean this receiver would not have a view of solar farm infrastructure.<br>This receiver is accessed off Delroy Road. They have no views of the access track from the dwelling due to existing screening.<br>**Glint and glare**<br>Existing topography and vegetation would screen this receiver from any potential glint or glare. | **Nil** | **No mitigation required.** |
| R34 | East | 1,495m west of the proposal site | 1,553m | 290m | **Solar farm infrastructure**<br>Existing topography and vegetation mean this receiver would not have a view of solar farm infrastructure.<br>**Glint and glare**<br>Existing topography and vegetation would screen this receiver from any potential glint or glare. | **Nil** | **No mitigation required.** |

| Receiver ID | Orientation of dwelling[2] | Distance (m) and direction from proposal site | Distance (m) from closest piece of permanent infrastructure | Elevation (AHD) | Mitigation factors (consideration of topography and existing structures and vegetation)<br>Solar farm and ancillary infrastructure includes solar panels, invertors. battery, substation, tracks and site access.<br>Glint and glare refers to any potential reflective item onsite such as panel, frames, buildings etc. | Visual impact rating | Mitigation Measures |
|---|---|---|---|---|---|---|---|
| R35 | South | 1,504m north east of the proposal site | 1,593m | 289m | **Solar farm infrastructure**<br>Existing topography and vegetation mean this receiver would not have a view of solar farm infrastructure.<br>**Glint and glare**<br>Existing topography and vegetation would screen this receiver from any potential glint or glare. | **Nil** | **No mitigation required.** |
| R36 | West | 1,522m west of the proposal site | 1,578m | 288m | **Solar farm infrastructure**<br>Existing topography and vegetation mean this receiver would not have a view of solar farm infrastructure.<br>**Glint and glare**<br>Existing topography and vegetation would screen this receiver from any potential glint or glare. | **Nil** | **No mitigation required.** |
| R37 | North | 1,587m west south west of the proposal site | 1,614m | 311m | **Solar farm infrastructure**<br>Existing topography and vegetation mean this receiver would not have a view of solar farm infrastructure.<br>**Glint and glare**<br>Existing topography and vegetation would screen this receiver from any potential glint or glare. | **Nil** | **No mitigation required.** |

| Receiver ID | Orientation of dwelling[2] | Distance (m) and direction from proposal site | Distance (m) from closest piece of permanent infrastructure | Elevation (AHD) | Mitigation factors (consideration of topography and existing structures and vegetation)<br>Solar farm and ancillary infrastructure includes solar panels, invertors. battery, substation, tracks and site access.<br>Glint and glare refers to any potential reflective item onsite such as panel, frames, buildings etc. | Visual impact rating | Mitigation Measures |
|---|---|---|---|---|---|---|---|
| R38 | East | 1,637m west of the proposal site | 1,682m | 285m | **Solar farm infrastructure**<br>Existing topography and vegetation mean this receiver would not have a view of solar farm infrastructure.<br>**Glint and glare**<br>Existing topography and vegetation would screen this receiver from any potential glint or glare. | **Nil** | **No mitigation required.** |
| R39 | East | 1640m west of the proposal site | 1,689m | 285m | **Solar farm infrastructure**<br>Existing topography and vegetation mean this receiver would not have a view of solar farm infrastructure.<br>**Glint and glare**<br>Existing topography and vegetation would screen this receiver from any potential glint or glare. | **Nil** | **No mitigation required.** |
| R40 | East/north east | 1,663m south west of the proposal site | 1,731m | 305m | **Solar farm infrastructure**<br>Existing topography and vegetation mean this receiver would not have a view of solar farm infrastructure.<br>**Glint and glare**<br>Existing topography and vegetation would screen this receiver from any potential glint or glare. | **Nil** | **No mitigation required.** |

| Receiver ID | Orientation of dwelling[2] | Distance (m) and direction from proposal site | Distance (m) from closest piece of permanent infrastructure | Elevation (AHD) | Mitigation factors (consideration of topography and existing structures and vegetation)<br>Solar farm and ancillary infrastructure includes solar panels, invertors. battery, substation, tracks and site access.<br>Glint and glare refers to any potential reflective item onsite such as panel, frames, buildings etc. | Visual impact rating | Mitigation Measures |
|---|---|---|---|---|---|---|---|
| R41 | West | 1,675m west of the proposal site | 2,059m | 289m | **Solar farm infrastructure**<br>Existing topography and vegetation mean this receiver would not have a view of solar farm infrastructure.<br>**Glint and glare**<br>Existing topography and vegetation would screen this receiver from any potential glint or glare. | **Nil** | **No mitigation required.** |
| R42 | South | 1,686m north west of the proposal site | 2,083m | 281m | **Solar farm infrastructure**<br>Existing topography, vegetation and structures mean this receiver would not have a view of solar farm infrastructure.<br>**Glint and glare**<br>Existing topography and vegetation would screen this receiver from any potential glint or glare. | **Nil** | **No mitigation required.** |
| R43 | South | 1,705m west of the proposal site | 2,048m | 286m | **Solar farm infrastructure**<br>Existing topography and vegetation mean this receiver would not have a view of solar farm infrastructure.<br>**Glint and glare**<br>Existing topography and vegetation would screen this receiver from any potential glint or glare. | **Nil** | **No mitigation required.** |

| Receiver ID | Orientation of dwelling[2] | Distance (m) and direction from proposal site | Distance (m) from closest piece of permanent infrastructure | Elevation (AHD) | Mitigation factors (consideration of topography and existing structures and vegetation)<br>Solar farm and ancillary infrastructure includes solar panels, invertors. battery, substation, tracks and site access.<br>Glint and glare refers to any potential reflective item onsite such as panel, frames, buildings etc. | Visual impact rating | Mitigation Measures |
|---|---|---|---|---|---|---|---|
| R44 | East | 1,705m east of the proposal site | 1,810m | 279m | **Solar farm infrastructure**<br>Existing topography and vegetation mean this receiver would not have a view of solar farm infrastructure.<br>This receiver is accessed off Delroy Road. They have no views of the access track from the dwelling due to existing screening.<br>**Glint and glare**<br>Existing topography and vegetation would screen this receiver from any potential glint or glare. | **Nil** | **No mitigation required.** |
| R45 | West | 1,709m west of the proposal site | 1,966m | 285m | **Solar farm infrastructure**<br>Existing topography and vegetation mean this receiver would not have a view of solar farm infrastructure.<br>**Glint and glare**<br>Existing topography and vegetation would screen this receiver from any potential glint or glare. | **Nil** | **No mitigation required.** |

| Receiver ID | Orientation of dwelling[2] | Distance (m) and direction from proposal site | Distance (m) from closest piece of permanent infrastructure | Elevation (AHD) | Mitigation factors (consideration of topography and existing structures and vegetation)<br>Solar farm and ancillary infrastructure includes solar panels, invertors. battery, substation, tracks and site access.<br>Glint and glare refers to any potential reflective item onsite such as panel, frames, buildings etc. | Visual impact rating | Mitigation Measures |
|---|---|---|---|---|---|---|---|
| R46 | South | 1,737m west north west of the proposal site | 1,918m | 277m | **Solar farm infrastructure**<br>Existing topography, vegetation and structures mean this receiver would not have a view of solar farm infrastructure.<br>**Glint and glare**<br>Existing topography and vegetation would screen this receiver from any potential glint or glare. | **Nil** | **No mitigation required.** |
| R47 | East | 1,750m south of the proposal site | 1,781m | 303m | **Solar farm infrastructure**<br>Existing topography and vegetation mean this receiver would not have a view of solar farm infrastructure.<br>**Glint and glare**<br>Existing topography and vegetation would screen this receiver from any potential glint or glare. | **Nil** | **No mitigation required.** |
| R48 | South | 1,756m north of the proposal site | 1,839m | 292m | **Solar farm infrastructure**<br>Existing topography and vegetation mean this receiver would not have a view of solar farm infrastructure.<br>**Glint and glare**<br>Existing topography and vegetation would screen this receiver from any potential glint or glare. | **Nil** | **No mitigation required.** |

| Receiver ID | Orientation of dwelling[2] | Distance (m) and direction from proposal site | Distance (m) from closest piece of permanent infrastructure | Elevation (AHD) | Mitigation factors (consideration of topography and existing structures and vegetation)<br>Solar farm and ancillary infrastructure includes solar panels, invertors. battery, substation, tracks and site access.<br>Glint and glare refers to any potential reflective item onsite such as panel, frames, buildings etc. | Visual impact rating | Mitigation Measures |
|---|---|---|---|---|---|---|---|
| R49 | West | 1,757m south west of the proposal site | 1,792m | 329m | **Solar farm infrastructure**<br>Existing topography and vegetation mean this receiver would not have a view of solar farm infrastructure.<br>**Glint and glare**<br>Existing topography and vegetation would screen this receiver from any potential glint or glare. | **Nil** | **No mitigation required.** |
| R50 | East | 1,793 north west of the proposal site | 2,244m | 279m | **Solar farm infrastructure**<br>Existing topography, vegetation and structures mean this receiver would not have a view of solar farm infrastructure.<br>**Glint and glare**<br>Existing topography and vegetation would screen this receiver from any potential glint or glare. | **Nil** | **No mitigation required.** |
| R51 | South | 1,795m north west of the proposal site | 1,915m | 283m | **Solar farm infrastructure**<br>Existing topography and vegetation mean this receiver would not have a view of solar farm infrastructure.<br>**Glint and glare**<br>Existing topography and vegetation would screen this receiver from any potential glint or glare. | **Nil** | **No mitigation required.** |

| Receiver ID | Orientation of dwelling[2] | Distance (m) and direction from proposal site | Distance (m) from closest piece of permanent infrastructure | Elevation (AHD) | Mitigation factors (consideration of topography and existing structures and vegetation)<br>Solar farm and ancillary infrastructure includes solar panels, invertors. battery, substation, tracks and site access.<br>Glint and glare refers to any potential reflective item onsite such as panel, frames, buildings etc. | Visual impact rating | Mitigation Measures |
|---|---|---|---|---|---|---|---|
| R52 | South | 1,800m north east of the proposal site | 1,914m | 289m | **Solar farm infrastructure**<br>Existing topography and vegetation mean this receiver would not have a view of solar farm infrastructure.<br>**Glint and glare**<br>Existing topography and vegetation would screen this receiver from any potential glint or glare. | **Nil** | **No mitigation required.** |
| R53 | East | 1,812m west of the proposal site | 2,129m | 295m | **Solar farm infrastructure**<br>Existing topography and vegetation mean this receiver would not have a view of solar farm infrastructure.<br>**Glint and glare**<br>Existing topography and vegetation would screen this receiver from any potential glint or glare. | **Nil** | **No mitigation required.** |
| R54 | East | 1,885m north west of the proposal site | 2,406m | 277m | **Solar farm infrastructure**<br>Existing topography, vegetation and structures mean this receiver would not have a view of solar farm infrastructure.<br>**Glint and glare**<br>Existing topography and vegetation would screen this receiver from any potential glint or glare. | **Nil** | **No mitigation required.** |

| Receiver ID | Orientation of dwelling[2] | Distance (m) and direction from proposal site | Distance (m) from closest piece of permanent infrastructure | Elevation (AHD) | Mitigation factors (consideration of topography and existing structures and vegetation)<br>Solar farm and ancillary infrastructure includes solar panels, invertors. battery, substation, tracks and site access.<br>Glint and glare refers to any potential reflective item onsite such as panel, frames, buildings etc. | Visual impact rating | Mitigation Measures |
|---|---|---|---|---|---|---|---|
| R55 | East | 1,913m south west of the proposal site | 1,954m | 326m | **Solar farm infrastructure**<br>Existing topography and vegetation mean this receiver would not have a view of solar farm infrastructure.<br>**Glint and glare**<br>Existing topography and vegetation would screen this receiver from any potential glint or glare. | **Nil** | **No mitigation required.** |
| R56 | North | 1,916m west of the proposal site | 1,973m | 288m | **Solar farm infrastructure**<br>Existing topography and vegetation mean this receiver would not have a view of solar farm infrastructure.<br>**Glint and glare**<br>Existing topography and vegetation would screen this receiver from any potential glint or glare. | **Nil** | **No mitigation required.** |
| R57 | South | 1,938m south west of the proposal site | 1,971m | 328m | **Solar farm infrastructure**<br>Existing topography and vegetation mean this receiver would not have a view of solar farm infrastructure.<br>**Glint and glare**<br>Existing topography and vegetation would screen this receiver from any potential glint or glare. | **Nil** | **No mitigation required.** |

| Receiver ID | Orientation of dwelling[2] | Distance (m) and direction from proposal site | Distance (m) from closest piece of permanent infrastructure | Elevation (AHD) | Mitigation factors (consideration of topography and existing structures and vegetation)<br>Solar farm and ancillary infrastructure includes solar panels, invertors. battery, substation, tracks and site access.<br>Glint and glare refers to any potential reflective item onsite such as panel, frames, buildings etc. | Visual impact rating | Mitigation Measures |
|---|---|---|---|---|---|---|---|
| R58 | West | 1,948m north east of the proposal site | 1,904m | 277m | **Solar farm infrastructure**<br>Existing topography and vegetation mean this receiver would not have a view of solar farm infrastructure.<br>**Glint and glare**<br>Existing topography and vegetation would screen this receiver from any potential glint or glare. | **Nil** | **No mitigation required.** |
| R59 | East | 1,979m west of the proposal site | 2,040m | 304m | **Solar farm infrastructure**<br>Existing topography and vegetation mean this receiver would not have a view of solar farm infrastructure.<br>**Glint and glare**<br>Existing topography and vegetation would screen this receiver from any potential glint or glare. | **Nil** | **No mitigation required.** |
| R60 | East | 1979m north west of the proposal site | 2,510m | 276m | **Solar farm infrastructure**<br>Existing topography, vegetation and structures mean this receiver would not have a view of solar farm infrastructure.<br>**Glint and glare**<br>Existing topography and vegetation would screen this receiver from any potential glint or glare. | **Nil** | **No mitigation required.** |
| Associated receivers | | | | | | | |

| Receiver ID | Orientation of dwelling[2] | Distance (m) and direction from proposal site | Distance (m) from closest piece of permanent infrastructure | Elevation (AHD) | Mitigation factors (consideration of topography and existing structures and vegetation)<br>Solar farm and ancillary infrastructure includes solar panels, invertors. battery, substation, tracks and site access.<br>Glint and glare refers to any potential reflective item onsite such as panel, frames, buildings etc. | Visual impact rating | Mitigation Measures |
|---|---|---|---|---|---|---|---|
| R0 | North | Within Proposal site | 428m | 307m | **Solar farm infrastructure**<br>Existing topography, vegetation and structures mean this receiver would have broken views of solar farm infrastructure.<br>**Glint and glare**<br>Existing topography and vegetation would screen this receiver from any potential glint or glare. | **Nil** | **No mitigation required.** |
| R1 | East | 95m west of the proposal site | 361m | 318m | **Solar farm infrastructure**<br>Existing topography, vegetation and structures mean this receiver would not have a view of solar farm infrastructure.<br>**Glint and glare**<br>Existing topography and vegetation would screen this receiver from any potential glint or glare. | **Nil** | **No mitigation required.** |
| R14 | East | 771m east of the proposal site | 849m | 289m | **Solar farm infrastructure**<br>Existing topography, vegetation and structures mean this receiver would not have a view of solar farm infrastructure.<br>**Glint and glare**<br>Existing topography and vegetation would screen this receiver from any potential glint or glare. | **Nil** | **No mitigation required.** |

## Associated infrastructure

The impact assessment outlined above for each viewpoint, receiver, public lands and National Park addresses the potential visual impact of infrastructure proposed. This section addresses specific concerns regarding to the associated infrastructure and lighting.

The proposal doesn’t include the construction of any new transmission lines offsite. Connection to the national grid would be via a new onsite substation and a new grind connection transmission line from the existing transmission line across the site. This grid connection may be above or below ground, however this will be determined for final designs. The proposed substation is situated in the north western end of the site. The proposed substation is situated in the north western end of the site. The footprint of the substation is around 118m x 108m. The majority of the substation will remain under 10m high, although the lightening poles will reach up to 20m high and the gantry up to 18m high. The proposed substation is located in a generally isolated location. As discussed, the proposal site is well screened from any viewpoint, receiver and public lands, therefore there is unlikely to be any views of the proposed substation or above ground grid connection transmission lines.

There would be no permanent night lighting installed within the array. Night lighting will only be used in the case of maintenance and in the event of an emergency and would be designed to ensure reduce disturbance to neighbouring properties. Any lighting installed will be in accordance with AS4228-1997 - Control of Obtrusive Effects of Outdoor Lighting.

Some minor vegetation clearing, and trimming is required along Delroy Road for safe access to site. The vegetation clearing would be minor and is unlikely to be noticeable for receivers along Delroy Road due to their short duration of views and existing landscape characteristic of liner infrastructure with patches of roadside vegetation.

## Glare and glint

Due to the materials used in the construction of PV panels being primarily glass and steel there is a perceived issue of glint and glare surrounding the reflectivity solar panels. As a result of the perceived reflection levels, there is a concern of possible distractions to motorists, aircraft and the hazard of eye damage. Glint is a quick reflection that occurs when the sun is reflected on a smooth surface. Glare is a longer reflection.

Solar panels are designed to absorb the sun energy and directly convert it to electricity. Current PV modules absorb approximately 93.5% of the light received. The solar panels are designed using anti-reflective solar glass effectively reducing reflectivity. Thin slivers of metal stripping on the face of the panels further reduce any potential glare issues that may occur.

The level of glare and reflectance from the PV solar panels are considerably lower than the level of glare and reflectance of common surfaces, particularly those surrounding the proposed solar farm. The PV panels would reflect approximately 6.5% of energy which is less than typical rural environments which have a reflectivity of approximately 15-30% (Figure 7-5). Seen from above (such as from aircraft) they appear dark grey and do not cause a glare or reflectivity hazard. Solar PV plants have been installed on a number of airports around the world and in Australia including Tamworth NSW, Karratha in WA and Darwin in NT.

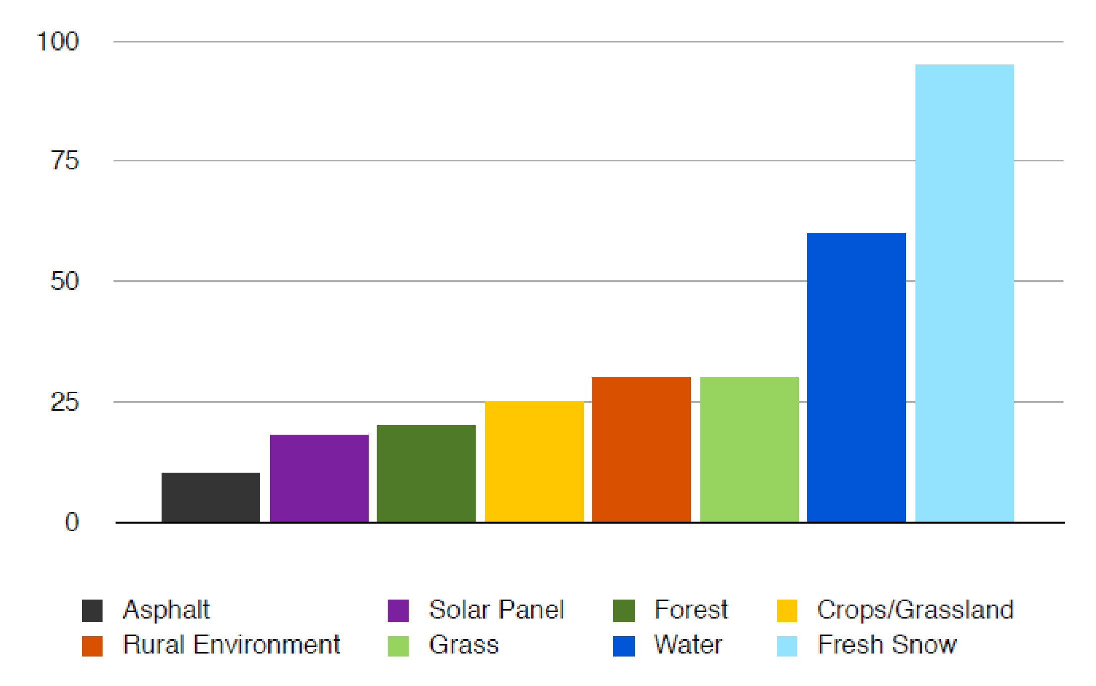



Figure 7-5 Comparative reflection analysis (Spaven Consulting, 2011)

It is noted that, in additional to the arrays, other onsite infrastructure may have potential to cause glint or glare depending on the sun angle, specifically:

- Steel array mountings – array mounting would be steel or aluminium.
- PCUs.
- Transmission line poles, if steel is used.
- On-site substation.
- Temporary construction site buildings.

Consistent with the visual impact assessment of each receiver above, it would be the receivers and public locations that have views of the proposal that have potential to experience glint and glare from the infrastructure. It was identified only one receiver (R4) would have potential to have views of the proposal site, however views would be broken up by existing screening. Therefore, it is unlikely there would be potential glare and glint impacts. The other receiver that may have potential for glare and glint impacts is the Dubbo Model Aero Club, adjacent to the proposal site. The club operates Sunday mornings and is located east of the site. Any glare or glint would be short term depending on the angle of the sun and time of the day. As mentioned the owner has no concerns regarding the solar farm, it is recommended consultation is ongoing to ensure any potential impacts or concerns that occur can be addressed.

Infrastructure would be relatively dispersed and unlikely to present a glare or reflectivity hazard to residences, traffic or aircraft.

## Dark sky region impacts

The proposal is located approximately 120km from the Siding Spring Observatory within the Dark Sky Region (DPE, 2016). The Dark Sky Region in NSW is centred upon the site of this observatory which is considered Australia's most important visible-light observatory. The Dark Sky Region consists of land within a 200km radius of the observatory, which therefore includes the solar farm proposal site.

The Dark Sky Region Guidelines have been prepared to ensure the night sky is free of light pollution and increased levels of atmospheric dust which may impact on the observatory.

General measures to minimise light pollution include control of upward spill night lighting (such as the use of shields), reducing the overall number of lights and the duration that they are used for, using asymmetric beams when using floodlights, ensuring lights are not directed towards reflective surfaces and using warm white colours.

Relevant environmental considerations for the solar farm, given its location within the Dark Sky Region include:

- Construction phase:
    - Control of dust from vehicle haulage, excavation, any clearing required, stockpiles. Water or other means can be used to control dust.
    - Night works should be strictly limited and if required, undertaken with the above prescriptions to minimise its impact.
- Operational phase:
    - Control of dust from the operation; maintenance of ground cover beneath panels, minimising traffic movements on unsealed tracks during operation.
    - Night lighting limited and if required, undertaken with the above prescriptions to minimise its impact.

As the site cropping and more intensive agricultural use would be less under the solar farm's operation (allowing for some continued grazing), it is expected dust generating in operation may be less than existing levels. With measures to control dust and light spill, impacts on the observatory are considered low.

### Visual impact from nearest R2 – Low Density Residential land (proposed ISEPP amendments)

In relation to the draft *Proposed Infrastructure SEPP Amendments: Renewable Energy and Regional Cities* legislation (addressed in Section 5.2.3), additional considerations would apply to wind and solar energy developments that:

4. Are located in or near Albury, Armidale, Bathurst, Dubbo, Griffith, Orange, Tamworth and Wagga Wagga;
5. Located within 10km of land zoned B3 - Commercial Core, or within 5km of any residential land zoned R1 – General Residential, or R3 – Medium Density Residential; and
6. Are 'utility-scale' ie. for the purpose of generating electricity for export to the electricity grid.

The nearest R2 zoned land is mapped 4.1km west of the proposal site however, this distance is measured from the Delroy Road/Minore Road intersection, which would not have any visual influence as the tallest piece of infrastructure would be limited to standard Give Way road signage. R2 zoned land is mapped 6km west of the nearest solar array (maximum height of 2.1m).

As stated in the preceding visual impact assessment, the Forest Glen SF viewshed is generally limited and effectively screened from its surroundings due to low local relief (topographic screening) and abundant existing vegetation screening as shown in Figure 7-3. The vegetation surrounding the site is extensive, across many land holdings and is therefore considered relatively secure in this function (refer to Figure 7-6).

Due to the flat topography and vegetation screening in the area, it is unlikely that any receivers within the nearest R2 zone would receive a visual impact from the proposal, additionally this lies beyond the 5km distance suggested by DPIE to limit regional city encroachment. Therefore the proposal is unlikely to have a significant impact on the scenic quality and landscape character of Dubbo.

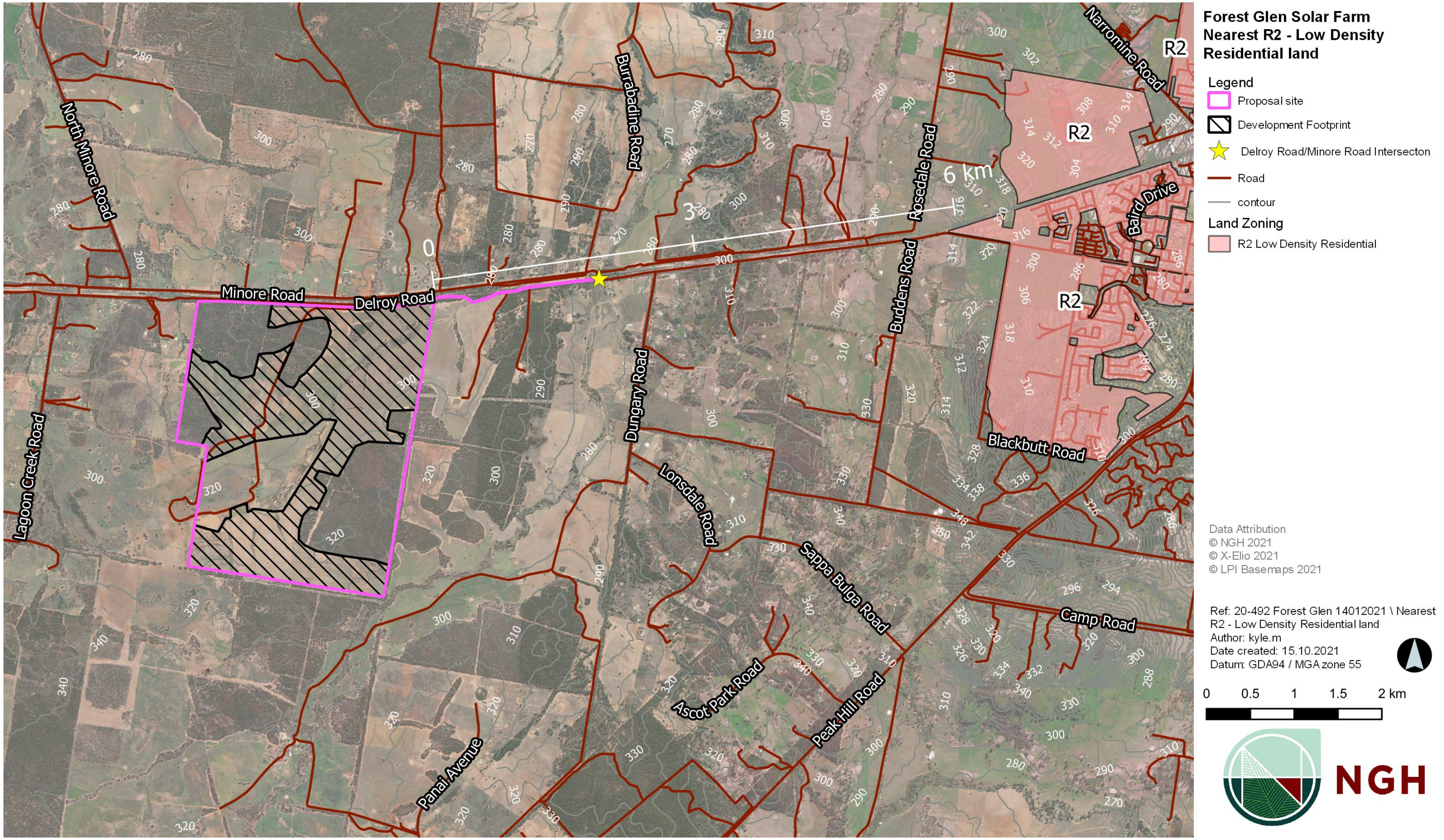



Figure 7-6 Nearest R2 – Low Density Residential land , showing distance to Dubbo, elevation and existing screening

### 7.1.4. Cumulative visual impacts

Adverse cumulative impacts occur when the infrastructure or activities at the solar farm site exacerbate the negative impacts of other infrastructure or activities occurring nearby. Cumulative impacts have been considered for the construction and operational stage of the project separately.

#### Construction

During construction, the additional traffic and dust generation impacts pose the greatest potential for cumulative visual impacts. The visual impact of increased traffic movements to the site would be predominantly limited to construction. A Traffic Management Plan (TMP) would be developed to minimise vehicle movements as much as practicable during construction.

#### Operation

During operation, with the exception of infrequent maintenance operations such as inverter or transformer replacement, a small maintenance team using standard vehicles is all that will be required. Cumulative visual traffic impacts are considered negligible.

Generally, adverse cumulative visual impacts are anticipated to be manageable due to the existing and retained vegetative screening and flat nature of the site that blocks out the majority of views.

### 7.1.5. Safeguard and mitigation measures

The proposal is unlikely to have potential impacts on the visual amenity or landscape character of the area. The mitigation measures suggested are intended to lessen the visual impact of the development whilst ensuring the existing visual character of the area is not altered significantly.

Table 7-6 Safeguards and mitigation measures for biodiversity impacts

*PC: Pre-Construction, C: Construction; O: Operation; D: Decommissioning*

| ID | Safeguards and mitigation measures | C | O | D |
|---|---|---|---|---|
| V1 | The materials and colour of onsite infrastructure would, where practical, be non-reflective and in keeping with the materials and colouring of existing infrastructure or of a colour that will blend with the landscape. Where practical:<br>• Proposed new buildings will be non-reflective and in eucalypt green, beige or muted brown.<br>• Pole mounts will be non-reflective.<br>• Security fencing posts and wire would be non-reflective. | Design | | |
| V2 | Ongoing consultation to be undertaken with R4 and the Dubbo Model Aero Club | C | O | D |
| V3 | Existing vegetation should be retained and protected, where possible, during the works to maintain the existing level of screening. | C | | |
| V4 | Night lighting would be minimised to the maximum extent possible (i.e. manually operated safety lighting at main component locations). | | O | |

## 7.2. Noise and vibration

**SECRETARY'S REQUIREMENTS**

*The EIS must also address the following specific issues:*

- ***Noise –*** *including an assessment of the construction noise impacts of the development in accordance with the Interim Construction Noise Guideline (ICNG), operational noise impacts in accordance with the NSW Noise Policy for Industry 2017 and a draft noise management plan if the assessment shows construction noise is likely to exceed applicable criteria;*

Noise and vibration impacts are an important consideration in the planning and implementation of the proposal's construction and maintenance activities.

### 7.1.1 Approach

NGH conducted noise modelling against established noise criteria for the construction and operational phases of the proposal, presented below. No onsite background noise monitoring was undertaken. The background noise levels were determined by NSW Policy for Industry (NPfI) (EPA 2017). Construction and operational noise generated by the project were modelled using the Transport for NSW construction noise calculator to determine if there would be any noise exceedances during these stages of the project. Feasible measures have been proposed for any potential noise exceedances.

### 7.1.2 Existing environment

The proposal site is within the locality of Minore and approximately 16km west of Dubbo. The locality is sparsely populated with the existing noise sources being from the land uses on and adjacent to the proposal site generally consist of:

- Road traffic noise from local roads including Minore Road and Delroy Road, which would have low traffic volumes.
- Trains along the Main Western Railway line.
- Spraying, cultivation and harvesting of crops.
- Livestock grazing and management.

Onsite and on adjacent properties, existing noise generating equipment or activities include tractors, headers, bailers, grain and livestock transport, quad bikes, light vehicles, and heavy vehicles. These land uses characterise the background noise within the area. Noise levels from farm activities are concentrated at peak times during the year such as seeding and harvesting whereas noise from local roads is more continuous throughout the year.

The proposal site is generally flat elevation ranging from to 283m to 325m AHD. The majority of receivers within 2km of the Forest Glen SF are lower in the landscape or a similar elevation to the proposal site.

There are 20 receivers within 1km of the proposal site and 61 receivers within 2km of the proposal site. The residences are outlined in Table 7-7 and shown in Figure 7-2. The nearest non-associated residential dwelling is approximately 153m north of the proposal site (R2). There are three associated receivers including R0, R1, and R14. The table also outlines distance to the proposed upgrade works to Minore and Delroy Road, as there would be some receivers closer to the proposed upgrade work rather than works within the proposal site. For the upgrades along Delory Road and intersection upgrades at Delroy and

Minore Road R61[3] is the closest non-associated receiver. Associated receivers are not considered as part of this assessment.

Table 7-7 Distance between the nearest non-associated residences to the proposal site

| Residence | Distance (m) |
|---|---|
| **To proposal site boundary** | |
| R2 | 153 |
| R3 | 160 |
| R4 | 163 |
| R5 | 165 |
| R6 | 180 |
| R7 | 260 |
| R8 | 261 |
| R9 | 381 |
| R10 | 390 |
| R11 | 499 |
| R12 | 677 |
| R13 | 737 |
| R15 | 783 |
| R16 | 784 |
| R17 | 892 |
| R18 | 938 |
| R19 | 970 |
| **To upgrades along Delroy Road including intersection** | |
| R20 | 1000 |

[3] R61 is not within the 2km buffer zone from the proposal site that has been used to identify receivers that may be impacted by solar farm infrastructure, however due to the receivers proximity to intersection works it has been included in the noise assessment for scenario 2. Activities along Delroy road associated with the solar farm have been considered minor in comparison to the extent of works proposed for solar array structures, requiring approximately one week of work for minor upgrades to pavement.

| Residence | Distance (m) |
|---|---|
| R27 | 728 |
| R33 | 587 |
| R35 | 447 |
| R44 | 214 |
| R51 | 365 |
| R52 | 637 |
| R58 | 276 |
| R61 | 190 |

### Background noise levels

Assessment criteria and noise management levels for the construction and operational noise are derived from the existing noise environment of the sensitive receivers. The NSW Policy for Industry (NPfI) (EPA 2017) outlines methods for determining the background noise level of an area. For this assessment, the NPfI's minimum Rating Background Noise Level (RBL) from Table 2.1 of the NPfI has been adopted to describe the RBL of the areas around the proposal. Based on the identified receivers, existing environment and land zoning on and adjacent the proposal site, the noise environment is classified as rural. The RBL to be adopted for all receiver locations as part of this assessment are described below (Table 7-8). It is anticipated, however that at certain periods of the year that background noise levels would exceed the levels described in the NPfI guideline. As such this assessment of impacts is likely to be conservative and represents a worst-case scenario.

Table 7-8 Rating background noise level dB(A)

| Time of day | Applicable Rating Background Noise Level, dB(A) |
|---|---|
| Day | **35** |
| Evening | **30** |
| Night | **30** |

## 7.2.1. Construction noise impact assessment

### Criteria

The NSW Interim Construction Noise Guideline (ICNG) (DECC 2009) deals with managing construction noise impacts. According to the guideline, a quantitative assessment of noise impacts is warranted when works are likely to impact an individual or sensitive land use for more than three weeks in total. The construction of the Forest Glen Solar Farm would be 12-18 months with peak construction for 10 months and therefore meets the requirements of a quantitative assessment.

## Residential receivers

The NSW ICNG (DECC 2009) specifies noise targets, or 'noise management levels', for residences and other noise sensitive receivers (Table 7-9). The RBL is used when determining the management level. The RBL is the overall single-figure background noise level measured in each relevant assessment period. Residential receivers are considered 'noise affected' where construction noise levels are greater than the noise management levels identified below.

Table 7-9 Noise management levels at residential receivers

| Time of day | Management Level |
|---|---|
| Recommended standard hours:<br>Monday to Friday 7 am to 6 pm<br>Saturday 8 am to 1 pm<br>No work on Sundays or public holidays | Noise affected<br>Rating Background Level + 10dB(A) |
| | Highly noise affected<br>75dB(A) |
| Outside recommended standard hours | Noise affected<br>Rating Background Level + 5dB(A) |

Table 7-10 identifies the adopted construction Noise Management Levels (NMLs) for the nearest residential noise receivers for the Forest Glen SF (refer to Table 7-7). The NMLs for the receiver locations are derived from the RBLs represented by the background noise levels for the site and NSW ICNG (DECC 2009) criteria (Table 7-9). During standard construction hours, a highly affected noise criteria of 75 dB(A) applies for all receivers. Only the day RBL is applicable to the construction phase of the project. No construction works would be undertaken, or equipment utilized during evening or night hours.

Table 7-10 Construction noise management levels at residential receivers

| Location description | Day $L_{A90}$ background noise level (RBL) | Day noise management $L_{A90}$ $_{(15min)}$ |
|---|---|---|
| All residential receivers (Table 7-7) | 35 dB(A) | 35 + 10 = 45 dB(A) |

## Construction noise sources

Construction noise impacts would likely be from the operation of construction equipment. Several key activities on the site that are likely to produce the most noise include:

- Site establishment and earthworks for the construction of access roads, compounds and hard stands.
- Upgrade works along Delory Road and at the intersection with Minore Road.
- Pile driving for solar panel mounting system and trenching for the installation of cabling.
- Assembly of frames and panels, substation and transformers.

The equipment associated with these four scenarios would dominate the noise from the works at various times. The anticipated equipment noise has been used to predict the likely noise associated with each scenario. The equipment and their sound power level to be used within the proposal site for each scenario are in Table 7-11. The sound power levels for the equipment presented in the table are sourced from the Australian Standard 2436 – 2010 'Guide to Noise Control on Construction, Demolition and Maintenance Sites,' Transport for NSW Construction Noise Estimator, and information from past projects.

For each construction scenario, the 'worst case scenario' was modelled, where the three noisiest plant and machinery items are operating continuously and concurrently. This is unlikely to be the case and as such the noise levels should be lower than predicted.

Table 7-11 Construction noise scenario plant

| Construction equipment | Sound pressure level @ 7m ((dB(A)) | No. of units |
|---|---|---|
| **Scenario 1 – Site establishment and earthworks** | | |
| **Light vehicle** | 78 | 5 |
| **Grader** | 85 | 2 |
| **Excavator (tracked) 35t** | 85 | 4 |
| **Water cart** | 83 | 2 |
| **Vibratory roller** | 84 | 2 |
| **Dump truck** | 83 | 2 |
| **Scenario 2 –Upgrade works along Delroy Road and at the Minore Road intersection** | | |
| **Light vehicle** | 78 | 1 |
| **Grader** | 85 | 1 |
| **Smooth drum roller** | 82 | 1 |
| **Dump truck** | 83 | 1 |
| **Asphalt truck & sprayer** | 81 | 1 |
| **Scenario 3 – Piling of panel supports and trenching for cabling** | | |
| **Front end loader** | 88 | 2 |
| **Dump truck/road truck** | 83 | 2 |
| **Piling rig** | 89 | 3 |
| **Light vehicle** | 78 | 5 |
| **Power hand tools** | 80 | 2 |
| **Trencher** | 80 | 1 |
| **Scenario 4 – Assembly of frames and panels, substation and transformers** | | |
| **Front end loader/telehandler** | 88 | 2 |
| **Light vehicle** | 78 | 5 |
| **Power hand tools** | 80 | 3 |
| **Crane** | 88 | 2 |
| **Generator** | 78 | 1 |

## Construction noise assessment

The Transport for NSW construction noise calculator is a standard tool that can be used to model the noise of construction equipment. It was used to quantify the likely impact of noise at each non-associated receiver within 1km of the proposal site during construction. The calculator uses the following to model the noise impact:

- Relevant noise source data.
- Separation distances between sources and receivers.
- Ground type between sources and receivers, either green fields or concrete urban areas
- Mitigation from barriers (natural and purpose built).

Plant and equipment were modelled for three construction scenarios representative of noise generating construction conditions. The predicted levels are considered a worst-case scenario based on the three noisiest plant and machinery items operating continuously and concurrently. Construction activities are proposed to be progressive and would occur at several locations simultaneously.

Table 7-12 presents the noise levels likely to be experienced at the nearby affected receiver locations during the construction works within the Development footprint.

Table 7-12 Predicted $L_{Aeq}$ 15 min construction noise levels at receiver locations for works with the proposal site for each scenario, dB(A)

| Receiver location | Noise management level[4] | Predicted construction noise Level, $L_{Aeq\ (15\ min)}$ [5] | Compliance with criteria?<br>(exceedance) | Comment<br>Clearly audible = < 10 dB (A) above NML<br>Moderately intrusive = >10 dB (A) above NML<br>Highly affected = > 75 dB (A) |
|---|---|---|---|---|
| Scenario 1 – Site establishment and earthworks | | | | |
| **R2** | 45 | 57 | **No (12)** | **Moderately Intrusive** |
| **R3** | | 56 | **No (11)** | **Moderately Intrusive** |
| **R4** | | 56 | **No (11)** | **Moderately Intrusive** |
| **R5** | | 56 | **No (11)** | **Moderately Intrusive** |
| **R6** | | 55 | **No (10)** | **Moderately Intrusive** |
| **R7** | | 50 | **No (5)** | **Clearly Audible** |
| **R8** | | 50 | **No (5)** | **Clearly Audible** |

[4]Noise management for standard day time construction works (i.e. Monday to Friday 7am to 6pm and Saturday 8am to 1pm).

[5] Worst case scenario of the 3 noisiest plant and equipment being used concurrently and continuously.

| Receiver location | Noise management level[4] | Predicted construction noise Level, $L_{Aeq\ (15\ min)}$ [5] | Compliance with criteria? (exceedance) | Comment Clearly audible = < 10 dB (A) above NML Moderately intrusive = >10 dB (A) above NML Highly affected = > 75 dB (A) |
|---|---|---|---|---|
| **R9** | | 45 | **Yes** | **NA** |
| **R10** | | 44 | **Yes** | **NA** |
| **R11** | | 41 | **Yes** | **NA** |
| **R12** | | 37 | **Yes** | **NA** |
| **R13** | | 36 | **Yes** | **NA** |
| **R15** | | 35 | **Yes** | **NA** |
| **R16** | | 35 | **Yes** | **NA** |
| **R17** | | 33 | **Yes** | **NA** |
| **R18** | | 32 | **Yes** | **NA** |
| **R19** | | 32 | **Yes** | **NA** |
| **Scenario 2 – Upgrade works along Delroy Road and at the Minore Road intersection** | | | | |
| **R61** | 45 | 48 | **No(3)** | **Clearly Audible** |
| **R44** | | 47 | **No (2)** | **Clearly Audible** |
| **R58** | | 43 | **Yes** | **NA** |
| **R51** | | 40 | **Yes** | **NA** |
| **R35** | | 37 | **Yes** | **NA** |
| **R33** | | 33 | **Yes** | **NA** |
| **R52** | | 32 | **Yes** | **NA** |
| **R27** | | 30 | **Yes** | **NA** |
| **R20** | | 26 | **Yes** | **NA** |
| **Scenario 3 – Piling of panel supports and trenching for cabling** | | | | |
| **R2** | 45 | 59 | **No (14)** | **Moderately Intrusive** |
| **R3** | | 58 | **No (13)** | **Moderately Intrusive** |

| Receiver location | Noise management level[4] | Predicted construction noise Level, $L_{Aeq\ (15\ min)}$ [5] | Compliance with criteria? (exceedance) | Comment<br>Clearly audible = < 10 dB (A) above NML<br>Moderately intrusive = >10 dB (A) above NML<br>Highly affected = > 75 dB (A) |
|---|---|---|---|---|
| **R4** | | 58 | **No (13)** | **Moderately Intrusive** |
| **R5** | | 58 | **No (13)** | **Moderately Intrusive** |
| **R6** | | 57 | **No (12)** | **Moderately Intrusive** |
| **R7** | | 52 | **No (7)** | **Clearly Audible** |
| **R8** | | 52 | **No (7)** | **Clearly Audible** |
| **R9** | | 47 | **No (2)** | **Clearly Audible** |
| **R10** | | 46 | **No (1)** | **Clearly Audible** |
| **R11** | | 43 | **Yes** | **NA** |
| **R12** | | 39 | **Yes** | **NA** |
| **R13** | | 38 | **Yes** | **NA** |
| **R15** | | 37 | **Yes** | **NA** |
| **R16** | | 37 | **Yes** | **NA** |
| **R17** | | 35 | **Yes** | **NA** |
| **R18** | | 35 | **Yes** | **NA** |
| **R19** | | 34 | **Yes** | **NA** |
| **Scenario 4 – Assembly of frames and panels, substation and transformers** | | | | |
| **R2** | 45 | 57 | **No (12)** | **Moderately Intrusive** |
| **R3** | | 57 | **No (12)** | **Moderately Intrusive** |
| **R4** | | 57 | **No (12)** | **Moderately Intrusive** |
| **R5** | | 56 | **No (11)** | **Moderately Intrusive** |
| **R6** | | 55 | **No (10)** | **Moderately Intrusive** |
| **R7** | | 50 | **No (5)** | **Clearly Audible** |
| **R8** | | 50 | **No (5)** | **Clearly Audible** |

| Receiver location | Noise management level[4] | Predicted construction noise Level, $L_{Aeq\ (15\ min)}$ [5] | Compliance with criteria? (exceedance) | Comment Clearly audible = < 10 dB (A) above NML Moderately intrusive = >10 dB (A) above NML Highly affected = > 75 dB (A) |
|---|---|---|---|---|
| **R9** | | 45 | **Yes** | **NA** |
| **R10** | | 45 | **Yes** | **NA** |
| **R11** | | 42 | **Yes** | **NA** |
| **R12** | | 37 | **Yes** | **NA** |
| **R13** | | 36 | **Yes** | **NA** |
| **R15** | | 35 | **Yes** | **NA** |
| **R16** | | 35 | **Yes** | **NA** |
| **R17** | | 34 | **Yes** | **NA** |
| **R18** | | 33 | **Yes** | **NA** |
| **R19** | | 33 | **Yes** | **NA** |

Based on the construction noise levels presented in the table above, during site establishment / earthworks and assembly of frames and panels, substation and transformers (Scenario 1 and 4), the construction noise management levels would be exceeded for non-associated receivers R2 - R8.

- At R2 - R6 the predicted noise levels would exceed the noise management levels by 10-12 dB,
- At R7 and R8 the predicted exceedance is by 5 dB.

For the remaining non-associated receivers (R9 to R19) the predicted noise levels during construction of scenario 1 and 4 would be below the noise management level (<45dB).

During piling of panel supports and trenching for cabling (Scenario 3) the construction noise management levels would be exceeded for non-associated receivers R2 to R10.

- At R2 - R6 the predicted noise levels would exceed the noise management levels by 12 to14 dB.
- At R7 - R10 the exceedance of the noise management level by 1 to 7 dB.

For the remaining non-associated receivers (R11 to R19) the predicted noise levels during Scenario 3 would be below the noise management level (<45dB).

F For the proposed upgrades along Delroy Road and at its intersection with Minore Road (Scenario 2), the construction noise management levels would be only exceeded for two non-associated receivers R61 and R44 by 3 and 2 dB respectively. In consideration of the solar farm construction techniques and time period (12-18 months), these road works would be minor and generate minimal noise over a short period of time (approximately 1 week). Therefore the works would be low risk and manageable with mitigation measures proposed within this chapter.

No residence during any of the scenarios is predicted to be highly noise affected (>75dB(A)) under the ICNG.

It should be noted the construction noise predictions assumes three of the noisiest plant items would be operating simultaneously for each construction scenario at a location closest within the proposal site to the corresponding receiver location. Simultaneous use of this equipment, and the work locations would be across the proposal site, as a result the noise predictions are considered conservative. Noise levels from works at the receivers are likely to be less than that predicted.

For receivers R2-R8 it is expected that exceedance of the noise management level would likely occur when the construction works for scenarios 1 and 4 are conducted within approximately 380m of the dwelling / building. For scenario 3, it would for works conducted within 418m for receivers R2-R10. Construction works conducted within 380m and 418m of the dwelling / building would typically be completed over two to three days out of the approximately 540 day construction program. Regular work brakes would occur daily for staff management, survey, respite, meals and quality control. Construction works conducted beyond 418m of the dwelling building of receivers R2-R10, would be below the noise management level. Considering the short duration of predicted noise exceedances, it is recommended that a feasible and reasonable approach towards noise management measures be applied, in consultation with the potentially affected residents. This commitment is outlined in the mitigation strategy in Section 7.2.5.

### 7.2.2. Operational noise impact assessment

#### Background noise level

The background noise levels adopted to assess construction noise was also used to assess operational noise.

#### Criteria

The NSW Noise Policy for Industry (NPfl) (EPA, 2017) specifies noise criteria relating to intrusive noise impacts and noise level amenity. The assessment criteria under the NPfl for the Forest Glen SF is outlined in Table 7-13.

Table 7-13 proposal specific criteria

| Assessment Criteria | Proposal Specific Criteria |
|---|---|
| Intrusive | Rating background level + 5dBA |
| Amenity | $L_{Aeq\ period}$ recommended amenity noise levels – 5dBA<br>$L_{Aeq\ period}$ + 3dBA |

The operational noise criteria for the solar farm based on the NPfl criteria and guidelines (Table 7-14) is shown in Table 7-15 and Table 7-16.

Table 7-14 Intrusiveness noise criteria

| Receiver | Period | Laeq (15 minute) (dBA) |
|---|---|---|
| All residential | Day | 35 + 5 = 40 |
| | Evening | 30 + 5 = 35 |

| Receiver | Period | Laeq (15 minute) (dBA) |
|---|---|---|
| receivers[6] | Night | 30 + 5 = 35 |

Table 7-15 Applicable amenity noise criteria

| Receiver | Indicative noise amenity area | Time of day | Recommended noise level | |
|---|---|---|---|---|
| | | | $L_{Aeq\ Period}$ | $L_{Aeq\ 15\ min}$ |
| All residential receivers | Rural | Day[7] | 50 – 5 = 45 | 45 + 3 = 48 |
| | | Evening[8] | 45 – 5 = 40 | 40 + 3 = 43 |
| | | Night[9] | 40 – 5 = 35 | 35 + 3 = 38 |

In accordance with the NPfI guidelines, the operational noise trigger levels are the lowest (i.e. more stringent) value of the intrusiveness noise criteria and the amenity noise criteria. The intrusiveness noise criteria are more stringent than the amenity criteria and these are reproduced in Table 7-16 below.

Table 7-16 Project noise trigger levels, dB(A)

| Receiver location | LAeq 15 min Project Noise Trigger Levels (PTNL) | | |
|---|---|---|---|
| | Day | Evening | Night |
| All residential receivers (Table 7-7) | 40 | 35 | 35 |

## Operational noise sources

Overall noise levels associated with operations are demonstrably low due to the low level of noise generating equipment used during operation. Noise from the operation of the solar farm would be generated by:

1. Two transformers in the new onsite substation
2. Battery energy storage units
3. Tracking motors and movement of the solar panels.
4. Inverter stations.
5. Maintenance activities such as light vehicle use for inspections and general maintenance (e.g. electrical repairs, replacing panels), slashing, cleaning of panels and emergency repairs (e.g. replacing torsion bars).
6. Staff members, approximately 7-10, will attend site daily in light vehicles.

[6] Intrusiveness criteria is only applicable for residential receivers
[7] Day is defined as 7.00am to 6.00pm, Monday to Saturday, 8.00am to 6.00pm Sundays and Public holidays

[8] Evening is defined as 6.00pm to 10.00pm, Monday to Sunday and Public Holidays.

[9] Night is defined as 10.00pm to 7.00am, Monday to Saturday, 10.00pm to 8.00am, Sundays and Public Holidays.

Based on the above, the following Table 7-17 lists associated plant and equipment likely to be used for the operation of the proposed solar farm and their corresponding sound power levels. The sound power levels for the plant and are provided by information from past projects and/or information held in NGH library files.

Table 7-17 Operational equipment sound levels

| Equipment | Sound power level (dB (A) re 1pW |
|---|---|
| Substation transformers (x 2) | 96 |
| Battery energy storage unit | 87 |
| Tracking motor (approximately 3,000) | 81 |
| Modular inverters (x36) | 88 |
| Light vehicle (x8) | 78 |

## Operational noise assessment

The Transport for NSW construction noise calculator was used to quantify the likely impact of noise at each non-associated receiver within 1km of the proposal site during operation. The calculator uses the following to model the noise impact:

- Relevant noise source data.
- Separation distances between sources and receivers.
- Ground type between sources and receivers, either green fields or concrete urban areas
- Mitigation from barriers (natural and purpose built).

Predicted operational noise levels were calculated for each receiver for each noise scenario. The predictions were prepared based on their distance from the operational equipment, refer to Table 7-18. The assessment uses the distance between the receiver and the substation transformers, battery energy storage unit, tracking motors and inverters. The modular inverters and tracking motors would be distributed across the development site. Due to their distribution across the site, for any one receiver, it is expected that only one inverter and 10 tracking motors would be close enough to affect the noise scenario outcome. Accordingly, only one inverter and 10 tracking motors has been used to calculate the noise impacts for each receiver.

Table 7-18 Operational noise scenario equipment and distance

| Receiver location | Distance (m) between noise source and receiver | | | | |
|---|---|---|---|---|---|
| | Substation transformers<br>2 per receiver | Battery energy storage unit<br>1 per receiver | Tracking motors<br>10 per receiver | Modular inverters<br>1 per receiver | Light vehicle<br>2 per receiver |
| R2 | 1,054 | 1,115 | 237 | 671 | 227 |
| R3 | 1,003 | 1038 | 239 | 901 | 230 |
| R4 | 2,069 | 2,177 | 248 | 605 | 240 |
| R5 | 1,186 | 1,114 | 712 | 1,185 | 700 |

| Receiver location | Distance (m) between noise source and receiver | | | | |
|---|---|---|---|---|---|
| | Substation transformers<br>2 per receiver | Battery energy storage unit<br>1 per receiver | Tracking motors<br>10 per receiver | Modular inverters<br>1 per receiver | Light vehicle<br>2 per receiver |
| R6 | 1,114 | 806 | 306 | 797 | 241 |
| R7 | 1,118 | 1,162 | 341 | 860 | 332 |
| R8 | 1,341 | 1,429 | 395 | 723 | 361 |
| R9 | 1,948 | 2050 | 451 | 649 | 413 |
| R10 | 1,302 | 1,268 | 577 | 1,099 | 563 |
| R11 | 1,420 | 1,075 | 552 | 1,054 | 538 |
| R12 | 1,765 | 1,506 | 1026 | 1,514 | 957 |
| R13 | 1,911 | 1,785 | 1366 | 1,759 | 1,296 |
| R15 | 1,770 | 1,473 | 962 | 1,508 | 919 |
| R16 | 2,740 | 2,848 | 868 | 1,260 | 843 |
| R17 | 1,927 | 1,655 | 1,159 | 1,648 | 1,109 |
| R18 | 1,912 | 1,603 | 1086 | 1,604 | 1,037 |
| R19 | 2,967 | 3,083 | 1085 | 1,493 | 1,054 |

The operational noise predictions are based on noise attenuation with distance from source. They do not take into account any weather conditions which can influence the level of noise perceived. Aspects of the proposal design would likely reduce operational noise, such as retaining vegetation screening providing buffers between activities and equipment and nearby residences.

The predicted noise levels for the ‘worst case scenario’s based on concurrent operation all plant and equipment (Table 7-18) have been calculated and tabulated (Table 7-19).

Table 7-19 Predicted operational noise levels at residential receivers

| Receiver location | PNTLs dB(A) | | | Predicted operational noise levels, LAeq (15 min) | Comply? |
|---|---|---|---|---|---|
| | Day | Evening | Night | | |
| R2 | 40 | 35 | 35 | 29 | **Yes** |
| R3 | | | | 29 | **Yes** |
| R4 | | | | 28 | **Yes** |
| R5 | | | | <20 | **Yes** |
| R6 | | | | 26 | **Yes** |
| R7 | | | | 24 | **Yes** |
| R8 | | | | 22 | **Yes** |
| R9 | | | | 21 | **Yes** |
| R10 | | | | <20 | **Yes** |
| R11 | | | | <20 | **Yes** |
| R12 | | | | <20 | **Yes** |
| R13 | | | | <20 | **Yes** |
| R15 | | | | <20 | **Yes** |
| R16 | | | | <20 | **Yes** |
| R17 | | | | <20 | **Yes** |
| R18 | | | | <20 | **Yes** |
| R19 | | | | <20 | **Yes** |

Based on the predicted operational noise levels presented above, the predicted noise levels at the nearest non-associated receivers comply with the nominated criteria under all scenarios during operation.

### 7.2.3. Sleep disturbance assessment

To assess the likelihood of sleep disturbance during operation (no night works are proposed during construction), the potential of maximum noise level events from premises during the night-time period has been considered in this assessment. In accordance with the NPfI, a detailed maximum noise level event assessment should be undertaken where the subject development night-time noise levels at a residential location exceed:

- $L_{Aeq,15min}$ 40dB(A) or the prevailing RBL plus 5dB, whichever is the greater, and/or

- $L_{AFmax}$ 52dB(A) or the prevailing RBL plus 15dB, whichever is the greater.

Where there are noise events found to exceed the initial screening level, further analysis is undertaken to identify:

- The likely number of events that might occur during the night assessment period,
- The extent to which the maximum noise level exceeds the rating background noise level.

During the night-time period, no mechanical plant will be operating due to lack of sunlight, including the tracking motors and inverters. During daylight saving period over summer some tracker noise emissions may occur between 6 am and 7 am. When the sun is not shining the invertors stations will not be operating. It is expected and analysis shows that noise levels at the closest non-associated receivers would be well below the sleep disturbance criteria, refer to Table 7-19.

### 7.2.4. Vibration assessment

Assessment of potential disturbance from vibration on human occupants of buildings is made in accordance with the EPA's 'Assessing Vibration; a technical guideline' (DEC, 2006). The guideline provides criteria which are based on British Standard BS 6472-1992 'Evaluation of human exposure to vibration in buildings (1-80Hz)'.

Based on the proposed plant items presented in Table 7-11, vibration generated by construction plant was estimated and potential vibration impacts are summarised in Table 7-20 below. The assessment is relevant to the identified receiver locations. The potential for vibration impacts is shown to be very low.

Table 7-20 Potential vibration impacts for identified receivers

| Receiver location | Approx. distance to nearest buildings from works | Type of nearest sensitive buildings | Assessment on potential vibration impacts | Vibration monitoring |
|---|---|---|---|---|
| R2 | 153 | Residential | Very low | Not required |
| R3 | 160 | Residential | Very low | Not required |
| R4 | 163 | Residential | Very low | Not required |
| R5 | 165 | Residential | Very low | Not required |
| R6 | 180 | Residential | Very low | Not required |
| R7 | 260 | Residential | Very low | Not required |
| R8 | 261 | Residential | Very low | Not required |
| R9 | 381 | Residential | Very low | Not required |
| R10 | 390 | Residential | Very low | Not required |
| R11 | 499 | Residential | Very low | Not required |
| R12 | 677 | Residential | Very low | Not required |
| R13 | 737 | Residential | Very low | Not required |

| Receiver location | Approx. distance to nearest buildings from works | Type of nearest sensitive buildings | Assessment on potential vibration impacts | Vibration monitoring |
|---|---|---|---|---|
| R15 | 783 | Residential | Very low | Not required |
| R16 | 784 | Residential | Very low | Not required |
| R17 | 892 | Residential | Very low | Not required |
| R18 | 938 | Residential | Very low | Not required |
| R19 | 970 | Residential | Very low | Not required |

No operational ground vibration sources have been identified that are likely to generate ground vibration impacts. Potential vibration impacts from operation are therefore not assessed any further.

### 7.2.5. Road traffic noise assessment

Noise impact from the potential increase in traffic on the surrounding road network due to construction activities is assessed against the NSW 'Road Noise Policy' (RNP). The RNP sets out criteria to be applied to particular types of road and land uses. These noise criteria are to be applied when assessing noise impact and determining mitigation measures for sensitive receivers that are potentially affected by road traffic noise associated with the construction of the proposal site, with the aim of preserving the amenity appropriate to the land use.

Site access would be off Delroy Road. The anticipated peak vehicle movements during the construction stage of the project are presented in Table 7-21 Vehicle movements will only occur during the daytime period when construction works occur.

Table 7-21 Summary of estimated construction traffic volumes during peak

| Vehicle type | Trips per day |
|---|---|
| Semi-trailers | 24 |
| MRV/HRV | 20 |
| AV | 24 |
| Cars/light vehicles | 80 |
| Buses | 9 |
| Total | **157** |

During the operational stage, vehicle access to the site will be mostly light vehicles or delivery trucks which would occur on an irregular basis. Traffic noise impacts during the operational stage of the project would be minimal and insignificant and do not warrant further assessment.

Minore Road is categorised as a sub-arterial road and Delroy Road as a local road. For existing residences affected by additional traffic on existing arterial roads generated by land use developments, the following RNP road traffic noise criteria apply Criteria for the roads are outlined in Table 7-22.

Table 7-22 RNP Road Traffic Noise Criteria, dB(A)

| **Road Category** | **Type of Proposal /Land Use** | **Assessment Criteria dB(A)** | |
|---|---|---|---|
| | | **Day 7am-10pm** | **Night 10pm-7am** |
| Freeway/arterial/sub-arterial roads | Existing residences affected by additional traffic on existing freeways/arterial/sub-arterial roads generated by land use developments | $L_{Aeq,(15\ hour)}$ 60 (external) | $L_{Aeq,(9\ hour)}$ 55 (external) |
| Local roads | Existing residences affected by additional traffic on existing local roads generated by land use developments | $L_{Aeq,(15\ hour)}$ 55 (external) | $L_{Aeq,(9\ hour)}$ 50(external) |

The results of the road traffic noise predictions are presented in Table 7-23. It is noted that the predicted noise levels represent the traffic noise contribution from the vehicle movements associated with the construction works and does not take into account existing traffic noise levels.

It can be seen that road traffic noise level contributions from the vehicle movements associated with the construction works are at least 1 to 6dB(A) below the applicable noise criterion based on dwellings being 30 to 155m from the roads. Therefore, traffic noise levels as a result of the construction works for the solar farm would not adversely contribute to the existing traffic noise levels at the most affected residences along the surrounding roads and require no specific mitigation. The proposal complies with the criteria for road traffic noise, for both construction and operation, as the expected traffic volumes during operation are expected to be less than proposed construction traffic volumes.

Table 7-23 Predicted road traffic noise contribution levels along public roads, dB(A)

| **Receiver** | **Criteria** | **Truck traffic movements** | **Speed (km/h)** | **Distance to Road** | **Predicted Noise Level** | **Comply? (Yes/No)** |
|---|---|---|---|---|---|---|
| Residences on Minore Road | $L_{Aeq,\ (15\ hour)}$ 60 | Refer to Table 7-21 | 80 | 30m | 59 dB(A) | Yes |
| Residences on Delroy Road | $L_{Aeq,\ (15\ hour)}$ 55 | Refer to Table 7-21 | 60 | 155m | 49 dB(A) | Yes |

## 7.2.6. Safeguards and mitigation measures

The Construction and Operational Noise and Vibration Assessment determined that only during construction was there potential for the proposal to exceed noise criteria. The exceedance is only likely to occur when construction works occur within 380m of the closest receivers (R2-R8) for Scenario 1 and 2. For scenario 2, it would for works conducted within 418m for receivers R2-R10. Due to the size of the site and proposal type, the predicted noise exceedances are anticipated to be at short durations and manageable through the implementation of noise management plan during construction. A draft noise management plan has been prepared and provided in Appendix H to demonstrate how noise would be managed.

Based on the predicted noise levels, operational noise levels from the proposed solar farm would comply the noise criteria. The proposal noise level will also be well below the nominated sleep disturbance criteria. The proposal is very low risk for potential vibration impacts.

The proposal's noise commitments are set out below

Table 7-24 Safeguards and mitigation measures for noise and vibration impacts

_PC: Pre-Construction, C: Construction; O: Operation; D: Decommissioning_

| ID | Safeguards and mitigation measures | C | O | D |
|---|---|---|---|---|
| NV1 | A Noise Management Plan would be developed as part of the CEMP (refer to Appendix H). The plan would include, but not be limited to:<br>• Use less noisy plant and equipment where feasible and reasonable.<br>• Plant and equipment to be properly maintained.<br>• Provide special attention to the use and maintenance of 'noise control' or 'silencing' kits fitted to machines to ensure they perform as intended.<br>• Strategically position plant on site to reduce the emission of noise to the surrounding neighbourhood and to site personnel.<br>• Avoid any unnecessary noise when carrying out manual operations and when operating plant.<br>• Any equipment not in use for extended periods during construction work should be switched off.<br>• Complaints procedure deal with noise complaints that may arise from construction activities. Each complaint would need to be investigated and appropriate noise amelioration measures put in place to mitigate future occurrences, where the noise in question is in excess of allowable limits.<br>• Establish good relations with people living in the vicinity of the site at the beginning of Proposal and maintain. Keep people informed, deal with complaints seriously and expeditiously. The community liaison member of staff should be adequately experienced. | C | | |

## 7.3. Compatibility with existing land uses

**SECRETARY'S REQUIREMENTS**

_The EIS must also address the following specific issues:_

- _**Land** – including:_
- _an assessment of the potential impacts of the development on existing land uses on the site and adjacent land, including:_
  - _a consideration of agricultural land, flood prone land, Crown lands (including Delroy Road), mining, quarries, mineral or petroleum rights, (including mineral exploration rights licence EL 8961)_
  - _a soil survey to determine the soil characteristics and consider the potential for erosion to occur; and_
  - _a cumulative impact assessment of nearby developments;_

- *an assessment of the compatibility of the development with existing land uses, during construction, operation and after decommissioning, including:*
  - *consideration of the zoning provisions applying to the land, including subdivision, and;*
  - *completion of a Land Use Conflict Risk Assessment in accordance with the Department of Industry's Land Use Conflict Risk Assessment Guide;*

The nature of a development determines whether a permanent land use change occurs or whether the development is reversible. Apart from direct uses of the land, such as agriculture, electricity generation or mining, associated impacts, such as the degree of visual impact and traffic regimes, can affect the compatibility of alternative land uses. These issues as they relate to the proposal are discussed below.

Potential for impacts on existing and future land uses at and near to the proposal site have been assessed with reference to:

- Dubbo LEP land use zones.
- MinView and Common Viewer databases.
- Primefact 1063 Infrastructure proposals on rural land.
- Land Use Conflict Risk Assessment Guide (DPI, 2011).
- Landholder, ABS and ABARES agricultural production.
- Guidelines for developments adjoining land managed by OEH.
- Proposed amendments to the ISEPP (DPIE, 2021)

### 7.3.1. Existing environment

#### Land capability

The proposal site is approximately 789ha and is comprised mostly of grazed agricultural pastures with patches of remnant woodland, some of which retains moderate native diversity in the groundcover. The land on which the Development footprint is located is predominantly grazed by sheep and intermittent cropping for feed.

Alternative higher value land uses, given the local area, could potentially include wheat but given access to water and soil capability classes, are unlikely to include sustained cropping or the higher value crops such as cotton.

The *Mining, Petroleum, Production and Extractive Industries State Environmental Planning Policy 2007* (the Mining SEPP) extends across the proposal site. The SEPP outlines land that has been classed as Biophysical Strategic Agricultural Land (BSAL). BSAL is land with high quality soil and water resources capable of sustaining high levels of productivity. Across NSW, 2.74 million hectares of land has been mapped as BSAL as a means of sustaining the agriculture industry. The proposal site is not mapped as BSAL (Figure 7-1).

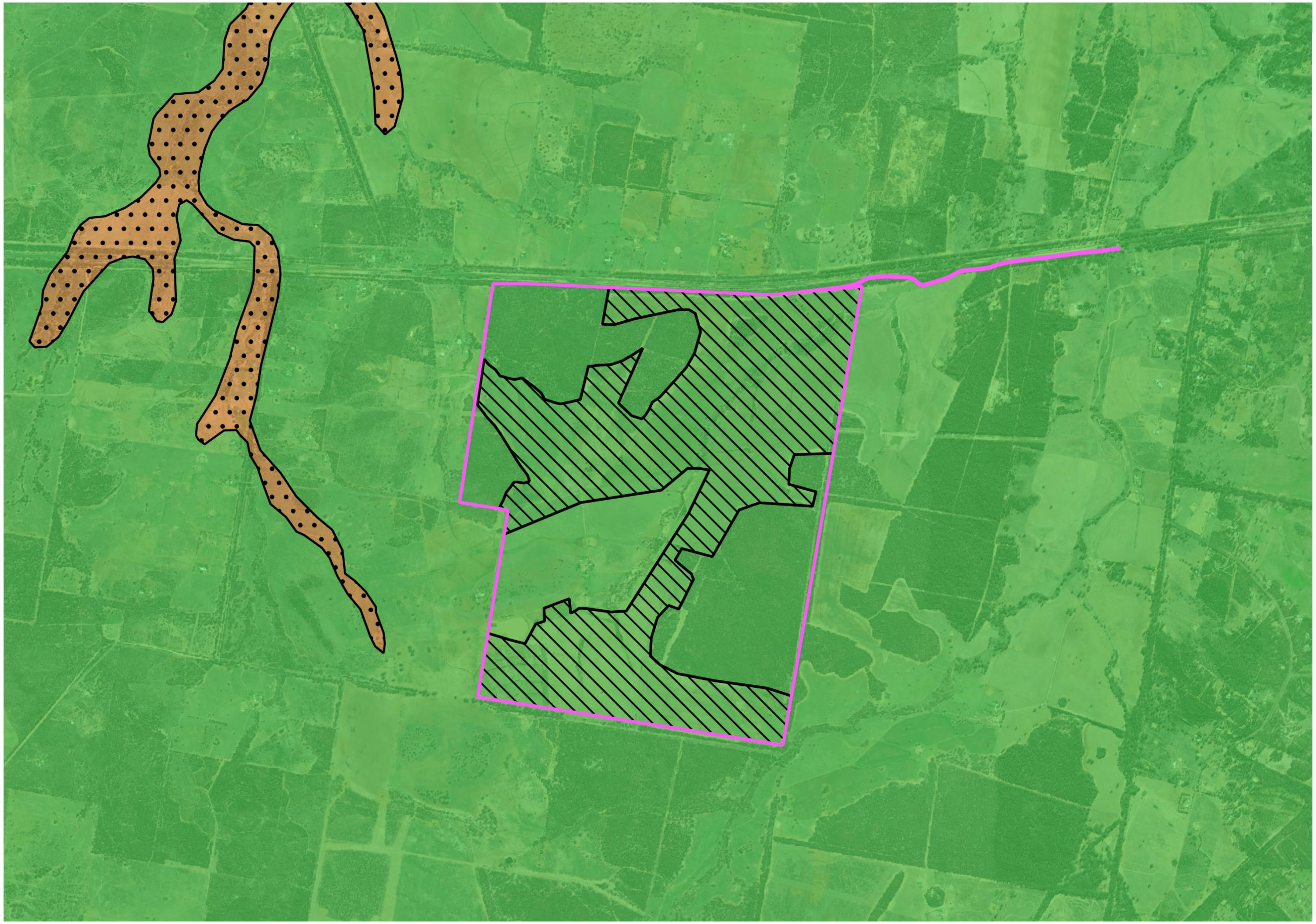
The Land and Soil Capability Assessment Scheme (OEH, 2012) provides land and soil capability (LSC) classes useful for broad-scale assessment of land capability. The eight classes describe land capability ranging from extremely high capability land (class 1) to extremely low capability land (class 8). A pre-determined set of biophysical land and soil features including landform position, slope gradient, drainage, climate, soil type and soil characteristics are used to determine potential land and soil hazards. These classes are used to inform long term land management practices with the aim of ensuring degradation to soil, land, air and water resources does not occur.

The proposal site is entirely located on land mapped LSC class 5 (moderate-low capability land). The current activities onsite align with class 5, largely used for grazing with occasional cultivation for pastures. The class

5 area is not capable of supporting regular cultivation due to the various limitation such as erosion and low fertility (refer to Table 7-25).

**Land use efficiency**

The indicative infrastructure footprint as shown in Figure 1-10 displays the total area that would be utilised for solar farm infrastructure within the Forest Glen SF's 444ha Development footprint. In total the indicative infrastructure layout would cover an approximate area of 266ha however that has been considered as a maximum extent and further flexibility in the solar array design may be considered in the final design layout. This area includes all infrastructure including solar arrays, the BESS, substation and ancillary infrastructure. Considering the solar farms AC equivalent capacity of 90MW the estimated land use efficiency of the proposal Forest Glen SF is approximately 3ha per 1MW AC.



**Land Capability Classes**

Legend

Proposal site

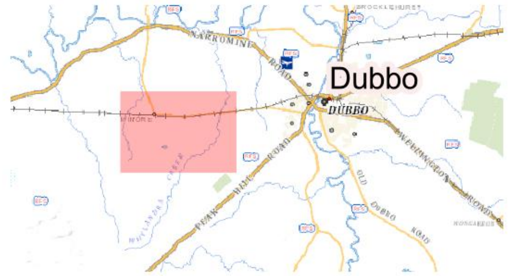
Development footprint

Biophysical Strategic Agricultural Land (BSAL)

Land and Soil Capability Mapping

3: High Capability Land

5: Moderate-low Capability Land

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Ref: 20-332 Forest Glen SF Workspace from scoping report KM 20210623 \ Scoping
Report: Land Capability Classes
Author: kyle.m
Date created: 15.09.2021
Datum: GDA94 / MGA zone 55

0 0.5 1 1.5 km

Figure 7-7 Land capability classes associated with the proposal site (Modified from OEH 2020)

Table 7-25 Land and Soil Capability Class definitions (OEH, 2012)

| Class | Category | Definition | Limitations | Area (ha) and percentage within the proposal site | Area (ha) and percentage within the Development footprint |
|---|---|---|---|---|---|
| **Class 5** | Moderate – Low capability land | Land has high limitations for high-impact land uses. Would largely restrict land use to grazing, some horticulture (orchards), forestry and nature conservation. Very occasional cultivation for pasture establishment. The limitations need to be carefully managed to prevent long-term degradation. | Sloping lands (10–20% slope) with highly erodible soils and/or significant existing soil erosion, or land that will be subject to wind erosion when cultivated and left bare. Other limitations include shallow soils, stoniness, climatic limitations, acidification, potential for structure decline and salinity hazards. | 789ha<br>100% | 444ha<br>100% |

## Agriculture

The proposal site is located within the Central West and Orana region in which Agriculture occupies 306,900 square kilometres about 90% of the region (ABARES, 2021). Grazing native vegetation is the most common land use within the region occupying 249,600 square kilometres or 74% of the region (ABRES, 2021). Agricultural production within the region contributes 10% of the total gross value of agricultural production in NSW.

Based on gross value of agricultural production, the most important agricultural commodities in 2017 - 2018 in the region were cotton (23%), cattle and calves (20%) and wool (19%). These three commodities contributed 63% of the total value of agricultural production in the region (Australian Government, 2019). In 2016 – 2017, there was 2,959 farms within the region, making up 11% of all farm businesses in NSW with grain-beef cattle farms being the most common (ABS, 2017).

## Zoning and mapped land use categories

The proposal site is located on land zoned as RU1 Primary Production under the Dubbo LEP (refer to Figure 1-7). There are six existing land uses currently relevant to the proposal site, including:

- Cropping
- Grazing modified pastures
- Grazing native vegetation
- Minimal use
- Reservoir/dam
- Residential and farm infrastructure.

Land use classifications within the region are shown in Table 7-26. Existing land uses adjacent to the proposal site with the potential to be affected by the proposal, or that may be supported by the proposal in the future include:

- Cropping and grazing
- Crown land (paper road easements)
- Electricity assets and easements
- Railway corridor.

The dominant land use on site based on mapping is cropping which in conjunction with modified pastures would account for the highest income per hectare on the site. Based on the site inspection and discussions with the landowner, the actual site land use is predominately grazing with intermittent cropping for feed.

Land use categories and areas within the proposal site are identified in Figure 7-8 and Table 7-26 below.

Table 7-26 Land use categories within the proposal site (DPIE, 2013)

| Land use category | Area (ha) within proposal site |
|---|---|
| 1.3.3 Residual native cover | 185.28 |
| 2.1.0 Grazing native vegetation | 193.14 |
| 3.2.1 Native/exotic pasture mosaic | 98.62 |
| 3.3.0 Cropping | 308.94 |
| 5.4.0 Residential and farm infrastructure | 3.14 |
| 5.4.5 Farm buildings/infrastructure | 0.33 |
| 5.7.0 Transport and communication | 1.80 |
| 6.2.0 Reservoir/dam | 6.15 |

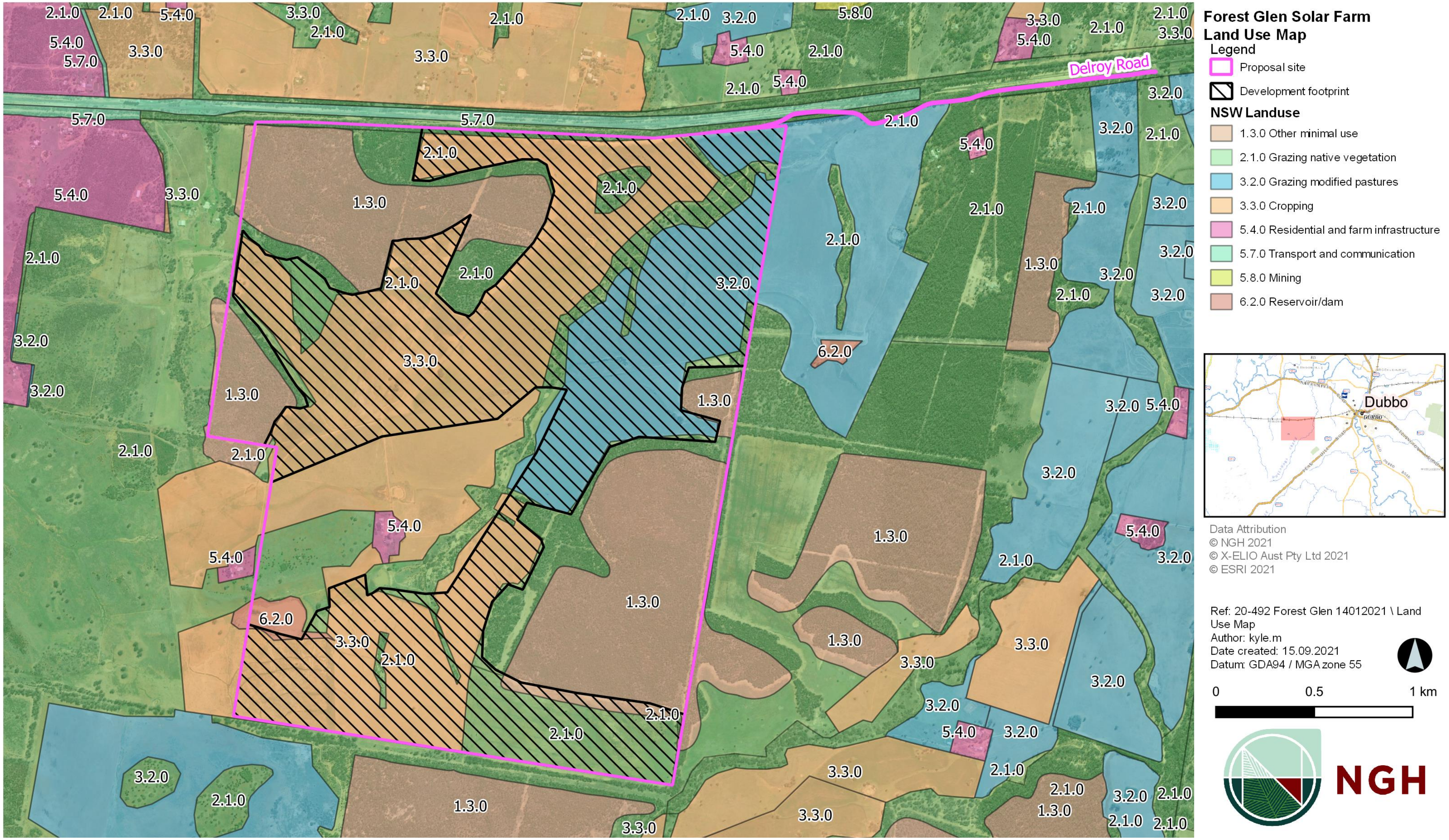


Figure 7-8 Land use within the proposal site and surrounds

## Other surrounding land uses

There are 61 residences within 2km of the proposal, which includes three associated receivers (R0, R1 and R14) and 58 non-associated receivers. The closest non-associated receiver is located 153m north of the proposal site. All receivers can be seen in Figure 7-1 in Section 7.1. The majority of the lots a medium sized rural lots with single dwellings and farm infrastructure associated with their land use such as silos and farm sheds. The properties are a mix of agriculture including cropping and grazing with large patches of remanent vegetation distributed across the landscape. There is also a number of lifestyle blocks generally along the main roads and closer to Minore village.

Other land uses within the locality of the proposal site, other than agriculture and residential are outlined in Table 7-27.

Table 7-27 Surrounding land uses of the proposal site

| Land use | Description |
|---|---|
| **Reserves** | The proposal site is approximately 3km north west of the Sappa Bulga National Park. The national park was made a reserve in January 2011 due to it being an important patch of remanent native vegetation. There are no formal recreational areas in the park. Visitors to the park would have no views of the proposal site due to topography, there is a range in between the two sites as well as extensive patches of forest.<br>There are no other reserves, State Forest or National Parks within 20km of the proposal site. |
| **Renewable energy projects** | There are several renewable energy projects proposed or already present in the Central West Orana REZ, including:<br>Constructed or construction pending:<br>• Gilgandra Solar Farm by Neoen Australia Pty Ltd 40km north of the proposal site.<br>• Maryvale Solar Farm by Maryvale Solar Farm Pty ltd 45km south west of the proposal site.<br>• Wellington Solar Farm by Lightsource Development Services Australia Pty Ltd 55km south east of the proposal site.<br>• Wellington North Solar Farm by Lightsource Development Services Australia Pty Ltd 51km south east of the proposal site.<br>• Suntop Solar Farm by Photon Energy, Canadian Solar and Polpo investments 88km north east of the proposal site.<br>• Beryl Solar Farm by First Solar (Australia) Pty Ltd 100km East of the proposal site.<br>• Nevertire Solar Farm by EPURON 90km north west of the proposal site.<br>• Wollar Solar Farm by Wollar Solar Development Pty Ltd 150km south east of the proposal site<br>• Uungula Wind Farm by CWP Renewables Pty Ltd 70km south east of the proposal site.<br>Proposed, not yet approved:<br>• Dunedoo Solar Farm by ib vogt GmbH 95km north east of the proposal site. |

| Land use | Description |
|---|---|
| | • Mumbil Solar Farm by EPURON 71km south east of the proposal site.<br>• Bunrrendong Wind Farm by EPURON 84km south east of the proposal site.<br>• Suntop Solar Farm Stage 2 by Photon Energy, Canadian Solar and Polpo investments 88km north east of the proposal site.<br>The following renewable projects are the closest to the Forest Glen Solar Farm and can be seen in Figure 1-1:<br>• Maryvale Solar Farm (45km)<br>• Suntop Solar Farm (88km)<br>• Wellington Solar Farm (55km). |
| **Industry and commercial use** | An existing 132kV transmission lines traverses the site and just north of the site, which means the that the connection to the high voltage network can be made onsite or nearby without the need to construct any transmission lines offsite.<br>Other projects underway in the Dubbo Regional LGA include the Young – Wellington Gas Pipeline, the Dubbo Zirconia mine and Cobbora Coal Mine. Additionally the Dubbo Base Hospital is undergoing significant Redevelopment. |
| **Crown land and paper roads** | There is no Crown Land in the form of paper roads associated with the proposal site. However, the site access, Delroy Road has been identified as a Crown Road. |
| **Aviation** | Solar farms are sometimes identified as a concern with regard to airports, in relation to perceived issues of glare and being an attractant for waterbirds (which may perceive the solar arrays as a water body). There are two significant airports located within the vicinity of the proposal site:<br>• Dubbo City Regional airport about 8km north east<br>• Narromine airport about 25km north west.<br>Dubbo Airport is a principle regional airport that provides direct flight services to major Australian airports. Narromine airport is smaller and is primarily used by small aircrafts, private charter flights and medical services.<br>Due to the nature of the mining and agricultural industry in the area, there are other smaller (private) airstrips at the locality used for transport or aerial spraying of crops.<br>Directly adjacent to the proposal site is the Dubbo Model Aero Club and owned by the same landowner as the proposal site. The aeroclub is used for flying model planes and is used almost every Sunday between 8am and midday by approximately 10 people. The area includes an informal carpark, grassed runway, sheds and signage. |
| **Exploration licences and mining leases** | Mineral exploration licence (EL8961) held by Sunrise Energy Exploration Pty Ltd Pty Ltd and expires on 6 April 2023 is located across the entire proposal site. |

### 7.3.2. Potential impacts

#### Land use risk assessment

A Land Use Conflict Risk Assessment (LUCRA) can be used to look at the compatibility of a change in land use. A LUCRA has been carried out in accordance with the DPI *Land Use Conflict Risk Assessment Guide* (DPI, 2011). The LUCRA assessment primarily is used focus on agricultural developments but can be used to assess other primary industry such as mining or forestry (DPI, 2011). Given the surrounding land uses are different the proposed solar farm, specifically agriculture, this assessment aims to identify and rank potential land use conflicts to ensure they are adequately managed. Where expected conflicts are adequately managed, the rights of the existing and proposed land uses can be protected.

The risk ranking in Table 7-29 has been determined using the risk ranking matrix shown in Table 7-28, and in accordance with the probability table and measure consequence table in Department of Primary Industries Land Use Conflict Risk Assessment Guide (DPI, 2011). The matrix ranks the risk of impacts according to the probability of occurrence and the consequence of the impact. Probability 'A' is described as 'almost certain' to probability 'E', which is described as 'rare'. The level of consequence starts at 1 – Severe to 5 – Negligible. The risk ranking from 1 to 25 is a result of the probability and consequence. For example, a risk ranking of 25 is the highest magnitude of risk (DPI, 2011).

Table 7-28 LUCRA Risk Ranking Matrix

| **Probability** | **A** | **B** | **C** | **D** | **E** |
|---|---|---|---|---|---|
| Consequence | | | | | |
| **1** | **25** | **24** | **22** | **19** | **15** |
| **2** | **23** | **21** | **18** | **14** | **10** |
| **3** | **20** | **17** | **13** | **9** | **6** |
| **4** | **16** | **12** | **8** | **5** | **3** |
| **5** | **11** | **7** | **4** | **2** | **1** |

Potential impacts of the proposal are assessed against the land use conflict risk assessment table from the Land Use Conflict Risk Assessment Guide (DPI 2011) in Table 7-29.

Table 7-29 LUCRA assessment for Forest Glen SF

| **Identified Potential Conflict** | **Risk Ranking** | | **Management Strategy** | **Revised Risk Ranking** | |
|---|---|---|---|---|---|
| **Agriculture** | | | | | |
| Agricultural spraying (aerial) | C4 | 8 | There is unlikely to be an impact to aerial spraying activities given low levels of glare and the limited height of infrastructure. | C4 | 8 |
| Contaminated surface water runoff | B3 | 17 | Implementation of a soil and water management plan and an erosion and sediment control plan would minimise the potential impact. | D4 | 5 |

| Identified Potential Conflict | Risk Ranking | | Management Strategy | Revised Risk Ranking | |
|---|---|---|---|---|---|
| Dust | B3 | 17 | Dust generated during the construction and decommissioning stages to be managed using water carts when required.<br>Dust is not expected to generate a significant land use conflict during operation. | C4 | 8 |
| Fire/ Bushfire | C1 | 22 | Implementation of a Bushfire Management Plan and higher than required APZ would significantly reduce the probability of solar farm operation starting a fire or a bushfire damaging the solar farm infrastructure. | D3 | 9 |
| Visual amenity | C3 | 13 | Existing vegetation and topography within the area would screen the proposal as identified in Section 7.1 would substantially mitigate expected impact on visual amenity. | C5 | 4 |
| Noise | B3 | 17 | Noise generated during construction and decommissioning stages would be minimised through the implementation of mitigation measures.<br>Where regular maintenance practices are incorporated into operation, noise is not expected to generate a land use conflict. | C4 | 8 |
| Traffic generation and disruption | B3 | 17 | Traffic generation and disruptions during construction and decommissioning stages are considered likely however the impact would be temporary and able to be managed (refer to section 7.5).<br>Traffic is not expected to generate a land use conflict during operation. | C4 | 8 |
| Weed and pest control | A3 | 20 | Implementation of pest and weed management plan during construction and operation phases | D4 | 5 |
| **Resource extraction/exploration** | | | | | |
| Mining land use | D5 | 2 | The proposal would temporarily sterilise the development site from exploration and mining activities for the life of the solar farm. One mineral exploration licence exist over the development site.<br>After decommissioning, the solar farm infrastructure would be removed, and the site made available for alternate land uses including for mining purposes, if desirable. | D5 | 2 |

## Construction and operation

The range of scores in the mitigated risk rating were medium to low, demonstrating that the proposed construction and operation of the solar farm would have minimal impact on the surrounding land uses and is considered manageable with implementation of mitigation measures.

The potential impacts of the proposal during construction and operation are discussed in detail below.

### Agriculture

The potential impacts of the proposal on agriculture are detailed below with respect to *Primefact 1063: Infrastructure proposals on rural land* (DPI, 2013). During operation, the proposal site would change from agricultural land use to power generation.

<u>Resource loss and fragmentation</u>

- Agricultural activities would temporarily cease upon commencement of construction in areas within the proposal site and areas involved with primary access to the site.
- The proposal would result in the temporary loss of 444ha of agricultural land for the life of the solar farm (approximately 35 years). This represents 0.0001% of the agricultural holdings within the Central West Orana Region and does not significantly reduce the availability of land for primary production in the region.
- The Proposal is not placed on land that is of higher quality Land and Soil Capability than the surrounding lands (refer to Figure 7-7. As such there would be no losses of uniquely high value land to the locality during the construction and operation of the solar farm.
- The infrastructure layout avoids remnant forest stands and TEC's present on site (Section 7.5)
- Connection to the national grid does not require additional power lines as the proposal would connect via an existing 132kV transmission line that traverses the northern section of the site. This reduces the potential for limiting ground clearance and impacting on safe movement of agricultural machinery.

<u>Impacts on farming operations and livestock</u>

- Agricultural activities would temporarily cease upon commencement of construction in areas within the Development footprint and areas involved with primary access to the site.
- Grazing and agricultural activities would continue within the proposal site, outside the solar farm Development footprint. The existing landowner is going to continue using the remaining land for production.
- Some sheep grazing may also continue to be undertaken within the Development footprint to control grass and weed growth around the solar arrays. Grass fuel levels within the site would be managed to minimise bushfire risks (refer to Section 8.4). Adequate groundcover would be maintained to protect soil and water values (refer Section 8.1 and Section 8.1).
- The proposal would not affect access or agricultural land uses on surrounding properties during the operation phase. The existing surrounding land uses are known, and the solar farm is not considered to be an incompatible land use with a potential to create land use conflicts. Local pastoral companies have the potential to benefit from future grazing arrangement within the proposal site.
- Best practice waste and wastewater management, fuel storage and re-fuelling and chemical handling would be stringently applied to prevent soil and water pollution (refer Section 8.1 and Section 8.4).
- Impacts on soils and erosion risk are assessed in Section 8.1, impacts on downstream water quality are assessed in Section 8.1 and impacts on local air quality are assessed in Section 8.10. These assessments conclude that the proposal would not be likely to adversely affect land uses or activities on neighbouring properties or elsewhere in the locality, subject to identified mitigation measures.

<u>Biosecurity risks – pests' diseases and weeds</u>

- The increased movement of vehicles, machinery and people to within the proposal site, particularly during construction and decommissioning poses the largest risk to biosecurity. Weed seeds can be transported via the tyres and undercarriages of vehicles and clothing of staff resulting in a risk of spreading weeds to the proposal site. Confining vehicles and machinery movements to formed access tracks during all phases and implementing a wash down procedure for vehicle entering the proposal site would mitigate potential risk of seed dispersal.
- Risk of increasing pest animals (cats and foxes) at the proposal site during operation would be managed by ensuring waste from rubbish bins containing food are covered and regularly removed. Targeted pest management during the operational phase of the proposal would control rabbit and fox numbers. Resources and cover for pest species would be reduced grazing pressure and reduced plant matter.
- Preparation of a Weed Management Plan for the construction and decommissioning phases based on Dubbo Regional Council and NSW DPI requirements would assist in the management of weeds.
- A temporary construction site compound would be established with the aim of reducing pest animals at the proposal site.

Prior to commencement of construction, representative soil samples would be gathered as part of a specialist soil survey in order to establish baseline data on the existing agronomic characteristic of the soil. The survey would include sampling for soil texture and structure, nutrients, acidity and organic matter.

### Residential

Residences located near the site or along the access route may experience temporary noise, dust and traffic during construction. During operation there is a very low likely likelihood for potential visual impacts (glare and glint are discussed below). Traffic and activities onsite during operation would be minimal compared to construction and are unlikely to generate substantial noise and dust. These potential impacts to residences during construction and operation are best managed through consultation and mitigation measures outlined for each specific issue outlined in Section 7.1, Section 7.2, Section 7.5 and Section 8.10.

### Aviation

There is unlikely to be any construction impacts on aviation or aerial spraying during construction of the proposal. The proposed infrastructure is low-lying with the transmission line poles being the tallest infrastructure, which are already present on site. The installation of this infrastructure would not impact on any flight paths or present a hazard to aircraft.

Seen from above (such as from aircraft) they appear dark grey and do not cause a glare or reflectivity hazard. Solar PV plants have been installed on a number of airports around the world and in Australia including Tamworth NSW, Karratha in WA and Darwin in NT. Glare and glint is addressed in Section 7.1.

Directly adjacent to the proposal site is the Dubbo Model Aero Club and owned by the same landowner as the proposal site. The aero club is used for flying model planes and is used almost every Sunday between 8am and midday. During construction, no works are proposed on Sundays when the club is operational. However they would have views of the construction site, which may impact the users experience of the site. During operation of the solar farm, the users of the club would also have views of solar farm infrastructure including arrays and inverters. As the club operates Sunday mornings and is located east of the site, they have potential to experience short term glare or glint depending on the angle of the sun and time of the day. As mentioned the owner has no concerns regarding the solar farm, it is recommended consultation is ongoing to ensure any potential impacts or concerns that occur can be addressed (refer to Section 7.1)

### Exploration licences

The proposal site is occupied by one mineral exploration licence (EL8961) identified on 15 July 2020 . The license is held by Sunrise Energy Exploration Pty Ltd Pty Ltd and expires on 6 April 2023. During construction and operation, extraction of any resources within the proposal site would not be possible, potentially affecting exploration licence holder. Given the highly reversible nature of the proposal, resource extraction would not be sterilised in the long term and could resume post decommissioning. The relevant exploration licence holders have been notified of these restrictions. It is understood that vegetation offset areas, established in perpetuity, may form an additional long term restriction to exploration. It is noted that permission to impact offset areas can be sought under the Biodiversity Offset Scheme, albeit with a surcharge applied to account for impacts on offset areas and subject to the *Biodiversity Conservation Act 2016*.

There are no mining leases over the proposal site.

### Dubbo future growth areas

The impact of the proposal on Dubbo's future growth area has been considered due to the Proposed amendments to the ISEPP (DPIE, 2021), with reference to the Central West and Orana Regional Plan (DPIE, 2017) and the Dubbo Local Strategic Planning Statement (Dubbo Regional Council , 2020). Dubbo is expected to see a total population growth of around 12,288 people by 2040 (Dubbo Regional Council , 2020). Future planning maps in the Dubbo LSPS do not forecast any intensified land usage that would result in additional land use conflict in the next 20 years. Planning for growth in the renewables sector has been considered directly in two planning priorities in the Dubbo LSPS (refer to Section 2.2.4). As such it is expected that the proposal would positively impact on the future growth and planning of the Dubbo Regional Council through the addition of new renewable energy infrastructure.

### Other land uses

During construction and operation of the solar farm, there is unlikely to be any impacts on other land uses including:

- Industry and commercial use (transmission line) – minimal impact is anticipated during construction to the existing 132kV transmission line onsite, consultation with Essential Energy would be undertaken. No transmission line or substation works are proposed offsite.
- Industry and commercial use (railway line) – the proposal would not impact the railway line. The existing access track is adjacent to the railway line but doesn't cross it.
- Reserves – due to the distance from the site (closest reserve is 3km north) and there is unlikely to be any views due to existing vegetation and topography.
- Crown Land – the site access is Crown Land. A licence would be required prior to construction.

It is unlikely that any potential mining activities or other land uses will impact on the solar farm development.

## Decommissioning

The potential impacts of the proposal during decommissioning on surrounding land uses is considered to be manageable with the implementation of the mitigation measures presented in this EIS. The proposal is considered highly reversible given the relatively low impact on the soil surface. Following decommissioning, rehabilitation of the site would be undertaken to restore the site to its pre-existing condition. All above ground infrastructure would be removed upon decommissioning and alternate land uses including agriculture and mining could resume.

Potential impacts to surrounding land uses include:

**Agricultural activities**

Existing agricultural land uses, or future agricultural land uses on the proposal site or adjacent land are not anticipated to be impacted due to the reversible nature of the proposal. The construction of the solar array will not require substantive soil disturbance or concrete footings. Steel poles (driven into the ground) would be used to support the mounted solar array. These involve minimal soil and groundcover vegetation impacts. Cable trenches will also be required however, topsoil and subsoils will be reinstated immediately following installation and impacts are expected to be minimal. These structures are also easily removed when the farm is decommissioned.

For the operational life of the solar farm, the resting/shading impacts of the solar farm combined with operational management to protect groundcover may improve soil health and capability, in comparison to current livestock agricultural activities, particularly in drought conditions. The maintenance of soil health is imperative to the long term sustainability of agricultural land. Resting the land through the life of the solar farm could play an important role in soil health over the Development footprint (BRE, 2014). In comparison to sheep grazing rested land within the solar farm development could have the following benefits:

- Increased groundcover and diversity of groundcover with biosecurity management.
    - Perennial grasses can be encouraged to increase soil stability of the grassland around the panels.
- Increase in soil moisture and nutrients.
- Increases in soil organic matter means less evaporation, less impact of raindrops, less impact of runoff and less erosion.
- Controlled stocking rates will reduce soil compaction.
    - An associated return of soil organisms for decomposition of organic matter, nutrient cycling and improving soil structure.

Therefore, it is expected that upon completion of decommissioning stage, the site would be in the same or better condition as it is today, in terms of agricultural land capability.

<u>Site rehabilitation</u>

A Rehabilitation Plan associated with decommissioning activities would be developed and implemented with the objectives of:

- Returning the land to its pre-solar capability and improving the current state of the land.
- Soil resource management.
- Landform and land use areas.
- Development of completion criteria and monitoring reporting.

The plan would be informed by soil information derived from a soil survey using:

- *The Australian Soil and Land Survey Handbook* (CSIRO, 2009).
- *The Guidelines for Surveying Soil and Land Resources* (CSIRO, 2008).
- *The land and soil capability assessment scheme: second approximation* (OEH, 2012).

### Other land uses

Impacts during decommissioning for the other surrounding land uses would be similar to construction and operation, as discussed above.

## 7.3.3. Safeguards and mitigation measures

The mitigation measures outlined below are to ensure the proposal reduces its potential impact on the existing and future agricultural land of the proposal site and existing and future land uses of adjacent land.

Other mitigation measures within this EIS are considered to also assist in reducing any potential impacts of the proposal on the regions land use, i.e. visual, noise, water and air quality.

Specific measures are outlined below to manage the potential impacts identified.

*PC: Pre-construction C: Construction; O: Operation; D: Decommissioning*

Table 7-30 Mitigation measures and land use impacts

| ID | Safeguards and mitigation measures | C | O | D |
|---|---|---|---|---|
| LU1 | Undertake a baseline soil survey prior to construction to inform construction and operational management measures to resist erosion and weed ingress. | PC | | |
| LU2 | Consultation would be undertaken with Essential Energy regarding connection to the substation and design of electricity transmission infrastructure. | C | O | D |
| LU3 | Consultation with proposal site exploration licence holders regarding the proposal and potential impacts. | C | O | D |
| LU4 | Consultation with DPIE-Crown Lands would be ongoing, and the following would be undertaken:<br>• Prior to construction, a permit will be applied for to allow construction to commence within Delroy Road Crown road. | PC | | |
| LU5 | A pest and weed management plan would be prepared to manage the occurrence of priority weeds and pest species across the site during construction and operation. The plans must be prepared in accordance with Dubbo Regional Council and NSW DPI requirements. | C | O | |
| LU6 | A Rehabilitation Plan would be prepared to ensure the array site is returned to at least or better than pre-solar farmland and soil capability during the decommissioning stage. The plan would be developed with reference to the base line soil testing (completed prior to construction) and with input from an agronomist to ensure the site is left stabilised, under a cover crop or other suitable ground cover. The soil survey would be based on:<br>• *Australian Soil and Land Survey Handbook* (CSIRO, 2009)<br>• *Guidelines for Surveying Soil and Land Resources* (CSIRO, 2008)<br>• *The land and soil capability assessment scheme: second approximation (OEH, 2012).* | C | | D |

## 7.4. Social and economic impacts

**SECRETARY'S REQUIREMENTS**

*The EIS must also address the following specific issues:*

- ***Socio-Economic** – including an assessment of the likely impacts on the local community and a consideration of the construction workforce accommodation;*

Large and new types of developments can produce social and economic impacts on local communities. These impacts can be positive, such as the provision of employment and increased retail trade. They may also put strains on existing infrastructure and services. This section investigates the socio-economic profile of the region to understand the compatibility with the region and potential impacts of the proposal on the socioeconomics and the local community.

### 7.4.1. Existing environment

#### Proximity to service centres

The proposed Forest Glen SF is located 16km west of the major service centre of Dubbo within the Dubbo Regional LGA. The LGA covers an area of 7,536 square kilometres. It is bounded by the Narromine LGA to the west, Cabonne LGA to the south, Mid-Western Regional LGA to the east and the Gilgandra LGA to the north. Agriculture, mining and manufacturing are the most significant industries in this region. (REMPLAN, 2021).

The 2016 census states that the Dubbo locality is home to 38,943 people and has a number of major facilities including a hospital, banks, large sporting facilities, churches and schools (ABS, 2016). Additionally, the region attracts approximately 1,526,000 visitors annually to experience various events and attractions (Dubbo Regional Council, 2021). The most visited sites include the Taronga Western Plains Zoo, Wellington Caves Lake Burrendong, Macquarie River and Mount Arthur Reserve. The area also holds rich cultural heritage, including the Old Dubbo Gaol and National Trust Dundullimal Homestead and Aboriginal heritage including art at the Western Plains Cultural Centre and tours at First Lesson Cultural Tours.

The proposal site is located within the locality of Minore, which had a population of 153 people (ABS 2016). Significant features of Minore include the old railway station at Minore Village, which was closed to passengers in 1975 and Minore Falls Reserve on the Macquarie River, which is popular for fishing, camping and boating. There is no services or accommodation available in Minore.

Table 7-31 Localities close to the proposal site and with relevance to the proposal

| Location | Distance from proposal site | Size |
|---|---|---|
| Minore | 3km west | Minore is the closest village to the proposal site.<br>2016 census Population: 153. |
| Narromine | 23km west | Next largest town after Dubbo with a strong agricultural industry.<br>2016 census Population: 6,444. |
| Geurie | 36km south-east | Small agricultural village.<br>2016 census Population: 755. |
| Wellington | 55km south-east | Small town with natural attractions such as caves and bushland.<br>2016 census Population: 4,077. |

## Socio-economic profiles

The socio-economic profile of the Dubbo Regional LGA is presented in Table 7-32.

Table 7-32 Socio-economic overview of Dubbo Regional LGA (ABS, 2016)

| Statistic | Dubbo Regional LGA[10] |
|---|---|
| Population | 76,563 |
| Median age | 39 |
| Top 10 industry sectors (REMPLAN, 2021) | Construction: $1,091.878 M<br>Manufacturing: $953.208 M<br>Rental, Hiring & Real Estate Services: $710.226 M<br>Health Care & Social Assistance: $517.455 M<br>Public Administration & Safety: $391.223 M<br>Agriculture, Forestry & Fishing: $380.420 M<br>Education & Training: $332.729 M<br>Electricity, Gas, Water & Waste Services: $327.832 M<br>Retail Trade: $320.816 M<br>Wholesale Trade: $319.890 M |
| Unemployment rate | 6.0% |
| Aboriginal/ Torres Strait Islander population | 13.7% |
| SEIFA index[11] | Ranked 980<br>$10^{th}$ decile |

## Industry profile

The Dubbo Regional Council's Gross Regional Product (GRP) was at $3.611 billion in June 2019. Overall economic growth is comprised mainly of contributions from education and training, health care, and agriculture. Of the 22,957 jobs in the Dubbo region, approximately 1,161 are engaged in agriculture and approximately 2,598 in construction. Significant population growth is expected in line with ongoing expansion of tourism sector and the establishment of state significant developments (ABS 2016).

The Central West and Orana Regional Plan 2036 (DPE, 2016) describes the regions strong agricultural industry as the base for "*The most diverse regional economy in NSW*". In 2011, the largest gross regional product contributors according to the plan were:

1. Mining, contributing $1.5 billion.

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[10] State Electoral Division of Dubbo used for statistics

[11] Socio Economic Indexes for Areas (SEIFA) is a suite of indexes created by the ABS. The Index of Relative Socio-economic Advantage and Disadvantage (IRSDAD) summarises data about economic and social conditions of people and households in an area. Ranking of NSW suburb's and LGA's are used in this report with 1 being most disadvantaged ($1^{st}$ decile) to 2643 being most advantaged ($10^{th}$ decile).

2. Agriculture, forestry, fishing contributing $1.3 billion.
3. Health Care and social assistance, contributing $1.1 billion
4. Manufacturing, contributing $1 billion
5. Education and training, contributing $849 million.

The most recent agricultural census (ABS, 2015-16) showed the total value of agricultural commodities in the Dubbo Regional Area to be $67 million (0.12 % of NSW).

This region has also been identified as an optimal Renewable Energy Zone **(**REZ) in which to develop new electricity generation projects, supported by existing transmission strength and capacity (AEMO, 2020). In July 2020, the NSW Government is expecting the REZ to be producing 3,000MW in the region by the mid-2020s. Planning is now underway so the Central-West Orana REZ can be ‘shovel-ready’ by the end of 2022. The proposed network upgrades and additional renewable projects will diversify the range of jobs and business for the region, in particular adding the to the construction and technical workforce and stimulating the service sector, such as accommodation and recreational facilities.

## Accommodation and services availability

Dubbo town centre is located approximately 20 minutes east north east of the site. In 2016, there were 16,379 private dwellings in Dubbo, including 1,552 unoccupied private dwellings. Online rental websites indicate 71 properties available to rent (Domain, 2021). Dubbo has multiple accommodation options, including 5-star accommodation, self-contained apartments, guesthouses, hotels motels and caravan parks. The following accommodation options were included in this assessment (Table 7-33).

Table 7-33 Accommodation options within Dubbo area

| Accommodation type | Number within Dubbo area |
|---|---|
| **Caravan Parks** | 5 |
| **Motels** | 24 |
| **Hotels** | 7 |
| **Bed and Breakfasts** | 8 |
| **Self-contained establishments** | 2 |
| **Total** | **46** |

In addition to Dubbo, the town of Narromine is approximately 35 minutes west of the proposal site. In 2016, there were 2,040 private dwellings in Narromine, including 223 unoccupied private dwellings. Online rental websites indicate 63 properties available to rent (Domain, 2021).

Narromine has four motels, one caravan park, one hotel and one bed and breakfast to provide accommodation within Narromine. The townships of Geurie and Wellington are also within commuting distance adding further accommodation options and local employment opportunities.

Other services required by temporary construction staff that are not local include (but are not limited to) food outlets, local retail, health services and entertainment. Peak tourism seasons in Dubbo generally centre around school holiday periods in April, June-July, September, and December-January.

## Economic strategy

Dubbo Regional Council and Narromine Shire Local Government have developed the Central Orana Regional Economic Development Strategy 2018-2022 (Dubbo Regional Council & Narromine Shire Council, 2018). A key aim of the economic strategy is:

> *'Capitalise on the growth potential of the Mining and Construction sectors to boost related clusters in Energy, Manufacturing and Transportation'*

A set of 5 key elements of the Economic strategy are identified by the strategy as essential in influencing economic development. The proposed Forest Glen SF would directly contribute to two of these, specifically:

Element 3: Establish Central Orana as an effective and interconnected business centre

- *Increased number of businesses and workers and increased business retention*

Element 4: Capitalise on the growth potential of the Mining and Construction sectors to boost related clusters in Energy, Manufacturing, and Transportation

- *Develop a healthy marketplace for agriculture, manufacturing, mining, transportation, and logistics businesses to increase employment, output and revenue in each of these industries*

Establishing large scale solar in the region is highly compatible with these elements. A new innovative technological industry such as solar would strengthen and diversify the local economy by introducing new business opportunities, and increasing the construction workforce in the region.

Diversification and innovation are also in line with the *Central West Orana Regional Plan 2036* which identifies renewable energy as a more sustainable energy source for the region. Additionally, the plan states that growth in solar energy will promote local jobs in smaller communities and development opportunities for future industries.

## Community attitudes to renewable energy

Generally, solar energy development enjoys community support. OEH commissioned community research regarding attitudes to renewable energy in 2014 found that 89% of people support the use of renewable energy in the form of solar farms in NSW. Furthermore, 78% of respondents supported having a solar farm within 1-2km of where they lived. Among the reasons for this were benefits to the environment and local economy. A significant amount (83%) of respondents believed that NSW should produce more of its energy from renewables over the following 5 years (OEH, 2015).

In research carried out by Ipsos for the Australian Renewable Energy Agency (ARENA), 48% of respondents agreed that the local economy is positively impacted by large scale solar facilities and 68% agreed that establishing more large-scale solar facilities would reduce Australia's carbon emissions. Making funding available for large scale solar facilities was viewed as a priority over non-renewable energy by 60% of respondents.

However, as more proposals become concentrated in suitable regions and particularly Renewable Energy Zones (those with good irradiance, electricity connections, generally flat and away from dense population centres), concern over local character loss and local agricultural impacts can be seen to emerge. The outcomes of the ARENA research resulted in five key themes that are important in establishing a social license to operate (SLO). These are noted below and are addressed in the following EIS sections:

1. Reliability and efficiency (Section 4.1).
2. Visual Impacts (Section 7.1).
3. Environmental Impacts (Section 7 and Section 7.5).
4. Economic and employment impacts (Section 2.2 and Section 7.4).
5. Health impacts (Section 8.8, Section 8.9, and Section 8.10).

## Community feedback on the Forest Glen SF proposal

Specific to this proposal, one resident raised visual impacts as being of interest regarding the proposal, during discussions with the proponent. In total, 66 feedback forms, sent on two different occasions were issued. As well as providing project information, the forms prompted respondents to note what they liked or disliked about solar farm developments, were distributed during the consultation to date. None have so far been returned. It is assumed the information provided has demonstrated the low level of impact the proposal is likely to have in the locality.

During consultation with the community there have been no objections raised regarding Forest Glen SF. Section 6.4 outlines the community consultation X-Elio has undertaken for the proposal.

### 7.4.2. Potential Impacts

## Construction

The key socio-economic construction impacts of the proposal include:

- Increased jobs (direct benefit of the proposal)
- Injection of money into the local economy (direct benefit of the proposal)
- Pressures on local services (adverse impact)
- Safety risks and hazards associated with construction activities (adverse impact).

During peak construction, the Forest Glen SF would generate approximately 150 jobs directly contributing to strengthening the economy. Up to 200 workers is a maximum estimation during peak construction (approximately 10months). Local residents would make up approximately between 20% and 50% of the workforce, with the remaining workers moving to the area for the duration of the construction phase.

Proposal benefits during construction are anticipated to extend to local service centres including Dubbo and Narromine and potentially Geurie and Wellington. These townships would provide accommodation, food, fuel and trade equipment and services. Local employment would be maximised by consulting with local employment and training organisations, and potentially supporting training and apprenticeships relevant to the proposal.

Conversely, the temporary influx may place pressures on local services such as schools, health services and accommodation. Additional traffic may be noticeable and could present an adverse effect on local tourism if coinciding with local festivals for example. Additional hazards accompany construction traffic (refer to Section 7.5). Mitigation strategies to address these impacts centre on consultation with the community, so that benefits can be maximised, and conflicts resolved proactively, wherever possible.

Dubbo and Narromine would likely be the main town centres providing accommodation for construction staff. The proposal commits to hiring locally (to reduce accommodation and service pressures) and liaising with local representatives to coordinate accommodation services. The proponent would make every effort to hire locally. Based on the variety of accommodation types and availability in Dubbo and Narromine, there would be sufficient accommodation for the proposal.

The change in land use of the proposal site from agricultural to renewable energy can be viewed as either positive or negative within a community and can vary depending on the values of each individual, views among the community vary substantially. The development may be viewed as an opportunity for jobs and economic stimulus within the region and a sign of protecting the environment through the generation of renewable energy. Alternatively, some community members are hesitant of changes to the rural landscape and would consider the development to be in conflict with the existing environment and scenic values. Note: impacts due to changes in predominant land use (from agriculture to electricity generation), are discussed in Section 7.3. Visual impacts are assessed in Section 7.1.

### Operation and decommissioning

Increased economic security of rural communities may be provided through the conversion of agriculturally compatible rural land to solar power generation by diversifying employment opportunities and income streams. Additionally, solar power generation contributes to state and national greenhouse emission reductions objectives by providing stable and renewable electricity generation.

The operation of the Forest Glen SF would also contribute to meeting the goals of the Central Orana Regional Economic Development Strategy 2018-2022 by:

- Generating increased employment opportunities in the construction sector
- Contributing to diversification of local industry, with increased solar power business opportunities
- Facilitating investment opportunities in the region.

The operation of the Forest Glen SF would contribute to the recent influx of new available energy, which has been forecasted by the AEMC and CEC to result in a 7.1% decrease in household energy expenditure between 2019 and 2022. The commissioning of new renewable energy facilities such as Forest Glen SF will increase competition in wholesale energy market and, as with any market, increased competition will tend to reduce prices.

There is a limited amount of information specifically regarding the effect of rural solar farms on local land values. The key driver of land value is and has been historically, the agricultural productivity of the area. The highly reversible nature of the proposal aims to ensure that existing land capability is restored during decommissioning (refer to Section 7.3). Amenity values, such as views, rural lifestyle and proximity to Dubbo, could also be considered to enhance land value. The proposal is unlikely to have visual impacts and the solar farm is reversible during decommissioning. Land values have been addressed in Section 7.3.

Agriculture is prevalent in the local community, however the soil capability at the proposal site has high limitations for high-impact land uses (Section 7.3 and Section 8.1). Land such as this that does not offer critical agricultural value is appropriate for large scale solar development and would add economic value to the land. The Landowner of the Forest Glen SF Proposal site will retain a portion of land for sheep grazing and feed crops over approximately 100 ha. As such the construction of the Forest Glen SF will not eliminate the lands agricultural production while adding a profitable industry to the land. Given the low impact nature of installing solar array modules, solar farms have the potential to provide an alternative stream of income for sites previously accommodating agriculture specific land usage. This is particularly relevant for the proposal site where drought has been a considerable and costly issue. Solar installations do not degrade the landscape and when decommissioned, previous agricultural practices can be reinstated.

Adverse socio-economic impacts are anticipated to be minimal during operation and decommissioning. During operation, maintenance staff and associated activities would be consistent but limited. The additional accommodation, traffic and use of services are not likely to be noticeable. Where possible, maintenance staff would be sourced from the local area.

Less staff are likely to be required for decommissioning than during construction. The economic benefits during this stage would be similar to construction, introducing local opportunities for employment, accommodation and services. Additionally, local recycling of infrastructure components would potentially occur during the decommissioning stage.

## 7.4.3. Safeguards and mitigation measures

It is recommended that consultation be undertaken with key stakeholders of region to so that benefits can be maximised, and potential pressures and conflicts are resolved proactively, wherever possible. Additionally, X-Elio is currently developing a Community Benefit Sharing Program (CBSP) to share the benefits of the Forest Glen SF with the local community. The goal of the CBSP is to facilitate meaningful results-based engagement between X-Elio and the local community in order to generate community support for delivering positive and effective outcomes for renewable energy projects through meaningful community engagement and benefit sharing. A number of priority areas for community funding will be identified and may include contributions to community education centres, training, renewable energy projects, local sports and wellbeing programs.

The CBSP would be key during construction and decommissioning when there is likely to be an influx of workers and potential impact on the local community. During operation, maintenance staff and associated activities would be consistent but limited. The additional accommodation, traffic and use of services are not likely to be noticeable during operational.

The implementation of CCP aims to keep ongoing effective liaison with the community. It would ensure that engagement is appropriate and in line with good practice and proactive in maximising the benefits of the proposal to the local community.

Table 7-34 outlines the Safeguards and mitigation measures for Social and economic impacts considered for the Forest Glen Solar Farm.

Table 7-34 Safeguards and mitigation measures for Social and economic impacts

_C: Construction; O: Operation; D: Decommissioning_

| ID | Safeguards and mitigation measures | C | O | D |
|---|---|---|---|---|
| SE1 | Liaison with local industry representatives to maximise the use of local contractors, manufacturing facilities, materials. | C | | |
| SE2 | Liaison with local representatives regarding accommodation options for staff, to minimise adverse impacts on local services. | C | | D |
| SE3 | Liaison with local tourism industry representatives to manage potential timing conflicts with local events. | C | | D |
| SE4 | The Community Consultation Plan would be implemented to manage impacts to community stakeholders, including but not limited to:<br>• Protocols to keep the community updated about the progress of the proposal and proposal benefits.<br>• Protocols to inform relevant stakeholders of potential impacts (haulage, noise, air quality etc.).<br>• Protocols to respond to any complaints received. | C | | D |
| SE5 | The Proponent will consult with local employment agencies and training organisations and where practicable, will consider supporting training and apprenticeships. | C | O | D |

## 7.5. Biodiversity (Flora and Fauna)

**SECRETARY'S REQUIREMENTS**

_The EIS must also address the following specific issues:_

- **_Biodiversity_** _– including:_

- *an assessment of the biodiversity values and the likely biodiversity impacts of the project in accordance with Section 7.9 of the Biodiversity Conservation Act 2016 (NSW), the Biodiversity Assessment Method (BAM) and documented in a Biodiversity Development Assessment Report (BDAR), unless BCD and DPIE determine the proposed development is not likely to have any significant impacts on biodiversity values;*
- *the BDAR must document the application of the avoid, minimise and offset framework including assessing all direct, indirect and prescribed impacts in accordance with the BAM; and*
- *if an offset is required, details of the measures proposed to address the offset obligation;*

### 7.5.1. Approach

A Land Category Assessment (LCA) was undertaken to verify the specific areas of land that would be subjected to / excluded from the BAM assessment. The BC Act s6.8(3) allows that the biodiversity assessment can exclude any clearing of native vegetation and loss of habitat on category 1-exempt land (within the meaning of Part 5A of the *Local Land Services Act 2013* (LLS Act) with the exception of impacts prescribed by the regulations under section 6.3.

Based on these results, a BDAR for the Forest Glen SF was prepared in accordance with the *Section 7.9 of the Biodiversity Conservation Act 2016 (NSW)* and the *Biodiversity Assessment Method (BAM).* It has been prepared by accredited BAM assessors and uses a precautionary approach to address uncertainty. The biodiversity impact assessment is supported by comprehensive field survey and mapping. It has been developed concurrent with the project description so that areas of avoidance and minimisation measures can be included as part of the proposed presented in this EIS. It concludes with the mitigation measures required to manage residual impacts and offset obligation generated by the project's clearing requirements.

An EPBC Act Protected Matters Report was undertaken on the 19$^{th}$ November 2020 (10km buffer of the Development Site) to identify Matters of National Environmental Significance (MNES) that have the potential to occur within the proposal site. All relevant EPBC listed communities and species were included in the BDAR assessment. A Bilateral Agreement currently exists in relation to the NSW BC Act, meaning that biodiversity assessment and offsets requirements generally do satisfy the Commonwealth requirements.

The LCA and BDAR are included as Appendix D and summarised below.

### 7.5.2. Land category assessment

To meet the Category 1-exempt land requirement, land must be:

- Land cleared of native vegetation as at 1 January 1990; or
- Lawfully cleared after 1 January 1990.

Approximately 399.95ha of land within the proposal site has been determined to meet the definition of Category 1- exempt land. This is supported by recent and historical imagery, as well as 2017 Land Use Mapping data. These areas include mapped areas such as:

- Exotic – areas of cropping and horticultural plantings.
- Irrigation dams and channels.
- Residential – residential buildings containing exotic plantings and non-local native species.
- Infrastructure – roads, dwellings and agricultural infrastructure.

These areas have been excluded from the BAM assessment, except where 'prescribed impacts' as defined in the BAM are relevant. Where in doubt, or where data sources were conflicting, a precautionary approach has been implemented for areas deemed inconclusive in terms of determining historical land use. Refer to Figure 7-9 for excluded areas.

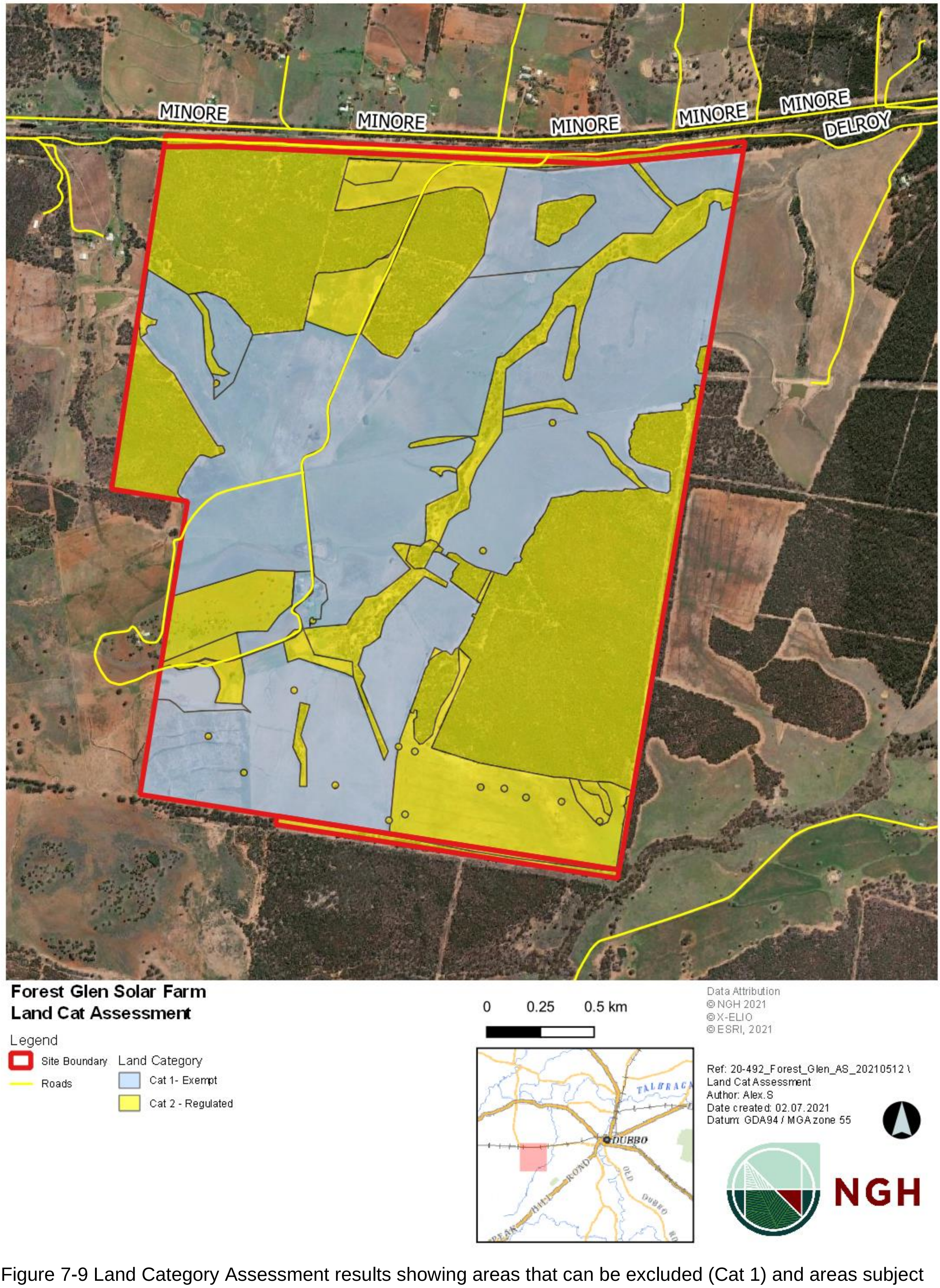


Figure 7-9 Land Category Assessment results showing areas that can be excluded (Cat 1) and areas subject to (Cat 2) the BAM

### 7.5.3. BDAR

## Field surveys

On-site field surveys were conducted by BAM accredited ecologists from the 9th – 13th November 2020 and 2nd – 4th May 2021. The surveys were to determine the Plant Community Types (PCTs) on-site, stratify the areas of homogenous vegetation into zones and determine the presence of delineate Threatened Ecological Communities (TEC). Surveys included BAM plot data collection to represent the zones in accordance with the BAM's stipulated minimum plot numbers.

Targeted flora and fauna surveys were also conducted to determine the presence of suitable habitat and where possible determine presence or absence of threatened fauna. Targeted fauna species included:

- Diurnal avifauna (White-bellied Sea-Eagle, Little Eagle, Major Mitchell's Cockatoo, Square-tailed Kite, Superb Parrot (EPBC Foraging))
- Nocturnal avifauna (Bush Stone-curlew, Barking Owl)
- Nocturnal mammals (Squirrel Glider, Koala).

Threatened flora targeted during surveys included *Commersonia procumbens*, Bluegrass, *Homoranthus darwinoides*, Leafless Indigo, Spiny, Peppercress, Large-leafed Monotaxis, *Pterostylis cobarensis*, Silky Swainson-pea, *Tylophora linearis*.

Survey timing was in accordance with the BAM and lead by accredited BAM assessors.

## Site description

The Development Site occurs within two Interim Biogeographical Regionalisation for Australia (IBRA) bioregions. These are:

- Brigalow Belt South
- NSW South Western Slopes.

The Brigalow Belt South Bioregion is an extensive area of undulating ranges extending from south of Dubbo in central-western NSW to the mid-Qld coast. The South Western Slopes is an extensive area of foothills and isolated ranges, comprising the lower inland slopes of the Great Dividing Range extending from north of Cowra through southern NSW into western Victoria. The Development Site also falls under two Mitchell Landscapes:

- Goonoo Slopes (dominant)
- Geurie Granites.

In terms of native vegetation extent in the locality, approximately 1650ha of native vegetation occurs in the surrounding 1500m buffer area out of a total area of 3258 ah. This constitutes approximately 51% of the buffer area. Approximately 1591ha occurs as cleared areas within the 1500m buffer around the Development footprint. This constitutes approximately 49% of the buffer area.

The Development Site comprises mostly paddocks classified as CATEGORY 1 – unregulated land, within flatter land and foot slopes, which have been cleared for agricultural purposes. Key features of the Development Site include:

- Areas of woodland with moderate diversity of ground cover species, which is potentially of biodiversity value for threatened fauna.
- Hollow bearing trees and additional scattered (paddock) trees.
- Highly disturbed native vegetation that lacks native understorey and forb diversity due to grazing practices.
- Exotic dominated areas used historically for agriculture (refer to Cat 1 mapping above).

- Six dams and two second order watercourses and seven smaller tributaries.

## Plant Community Types (PCTs) and zones

Following the surveys and analysis of the data, two PCTs were identified within the proposal site, these are:

- PCT 255: Mugga Ironbark - Buloke - Pillga Box - White Cypress Pine shrubby woodland on sandstone in the Dubbo region, south-western Brigalow Belt South Bioregion
- PCT 201: Fuzzy Box Woodland on alluvial brown loam soils mainly in the NSW South Western Slopes Bioregion.

PCT 201 is associated with the BC Act listed Endangered Threatened Ecological Community (TEC): Fuzzy Box Woodland on alluvial Soils of the South Western Slopes, Darling Riverine Plains and Brigalow Belt South Bioregions.

An additional PCT (PCT 81 'Western Grey Box - cypress pine shrub grass shrub tall woodland in the Brigalow Belt South Bioregion') was identified within the proposal site. As this PCT is not within the Development Footprint.

PCTs and TEC's within the Development Site are shown in Table 7-35 and Figure 7-10  below. Vegetation integrity scores are derived from the zone plot data and indicate precisely the condition of the vegetation (to a maximum score of 100, indicating pristine structure, composition and function of the zone).

Table 7-35 PCT condition and impact areas

| Zone | PCT | Condition | Vegetation Integrity (VI) score | Directly impacted (ha) | NSW or CW listed TEC |
|---|---|---|---|---|---|
| 1 | PCT 201: Fuzzy Box Woodland | Moderate | 51 | 0.37 | BC Act listed Endangered |
| 2 | PCT 255: Mugga Ironbark - Buloke - Pillga Box - White Cypress Pine shrubby woodland | Poor | 0.2 | 48.08 | No |
| 3 | PCT 255: Mugga Ironbark - Buloke - Pillga Box - White Cypress Pine shrubby woodland | Low | 50.6 | 37.6 | No |
| 4 | PCT 255: Mugga Ironbark - Buloke - Pillga Box - White Cypress Pine shrubby woodland | Moderate | 64.4 | 48.7 | No |
| NA | PCT 81 Western Grey Box - cypress pine shrub grass shrub tall woodland | Poor | NA | 0 | No |

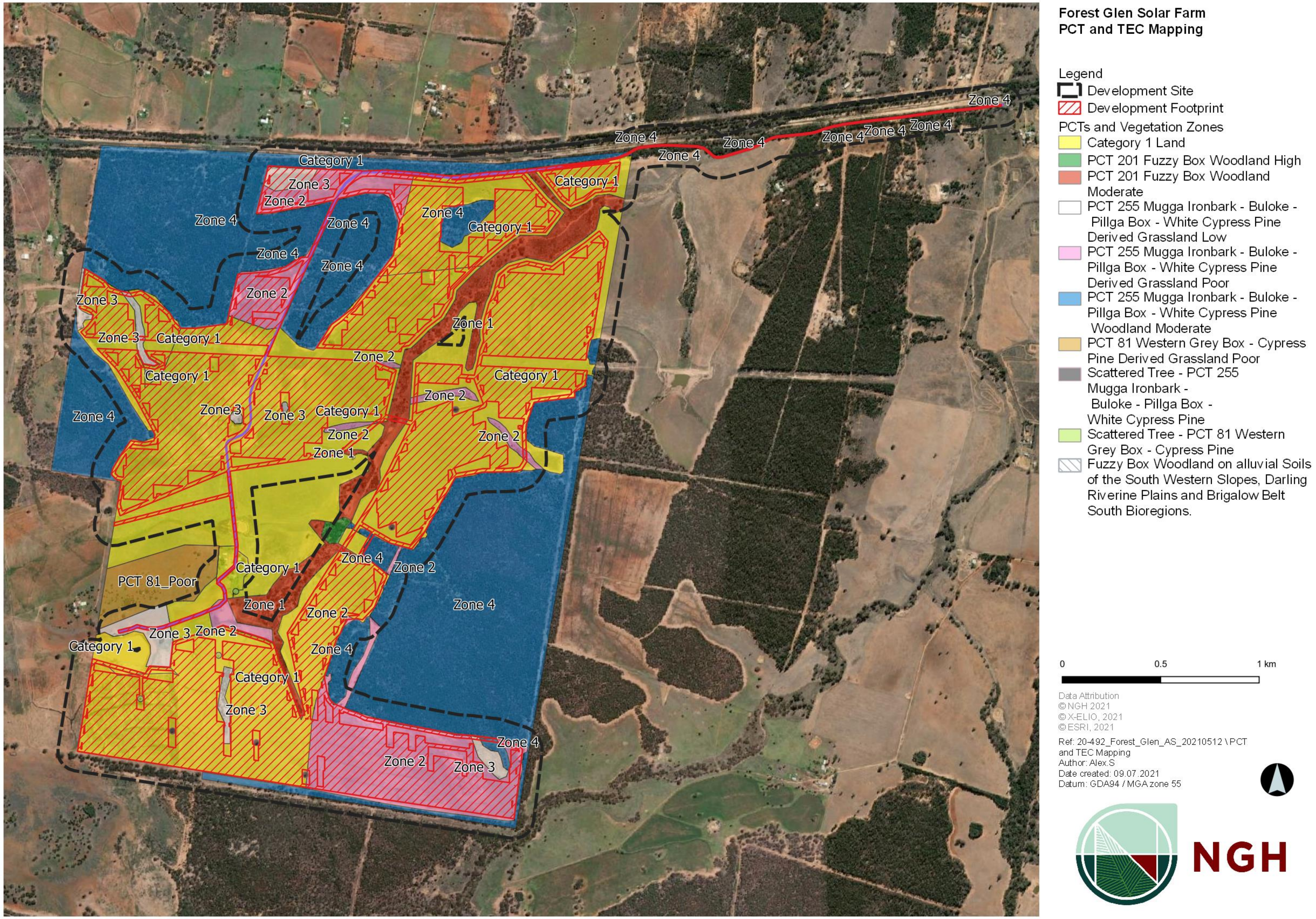


Figure 7-10 Condition of zones within each PCT and TECs extent at the Development Site

## Threatened species

The BAM Calculator predicted 96 ‘species credit’ species to occur within the Development Footprint. Under the BAM, these generate additional species credits unless:

1. They are excluded because habitat constraints required to support the species are not present onsite or,
2. Habitat quality is sufficiently degraded such that they could not be supported at the site or,
3. Survey effort has demonstrated they are not present.

In the table below, criterion 1 and 2 determined that 15 species could be ‘excluded’ on the basis of lack of habitat or sufficiently degraded habitat.

The remaining 19 species that cannot be excluded required seasonally appropriate targeted survey effort to confirm absence or must be assumed to occur onsite. The survey program did not detect any of these species and therefore all can be assumed absent for the purpose of the BAM assessment. No species credits are generated.

Table 7-36 Candidate species excluded on the basis of Criterion 1 or 2

| Species Credit Species | Habitat constraint and geographic restrictions | Sensitivity to gain class | NSW Listing Status | National listing status | Criterion 1: Presence of habitat constraints and abundance on site | Criterion 2: Suitable habitat quality and abundance on site | Included or Excluded | Reason for inclusion or exclusion |
|---|---|---|---|---|---|---|---|---|
| *Anthochaera phrygia* Regent Honeyeater (Breeding) | Breeding habitat is geographically restricted – in NSW, breeding areas are confined to two known locations. | High Sensitivity to Potential Gain | Critically Endangered | Critically Endangered | Outside of geographically restricted breeding habitat. | N/A | Excluded | Development Site outside of known breeding areas. |
| ***Cercartetus nanus*** **Eastern Pygmy-possum** | Requires dense mid-story. | High Sensitivity to Potential Gain | Vulnerable | Not Listed | N/A | Dense mid-storey absent from all zones within Development Footprint. | Excluded | This species has been excluded based on the absence of dense understorey across the Development Footprint. This species has been detected in a broad range of habitat types. However, habitat suitability is closely aligned with the presence of a dense mid-storey of shrubs, most commonly from the genera Banksia and Hakea. (Harris & Goldingay, 2005; Law et al., 2018), which was absent across the Development Site. |
| ***Chalinolobus dwyeri*** **Large-eared Pied Bat** | Requires caves (near their entrances), crevices in cliffs, old mine workings to roost. | Very High Sensitivity to Potential Gain | Vulnerable | Vulnerable | Caves and other suitable geological features absent from Development Footprint. | N/A | Excluded | This species has been excluded based on the absence of suitable roosting sites within or near the Development Footprint, specifically caves, crevices in cliffs, and old mine workings. |
| ***Digitaria porrecta*** **Finger Panic Grass** | None | Moderate Sensitivity to Potential Gain | Vulnerable | Not Listed | Suitable habitat not present within Development Footprint. | N/A | Excluded | Development Site outside of know distribution of species. Additional associated species not present within Development Site. |
| ***Hoplocephalus bitorquatus*** **Pale-headed Snake** | Requires high density of hollow-bearing trees (Shelton et al., 2020; Shelton et al., 2021). | High Sensitivity to Potential Gain | Vulnerable | Not Listed | High density of large hollow-bearing trees (generally Red Gums) not present within site. | N/A | Excluded | As found by Shelton et al. (2020), Pale-headed Snake has narrow habitat constraints, requiring a high density of very large hollow-bearing trees (on average >100 years old) in riparian zones. Additionally, Shelton et al. (202**1**) detected no Pale-headed Snakes within Pilliga Box woodland, with Red Gum forests providing the majority of Pale-headed snake observations (96%). Additionally, the closest record of this species to the Development Site is 150km north-west, in Baradine, NSW. The above factors considered, the Pale-headed Snake has considered unlikely to occur within the Development Site. |

| Species Credit Species | Habitat constraint and geographic restrictions | Sensitivity to gain class | NSW Listing Status | National listing status | Criterion 1: Presence of habitat constraints and abundance on site | Criterion 2: Suitable habitat quality and abundance on site | Included or Excluded | Reason for inclusion or exclusion |
|---|---|---|---|---|---|---|---|---|
| ***Lathamus discolor*** **Swift Parrot** **(Breeding)** | Breeding habitat is geographically restricted – breeds only in Tasmania. | Moderate Sensitivity to Potential Gain | Endangered | Critically Endangered | Outside of geographically restricted breeding habitat. | N/A | Excluded | Development Site outside of known breeding areas. |
| ***Lepidium aschersonii*** **Spiny Peppercress** | None | High Sensitivity to Potential Gain | Vulnerable | Vulnerable | Suitable habitat not detected within Development Footprint. Soils likely unsuitable and associated species not present. | N/A | Excluded | Suitable habitat not present within Development Site. |
| ***Miniopterus orianae oceanensis*** **Large Bent-winged Bat** **(Breeding)** | Caves are the primary roosting/breeding habitat, but also use derelict mines, storm-water tunnels, buildings and other man-made structures. Form discrete populations centred on a maternity cave that is used annually in spring and summer for the birth and rearing of young. | Very High Sensitivity to Potential Gain | Vulnerable | Not Listed | Caves and other suitable geological features not present within Development Footprint. | N/A | Excluded | This species has been excluded based on the absence of suitable roosting sites within or near the Development Footprint, specifically caves, tunnels, mines and culverts. |
| ***Petrogale penicillata*** **Brush-tailed Rock-wallaby** | Requires land within 1km of rocky escarpments, gorges, steep slopes, boulder piles, rock outcrops or clifflines | Very High Sensitivity to Potential Gain | Endangered | Vulnerable | Required land forms not present within Development Footprint. | N/A | Excluded | This species has been excluded based on the absence of rocky escarpments, gorges, steep slopes, boulder piles, rock outcrops, and cliff lines within 1km of the Development Footprint. |
| ***Polytelis swainsonii*** **Superb Parrot (Breeding)** | Breeding requires living or dead *E. blakelyi, E. melliodora, E. albens, E. camaldulensis, E. microcarpa, E. polyanthemos, E. mannifera,* or *E. intertexta* with hollows > 5cm diameter, > 4m above ground, or trees with a DBH of greater than 30 cm | High Sensitivity to Potential Gain | Vulnerable | Vulnerable | Suitable habitat and associated important breeding trees present within Development Footprint | N/A | Excluded | This species requires hollow-bearing trees with hollows greater than 4cm diameter and greater than 4m above the ground for breeding. Suitable hollows were detected onsite; however, these are not to impacted by the proposed development. Additionally, diurnal avifauna surveys conducted for other species met the survey requirements for this species and did not identify any individuals. |
| ***Pteropus poliocephalus*** ***Grey-headed Flying-fox*** ***(Breeding)*** | Breeding habitat is restricted to known breeding camps. | High Sensitivity to Potential Gain | Vulnerable | Vulnerable | No breeding camps present within the Development Site. | N/A | Excluded | No breeding camps present within the Development Site. |
| ***Swainsona murrayana*** ***Slender Darling Pea*** | None | High Sensitivity to Potential Gain | Vulnerable | Vulnerable | Absence of appropriate soils (heavy clay-based) and associated species. | N/A | Excluded | This species is associate with heavy clay-based soils, primarily cracking clays. This species grows in vegetation types including bladder saltbush, black box and grassland communities on level plains, floodplains and depressions and is often found with Maireana |

| Species Credit Species | Habitat constraint and geographic restrictions | Sensitivity to gain class | NSW Listing Status | National listing status | Criterion 1: Presence of habitat constraints and abundance on site | Criterion 2: Suitable habitat quality and abundance on site | Included or Excluded | Reason for inclusion or exclusion |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | | species. None of these habitat features were identified within the Development Site. |
| ***Tyto novaehollandiae*** **Masked Owl (Breeding)** | Hollow bearing trees<br>Living or dead trees with hollows greater than 20cm diameter | High Sensitivity to Potential Gain | Vulnerable | Not Listed | Hollow-bearing trees present within the Development Site. | N/A | Excluded | Hollow-bearing trees present within Development Site and within known distribution. |
| ***Vespadelus troughtoni*** **Eastern Cave Bat** | Caves<br>Within two kilometres of rocky areas containing caves, overhangs, escarpments, outcrops, crevices or boulder piles, or within two kilometres of old mines, tunnels, old buildings or sheds." | Very High Sensitivity to Potential Gain | Vulnerable | Not Listed | Caves and other suitable geological features not present within Development Footprint. | N/A | Excluded | This species has been excluded based on the absence of suitable roosting sites within or near the Development Footprint, specifically caves, overhangs, escarpments, outcrops, crevices, and boulder piles. |

The following species required survey in accordance with the BAM and other relevant guidelines or must be assumed to occur and generate credits. Table 7-37 summarises whether each species was detected during surveys and if so the area of habitat that would be impacted by the proposal and therefore are required to be offset.

Table 7-37 Species requiring targeted survey and result of survey

| Species Credit Species | Biodiversity risk weighting | Assumed to occur/survey |
|---|---|---|
| Burhinus grallarius<br>*Bush Stone-curlew* | 2 | Surveyed – not present |
| ***Commersonia procumbens***<br>**Commersonia procumbens** | 2 | Surveyed – not present |
| ***Dichanthium setosum***<br>**Bluegrass** | 2 | Surveyed – not present |
| ***Diuris tricolor***<br>**Pine Donkey Orchid** | 1.5 | Surveyed – not present |
| ***Haliaeetus leucogaster***<br>**White-bellied Sea-Eagle** | 2 | Surveyed – not present |
| **Hieraaetus morphnoides**<br>**Little Eagle** | 1.5 | Surveyed – not present |
| ***Homoranthus darwinioides***<br>**Homoranthus darwinioides** | 2 | Surveyed – not present |
| ***Indigofera efoliata***<br>**Leafless Indigo** | 3 | Surveyed – not present |
| ***Lophochroa leadbeateri***<br>**Major Mitchell's Cockatoo** | 2 | Surveyed – not present |
| ***Lophoictinia isura***<br>**Square-tailed Kite** | 1.5 | Surveyed – not present |
| ***Monotaxis macrophylla***<br>**Large-leafed Monotaxis** | 2 | Surveyed – not present |
| ***Ninox connivens***<br>***Barking Owl*** | 2 | Surveyed – not present |
| ***Petaurus norfolcensis***<br>**Squirrel Glider** | 2 | Surveyed – not present |
| ***Phascolarctos cinereus***<br>**Koala** | 2 | Surveyed – not present |

| Species Credit Species | Biodiversity risk weighting | Assumed to occur/survey |
|---|---|---|
| ***Polytelis swainsonii*** ***Superb Parrot*** ***(Foraging)*** | 2 | Surveyed – not present |
| ***Prasophyllum sp. Wybong*** ***Prasophyllum sp. Wybong*** | 3 | Surveyed – not present |
| ***Pterostylis cobarensis*** **Greenhood Orchid** | 2 | Surveyed – not present |
| ***Swainsona sericea*** **Silky Swainson-pea** | 2 | Surveyed – not present |
| ***Tylophora linearis*** **Tylophora linearis** | 2 | Surveyed – not present |

### 7.5.4. Potential Impacts

#### Direct and indirect impact types

Potential direct impacts to biodiversity during the construction and operational phases are anticipated to include:

- Clearing of habitat
- Shading of habitat (by mounted array panels)
- Displacement of resident fauna from vegetation clearing
- Injury or death of fauna.

Indirect impacts of the proposal are anticipated to include:

- Inadvertent impacts on adjacent habitat or vegetation
- Reduced viability of adjacent habitat due to edge effects
- Reduced viability of adjacent habitat due to increased noise
- Transport of weeds and pathogens from the site to adjacent vegetation
- Increased risk of starvation, exposure and loss of shade or shelter
- Loss of breeding habitat
- Trampling of threatened flora species
- Inhibition of nitrogen fixation and increased soil salinity
- Fertilizer drift
- Rubbish dumping
- Wood collection
- Removal and disturbance of rock, including bush rock
- Increase in predators
- Increase in pest animal populations
- Changed fire regimes

- Disturbance to specialist breeding and foraging habitat (e.g. beach nesting for shorebirds).

Biodiversity impacts have been assessed at a worst-case scenario. It is noted that the largest areas of impact result from mounted panels shading habitat below. While it is not expected to result in removal of habitat, 100% removal has been modelled in the BAM assessment.

The impact assessment has informed the development of the proposal. Exclusion zones have been included as part of the proposal to reduce impacts to higher quality vegetation. Mitigation and management measures will be put in place to adequately address impacts both direct and indirect impacts.

## Prescribed impacts

The following prescribed biodiversity impacts are relevant to the proposal:

### Impacts of development on the connectivity of different areas of habitat of threatened species that facilitates the movement of those species across their range

The majority of the Development Footprint is situated within unregulated Category 1 Land (255 ha). However, the installation of fencing, road construction and infrastructural development will have some impacts on connectivity. The species most likely impacted by changes to connectivity are those reliant on moving large distances such as Koala, should this species be present within the greater area surrounding the Development Site.

Short term impacts will result in species requiring relocating outside of the Development Footprint, while long term impacts could include permanent breaks in connectivity due to installation of fence lines and access roads. The loss of these areas is unlikely to have an impact that could cause a decline in a threatened species, with a modification of their behaviour over time to move within the existing and retained bushland more likely.

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

The installation of access roads within the Development Site will increase the likelihood of vehicle strike. Risk of vehicle strike will be highest where roads cross wooded vegetation, e.g., Delroy Rd intersects two patches of PCT 255 moderate condition woodland. In such areas, the risk to fauna can be mitigated by regulating speed limits. Given the speed limit of access roads will likely be relatively low and will primarily be used during daylight hours, the likelihood of vehicle strike is still considered low risk.

## Impacts to Matters of National Environmental Significance

### Threatened Ecological Communities

NGH surveys confirmed that no threatened ecological communities identified through the protected matters search tool as having potential to occur, were present within the Development Footprint.

### Threatened Species

Considering MNES, no EPBC listed threatened species are considered likely to be impacted by the proposed development. An initial Assessment of Significance (AoS) determined Regent Honeyeater had potential to be impacted by the development due to potential habitat within the Development footprint, however updates to the proposal resulted in impacts to Regent Honeyeater being deemed unlikely.

Assessments of Significance for Spot-tailed Quoll, Corben's Long-eared Bat, Swift Parrot, and Grey-headed Flying Fox concluded no significant impact was likely and EPBC to the Federal Department of Agriculture, Water and the Environment (DAWE) referral would not be required.

Habitat within the Development Site is also not deemed critical to the survival of the Koala and an assessment of significant impact according to the EPBC Act significant impact criteria is not required. This was determined using the EPBC Act Referral Guidelines for the Koala (DoE 2014).

### Migratory Species

A habitat assessment was conducted for migratory species returned from the protected matters report. None of these species are considered likely to occur onsite

## Potential serious and irreversible impact entities

The principles used to determine if a development will have serious and irreversible impacts, include impacts that:

- Will cause a further decline of the species or ecological community that is currently observed, estimated, inferred, or reasonably suspected to be in a rapid rate of decline, or
- Will further reduce the population size of the species or ecological community that is currently observed, estimated, inferred, or reasonably suspected to have a very small population size, or
- Impact on the habitat of a species or ecological community that is currently observed, estimated, inferred, or reasonably suspected to have a very limited geographic distribution, or
- Impact on a species or ecological community that is unlikely to respond to measures to improve habitat and vegetation integrity and is therefore irreplaceable.

### Threatened Ecological Communities

Fuzzy Box Woodland on alluvial soils of the South Western Slopes, Darling Riverine Plains and Brigalow Belt South Bioregions was identified in association with PCT 201 and zone 1 within the Development Footprint. Zone 1 exhibits a NVI score of 51. Impacts to this Serious and Irreversible Impact (SAII) TEC have been avoided where possible, with a maximum of 0.37ha proposed to be impacted. This represents a small impact of the total area of PCT201 onsite which will be predominantly protected through the implementation of exclusion zones for the TEC and riparian zones with which it is associated. Clearing within this zone (zone 1) is not expected to have a significant impact on the community, given the large majority of the patch being retained.

### Threatened species

The Development footprint has been designed so as to avoid all areas of moderate condition woodlands, scatter trees, and hollow-bearing trees as much as practical. This has resulted in a maximum of 1.53ha of PCT 255 moderate, 0.37ha of PCT 201 moderate, and 1 Mugga Ironbark scatter tree being impacted. These impacts will be mostly restricted to trimming of trees for vehicle access along Delroy Rd. Additionally, clearing will primarily follow existing vegetation lines, minimising adverse changes from edge effects. The footprint will not significantly increase the distance between patches, so impacts to connectivity are also deemed unlikely. Given the relatively low impact to potential Regent Honeyeater habitat, adverse impacts to habitat critical for survival is not considered likely.

28.5ha of biodiversity exclusion zone will be delineated to protect important vegetation within these PCTs and corridor connections. In total the exclusion zones within the Development footprint will directly protect up to:

- 11.9ha of PCT 201 Fuzzy Box Woodland on alluvial brown loam soils mainly in the NSW South Western Slopes Bioregion
- 16.4ha of PCT 255 Mugga Ironbark - Buloke - Pillga Box - White Cypress Pine shrubby woodland on sandstone in the Dubbo region, south-western Brigalow Belt South Bioregion
- 0.1ha of PCT 81 Western Grey Box - cypress pine shrub grass shrub tall woodland.

## Offset requirement

After consideration of avoidance measures, mitigation measures have been outlined to reduce the impacts to biodiversity (refer to Table 7-3). The residual impacts will be offset in accordance with the NSW Biodiversity Offsets scheme, and will be achieved by either;

(a) Retiring credits under the Biodiversity Offsets Scheme, or

(b) Making payments into the Biodiversity Conservation Fund using the offset payments calculator, or

(c) Funding a biodiversity action that benefits the threatened entity impacted by the development.

For ecosystem impacts that are unavoidable, the proposal would require the removal of:

- 52.83ha of PCT 255, generating 86 ecosystem credits
- 0.37ha of PCT 201, generating 9 ecosystem credits.

Offsets are also required for the clearing of Class 2 and Class 3 scattered trees. Scattered trees were assigned to PCTs based on species and PCTs within close proximity to scattered trees. One Class 3 scattered tree of PCT 255 is impacted by the proposed development resulting in the generation of 1 additional ecosystem credit.

No species credits have been generated.

### 7.5.5. Safeguards and mitigation measures

Table 7-38 Safeguards and mitigation measures for biodiversity impacts

*PC: Pre-Construction, C: Construction; O: Operation; D: Decommissioning*

| ID | Safeguards and mitigation measures | C | O | D |
|---|---|---|---|---|
| B1 | Timing works to avoid critical life cycle events such as breeding or nursing:<br>• Hollow bearing tree removal should be timed to avoid August-November - breeding season for the highest number of species. | C | | |
| B2 | Instigating clearing protocols including pre-clearing surveys, daily surveys and staged clearing, the presence of a trained ecological or licensed trained spotter catcher during clearing events:<br>• Staged clearing, supervised by Ecologist or trained spotter catcher to allow for resident fauna to relocate or be relocated where required | C | | |
| B3 | Relocation of habitat features (fallen timber, hollow logs and embedded rock) from within the Development Site:<br>• All embedded rock, fallen timber and hollow logs should be relocated outside of the construction area under the supervision of an Ecologist or spotter catcher. | C | | |
| B4 | Induct all staff prior to construction to identify vegetation to be retained, prevent inadvertent damage and reduce soil disturbance:<br>• Approved clearing limits to be clearly delineated with temporary fencing or similar prior to construction commencing.<br>• No stockpiling or storage within dripline of any mature trees.<br>• No stockpiling or storage within riparian buffers. | PC<br>C | | |

| ID | Safeguards and mitigation measures | C | O | D |
|---|---|---|---|---|
| B5 | Clearing protocols that identify vegetation to be retained, prevent inadvertent damage and reduce soil disturbance; for example, removal of native vegetation by chainsaw, rather than heavy machinery, is preferable in situations where partial clearing is proposed:<br>• Documented clearance protocols to mark and protect vegetation to be retained.<br>• Use handheld machinery where possible and have elevated work platform check hollows prior to tree felling | PC | | |
| B6 | Install temporary fencing to protect significant environmental features such as riparian zones:<br>• Prior to construction commencing, exclusion fences and signage would be installed around identified exclusion zones. | C | | |
| B7 | Hygiene protocols to prevent the spread of weeds or pathogens between infected areas and uninfected areas:<br>• Ensure machinery and equipment as clean and free from pathogens and weeds prior to entering site | C | | |
| B8 | Preparation of a Biodiversity Management Plan (BMP) for the site to include:<br>• How to remove and dispose of vegetation and topsoil containing weeds declared under the Biosecurity Act 2015 during and after construction.<br>• Reporting any occurrences of pathogens such as Myrtle Rust and Phytophthora<br>• Identification and protection of biodiversity exclusion zones during construction and operation. | C | O | |
| B9 | Sediment barriers and spill management procedures to control the quality of water runoff released from the site into the receiving environment:<br>• An erosion and sediment control plan would be prepared and implemented.<br>• Spill management procedures would be implemented.<br>• Stormwater management plan prepared and implemented. | C | | |

## 7.6. Traffic, transport and safety

**SECRETARY'S REQUIREMENTS**

*The EIS must also address the following specific issues:*

- ***Transport*** *– including:*
- *an assessment of the construction, operational and decommissioning traffic impacts of the development*
- *an assessment of the peak and average traffic generation, including over-dimensional vehicles and construction worker transportation*

- *an assessment of the likely transport impacts to the site access route (including Mitchell Highway, Newell Highway, Minore Road, Delroy Road and the adjacent Main Western Line rail corridor), site access point, any Crown land, particularly in relation to the capacity and condition of the roads, road safety and intersection performance and impacts to the rail corridor*
- *a cumulative impact assessment of traffic from nearby developments*
- *provide details of measures to mitigate and / or manage potential impacts including a schedule of all required road upgrades (including resulting from heavy vehicle and over mass / over dimensional traffic haulage routes), road maintenance contributions, and any other traffic control measures, developed in consultation with the relevant road and rail authorities*

Amber Organisation Pty Ltd (2021) prepared a Traffic Impact Assessment for the proposed construction, operation and decommissioning of Forest Glen Solar Farm including potential impacts to the proposed construction transport route

The report is summarised below and provided in full in Appendix I.

### 7.6.1. Approach

The Traffic Impact Assessment has been prepared in accordance with the guidelines contained within the following publications:

- Austroads Guide to Traffic Management Part 12 and TfNSW supplement.
- Austroads Guide to Road Design and TfNSW supplements.
- TfNSW (RMS) Guide to Traffic Generating Developments.
- *Unsealed Roads Manual: Guidelines to Good Practice* (2009).

The Traffic Impact Assessment approach included:

- Consultation with road authorities including Transport for NSW and Dubbo Regional Council (refer to Section 6.1.3).
- Review of existing traffic volumes and types along the haulage route and local roads
- Turning movement count survey at the intersection of the Newell Highway and Minore Road to determine any need to upgrade the intersection.
- Undertake a SIDRA analysis and swept path assessments for intersections.

### 7.6.2. Existing environment

#### Road network

Vehicles accessing the site are expected to primarily use Golden Highway, and to a lesser extent Mitchell Highway, which both connect with Newell Highway within Dubbo. Vehicles will then use the local road network via Minore Road and Delroy Road to access the site. The preferred haulage route from Botany Bay to the Delroy Road site access point is shown in Figure 7-11. The final haulage route would be further detailed in the traffic management plan.

Each road part of the proposed haulage route for the Forest Glen SF are described in Table 7-39 below. Golden Highway, Mitchell Highway and Newell Highway are State Roads under the care and management of Transport for New South Wales (TfNSW). While Minore and Delory Road are local roads, both under the management of Dubbo Regional Council. It is noted that part of Delroy Road is Crown Land, however it is still managed by council on behalf of DoI- Crown Lands.

Table 7-39 Forest Glen SF's road descriptions and authorities

| Name | Road Authority | Description |
|---|---|---|
| Golden Highway | State road (TfNSW) | Located in the Hunter and Orana regions and runs in an eastbound direction from Newell Highway in Dubbo towards Newcastle where it connects with New England Highway. Within the Dubbo LGA it typically has a sealed width of approximately 9.0m accommodating one lane of traffic in each direction, and has a speed limit of 100km/hr. |
| Mitchell Highway | State road (TfNSW) | Extends north west from its connection with Great Western Highway and Mid-Western Highway in Bathurst. The road runs through Dubbo and continues to the Queensland border. Within the Dubbo LGA it typically has a sealed width of approximately 9.0m accommodating one lane of traffic in each direction, and has a speed limit of 110km/hr. |
| Newell Highway (Figure 7-13) | State road (TfNSW) | Generally runs in a north-south alignment from West Wyalong to Tocumwal. Within the vicinity of the site, it accommodates one lane of traffic in each direction and has a sealed width of approximately 10.0m. It also has a posted speed limit of 60km/hr within Dubbo. |
| Minore Road | Local (Dubbo Regional Council) | Local road that extends west from Newell Highway to its connection with Narromine Street. It has a sealed carriageway width of approximately 12.0m within Dubbo which narrows to 7.0 metres towards the site. It accommodates one lane of traffic in each direction and has a speed limit of 80km/hr west of the urban area. Provide access between Dubbo and rural properties within the Minore locality. |
| Delroy Road (Figure 7-12**)** | Local (Dubbo Regional Council and Crown Lands) | Local road that extends west from Minore Road for 3.6km to its connection with the site access. It has an unsealed carriageway width of approximately 5.5m and accommodates two-way vehicle access. Provides access only to approximately 7 properties along the road, which terminates at the proposal site. |

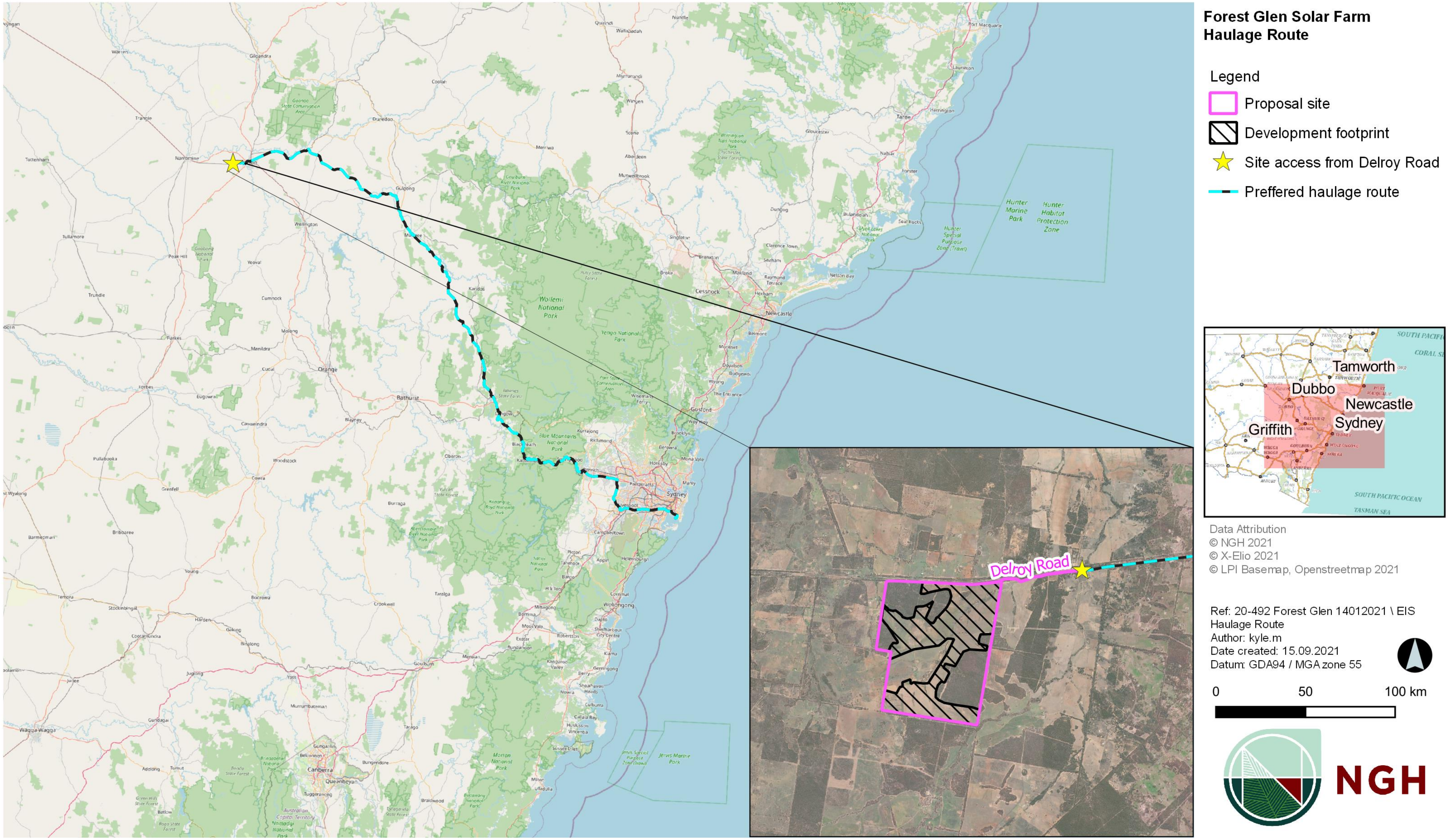


Figure 7-11 Haulage Route from Port Botany to proposal Site


Figure 7-12 Delroy Road

The intersection of Newell Highway with Minore Road is priority controlled with a Give Way sign provided for vehicles exiting Minore Road. Turning movements from Newell Highway are supported by a right turn lane and vehicles turning left are provided with basic left turn treatment. The intersection of Minore Road and Delroy Road is priority controlled with a Give Way sign provided for vehicles exiting Delroy Road

Amber commissioned a turning movement count survey at the intersection of Newell Highway and Minore Road in order to determine the existing traffic conditions at the intersection. The survey was undertaken on Tuesday 8 December 2020 from 6:00am to 8:00am and from 4:30pm to 6:30pm. The peak hour survey results are illustrated below in Figure 7-14.


Figure 7-13 Newell Highway looking southbound. With Minore Road intersection in the west, right turn.

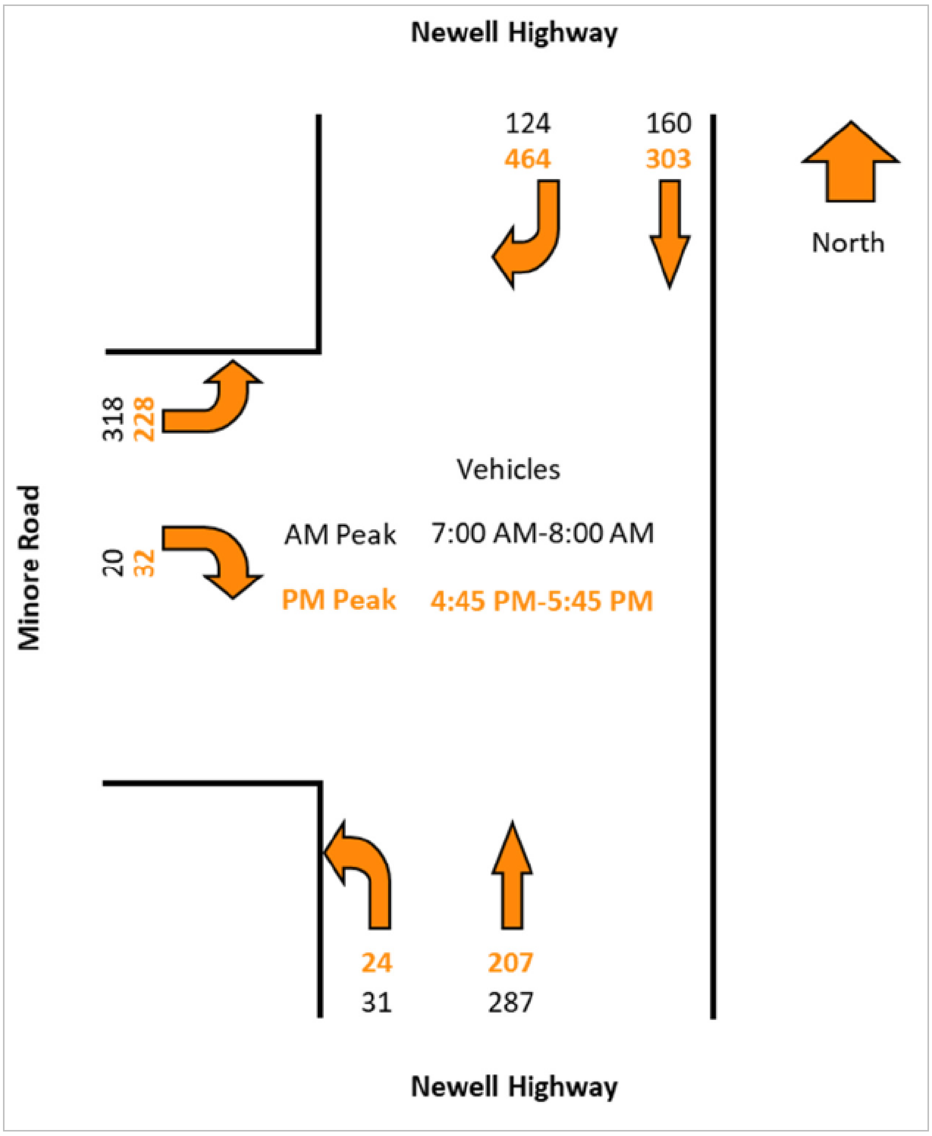


Figure 7-14 Turning movement count peak hour survey results

The survey results indicate the morning peak hour occurred from 7:00am and the afternoon peak occurred from 4:45pm. The intersection accommodates a total of 940 and 1,258 vehicles per hour during the morning and evening peak hours, respectively. Traffic volume data for Newell Highway was obtained from the TfNSW traffic volume viewer. The closest available data was located 370m east of Yuille Court, where the 2009 data recorded an average daily traffic count of 5,178 vehicles per day (vpd). The traffic count data also indicates that 19% of all traffic are heavy vehicles. Applying a growth rate of 1.5% to the 2009 data suggests Newell Highway currently accommodates in the order of 6,099vpd. Traffic count data for Minore Road has been provided by Dubbo Regional Council and is outlined below:

- Minore Road west of St Andrews Drive (February 2016): 2,825vpd - 1% heavy vehicles;
- Minore Road west of Champagne Drive (February 2016): 950vpd;
- Minore Road east of St Andrews Drive (September 2007): 3,300vpd.

Council has suggested a growth rate of 1.0-1.5% for Minore Road. Therefore, Minore Road is estimated to currently accommodate approximately 4,184vpd. Given Delroy Road services approximately 6 residential properties it is estimated that it currently accommodates in the order of 10 vehicle movements per day.

### Public transport services

School bus services are operated within the vicinity of the site and are summarised below:

- Dubbo Bus Lines operate along Minore Road between Newell Highway and Champagne Drive; and
- Ogden's Coaches operate along Minore Road with buses expected along the section used by the project between 7:40am-8:00am and 4:10pm-4:30pm.

### Restricted vehicle access

The state road network within the vicinity of the site is rated to accommodate B-Double movements. The Newell and Mitchell Highways crossing through Dubbo township are rated to accommodate B-Double movements as well as a number of additional roads that access the town. Minore Road is accessed via the Newell Highway intersection s described above (refer to Figure 7-13).

## 7.6.3. Potential impacts

### Construction

#### Increased traffic generation

A maximum of 200 staff will be on-site during peak construction periods. It is understood that shuttle buses will be provided that can accommodate the majority of staff, with the remaining staff to access the site using private vehicles.

Approximately 34 trucks will access the site per day during peak construction periods. The delivery trucks will predominantly be Medium and Heavy Rigid Trucks (MRV and HRV). Articulated vehicles (AV) and B-Doubles will be used to transport larger plant such as the PV panels It is also noted that Restricted Access Vehicle / Oversized vehicles will also be required for the delivery of larger plant to the site such as the sub-station transformer. The longest vehicle expected on site is a 19m B-Double.

It is anticipated that during peak construction the site could generate up to 68 heavy and 89 light vehicle movements per day. Table 7-40 summarises the traffic movements generated during the construction period of the solar farm.

Table 7-40 Traffic generation during peak construction periods

| Vehicle Type | Average Vehicle Movements per Day | | Peak Vehicle Movements per Day | |
|---|---|---|---|---|
| | Daily (vpd) | Peak Hour (vph) | Daily (vpd) | Peak Hour (vph) |
| Light Vehicle (car / 4WD) | 30 | 5 | 80 | 50 |
| Shuttle Bus | 48 | 8 | 9 | 5 |
| MRV/HRV | 18 | 3 | 20 | 5 |
| AV | 18 | 3 | 24 | 6 |
| B-Double | 18 | 3 | 24 | 6 |
| **Total** | **132** | **22** | **157** | **72** |

Accordingly, the site is expected to generate approximately 72 vehicle movements in the peak hour during peak construction periods.

### Traffic distribution

Traffic accessing the site would do so via Newell Highway and then Minore Road, before entering the site via Delroy Road. The following provides a breakdown of the access distribution for each of the vehicle classifications outlined within Table 7-40:

- Light Vehicles: It is anticipated that most staff will be travelling from Dubbo, to and from the site.
- Shuttle Bus: It has been assumed that all shuttle buses be travelling from Dubbo, to and from the site
- MRV/HRV: These vehicles will predominantly be water trucks and vehicles transporting materials such as concrete and fencing supplies which will be sourced within the surrounding area. The Applicant has advised that the majority of movements will be to/from the site and Dubbo.
- AV/B-Double: Plant will be transported via Sydney and will utilise Golden Highway to access Newell Highway, then Minore Road.

Accordingly, the majority of vehicle movements are expected to access the site via Newell Highway from the north. However, it is noted that there may be the occasional vehicle that accesses the site from the south.

The peak hour for the solar farm would occur at the start and end of the day when staff are transported to/from the site. During the morning peak all vehicle movements will be towards the site and in the evening peak all vehicle movements will be away from the site. Heavy vehicle movements will be distributed throughout the day and will be split evenly between inbound and outbound movements.

### Traffic assessment

In order to determine the traffic impact generated during the construction of the solar farm an analysis of the operation of the intersection of Newell Highway with Minore Road was carried out using the SIDRA computer modelling program. The concepts of intersection capacity and level of service, as defined in the guidelines published by the RTA (2002), are discussed in Appendix A of the Amber Traffic report (Appendix I) together with criteria for their assessment. The level of service for sign- controlled intersections is based on the average delay (seconds/vehicle) of vehicles moving through the intersection.

The turning movement count surveys have been used to determine the existing operating conditions at the intersection. The assessment has been undertaken for the peak hour for construction traffic which is expected to occur between 6:00am and 7:00am when staff arrive on-site and from 5:30pm to 6:30pm when staff depart the site.

Outside of the morning and evening peak hour of the solar farm the traffic generation is expected to be minimal (less than 5 vehicles per hour) and would be well within the typical daily variation in traffic at the intersection. As such, the construction traffic can readily be accommodated on the road network at these times.

The traffic volumes used for the assessment are provided within Appendix B of the Amber report and the results of the analysis summarised in Table 7-41.

Table 7-41 SIDRA Analysis results summary - AM Peak

| **Movement** | | **Existing Environment** | | | **Peak Construction Conditions** | | |
|---|---|---|---|---|---|---|---|
| | | **Average delay (Sec)** | **95% Queue (m)** | **Level of Service** | **Average Delay (sec)** | **95% Queue (m)** | **Level of Service** |
| Newell Highway Northern Leg | Through | 0.0 | 0.0 | A | 0.0 | 0.0 | A |
| | Right Turn | 6.2 | 2.5 | A | 6.3 | 4.5 | A |
| Minore Road | Right | 9.4 | 0.2 | A | 10.2 | 1.7 | B |
| | Left | 5.9 | 0.7 | A | 5.9 | 5.0 | A |
| Newell Highway Southern Leg | Through | 0.0 | 0.0 | A | 0.0 | 0.0 | A |
| | Left | 5.6 | 0.0 | A | 5.6 | 0.0 | A |

The SIDRA analysis for the AM peak indicates the following:

- The right turn lane from Newell Highway has sufficient length to continue to accommodate the queue length generated during the morning peak hour;
- The delay at the intersection increases from 3.3 seconds to 3.7; and
- The intersection is expected to continue to operate with a good level of service.

Table 7-42 SIDRA Analysis results Summary - PM peak

| **Movement** | | **Existing Environment** | | | **Peak Construction Conditions** | | |
|---|---|---|---|---|---|---|---|
| | | **Average delay (Sec)** | **95% Queue (m)** | **Level of Service** | **Average Delay (sec)** | **95% Queue (m)** | **Level of Service** |
| Newell Highway Northern Leg | Through | 0.0 | 0.0 | A | 0.0 | 0.0 | A |
| | Right Turn | 7.0 | 12.4 | A | 7.0 | 12.4 | A |
| Minore Road | Right | 16.8 | 2.1 | C | 16.9 | 2.4 | C |

| Movement | | Existing Environment | | | Peak Construction Conditions | | |
|---|---|---|---|---|---|---|---|
| | | Average delay (Sec) | 95% Queue (m) | Level of Service | Average Delay (sec) | 95% Queue (m) | Level of Service |
| | Left | 6.0 | 6.2 | A | 6.1 | 8.4 | A |
| Newell Highway Southern Leg | Through | 0.0 | 0.0 | A | 0.0 | 0.0 | A |
| | Left | 5.6 | 0.0 | A | 5.6 | 0.0 | A |

The SIDRA analysis for the PM peak indicates the following:

- The right turn lane from Newell Highway has sufficient length to continue to accommodate the queue length generated during the morning peak hour;
- The delay at the intersection increases from 4.2 seconds to 4.3;
- The right turn lane from Minore Road experiences a Level of Service C during both the existing and future conditions, with the delay expected to increase by only 0.1 seconds; and
- The intersection is generally expected to continue to operate with a good level of service.

Overall, the construction traffic is expected to have a minimal impact on the operation of the intersection. Accordingly, it is concluded that the road network is able to accommodate the traffic development during the construction period.

### Cumulative impacts

It is noted that the following major projects are located in the surrounding area:

- Suntop Solar Farm Stage 2 – Prepare EIS (refer to Figure 1-1)
- Maryvale Solar Farm –Determination (refer to Figure 1-1)
- Wellington Solar Farm –Determination (refer to Figure 1-1)
- Wellington North Solar Farm – Determination
- Dunedoo Solar Farm –Determination
- Uungula Wind Farm –Assessment.
- Dubbo Quarry Continuation Project – Assessment
- Mumbil Solar Farm – Prepare EIS
- Bunrrendong Wind Farm – Prepare EIS
- Gilgandra Solar Farm – Determination.

The surrounding major projects have the potential to generate a number of staff vehicle movements during the peak periods associated with construction, and a number of staff for the projects are expected to be located in Dubbo. The traffic associated with the projects will be spread on the surrounding road network and will be utilise Newell Highway, Mitchell Highway, and Golden Highway.

The traffic assessment provided within this report demonstrates that the local road network is expected to continue to operate with a good level of service with ample spare capacity. As such, the combined increase in traffic generated by the site and these projects is expected to have a minimal cumulative impact on the road network. Further, it is noted that the peak traffic generated by these projects during construction occurs before 7am and after 6pm which is outside of the peak times of the road network.

It is recommended that any delivery of large plant be coordinated with the other solar and wind farm projects to ensure the vehicle movements do not conflict.

### Route assessment

Access Route

Botany Bay, Sydney has been identified as the location where the solar farm plant will be imported. The proposed construction traffic access route from Sydney to the site is proposed to be via Castlereagh Highway, Golden Highway and Newell Highway. The state roads are designated for B-Double vehicles as outlined within the TfNSW Restricted Access Vehicle Map. Accordingly, the access route is able to accommodate the loads and type of vehicle movement to be generated during construction of the solar farm.

It is also noted that some oversize and over mass vehicles will be required to deliver larger plant to the site such as the sub-station transformer. The vehicles are subject to specific road permits that will be applied for by the contractor once the dimensions of the load and the specific delivery vehicle are known. The longest vehicle expected on site is a 19m B-Double.

Local Road Network

All vehicles accessing the site will utilise Minore Road and Delroy Road which both accommodate simultaneous two-way vehicle movement. Minore Road has a sealed surface whilst Delroy Road has an unsealed surface. It is noted that both roads are not classified within the TfNSW Restricted Access Vehicle Map and as such, approval of the use of the roads by larger vehicles is required as part of any future Construction Traffic Management Plan (CTMP).

The *Unsealed Roads Manual: Guidelines to Good Practice*, dated March 2009, notes that the average traffic for gravel roads usually varies between 20 and 200 vehicles per day. The document also notes that roads may warrant paving when maintenance costs increase to unacceptable levels, in wet climates, or when economic or social benefits are evident.

The increase in traffic and heavy vehicle movement could impact the condition of roads on the haulage network. As mentioned, Castlereagh Highway, Golden Highway and Newell Highway the impact is expected to be negligible due to the existing capacity of the road network. However the impact of turning traffic at the intersections in Dubbo (Newell Highway, Minore Road and Delroy Road) would likely require monitoring to ensure that the road is maintained in an adequate condition. Any damage as a consequence of the works would be rectified. A dilapidation survey of the haulage routes between the Newell Highway and the site would be completed prior to the commencement of any site works.

### Site access (Delroy Road)

Delroy Road is estimated to currently accommodate 10 vehicle movements per day. The traffic volumes along Delroy Road would increase to 167 vehicle movements per day during peak construction periods and 142 vehicle movements per day during typical construction periods. Therefore, the traffic volumes along Delroy Road would be less than the recommended loading for gravel roads during peak construction periods. It is noted that the Main Western Railway line is adjacent to the proposal, but the haulage route doesn't cross the railway line.

Given the expected traffic along Delroy Road during construction, it is concluded that the unsealed surface of the road is suitable to accommodate the future traffic volumes. However the road would require road width upgrades from the existing 5.5m carriageway to a 6.5m carriageway to allow simultaneous two-way vehicle traffic. The Delroy Road and Minore Road intersection also requires minor upgrades as outlined below in the intersection assessment (no change to intersection type or alignment).

A Construction Traffic Management Plan (CTMP) will be prepared prior to construction of the site to minimise the impact of construction traffic along the unsealed roads and will address issues such as dust generation and private access disruptions (refer to Section 7.6.4 for mitigation measures).

### Intersection assessment

Newell Highway / Minore Road

*Austroads Guide to Traffic Management Part 6: Intersections, Interchanges, and Crossings* specifies the turning treatments required at intersections. Figure 2.26 of the guide specifies the required turn treatments on the major road at un-signalised intersections, and is provided below in Figure 7-15 for a design speed of less than 70km/hr.

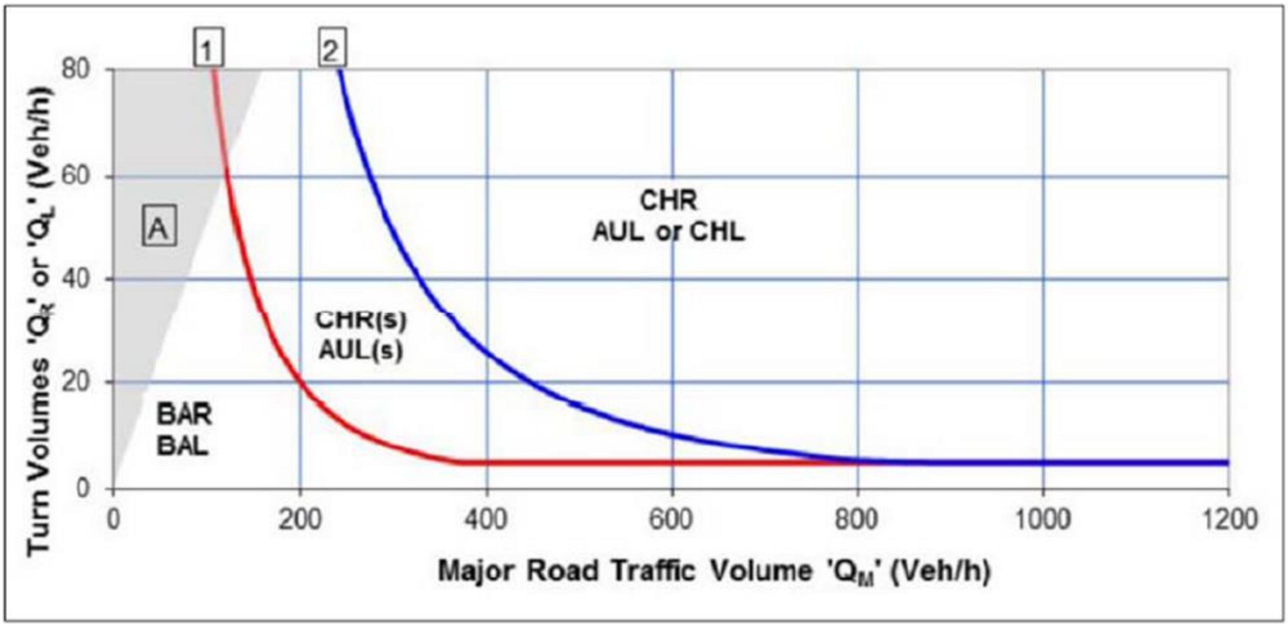


Figure 7-15 Figure 2.26 of Austroads Guide to Traffic Management part 6

The peak hour turning volumes will predominantly be generated by staff accessing the site in the morning which occurs from 6:00am to 7:00am. Table 7-43 identifies the required turning treatments based on the expected traffic volumes at the intersection outlined within Appendix B of the Amber traffic report (Appendix I).

Table 7-43 Turning volumes for Turn Treatment Calculations

| Turning Treatment | Traffic Volume (vpd) | | Requirement |
|---|---|---|---|
| | Turn Volume | Major Road | |
| **Right Turn** | 102 | 322 | CHR |
| **Left Turn** | 8 | 135 | BAL |

The intersection is already provided with an Channelised Right Turn Lane (CHR) and a Basic Left Turn (BAL) turn treatment. Therefore, the existing turn facilities meet the requirements of the Austroads Guideline. Accordingly, the intersection of Newell Highway and Minore Road is expected to be able to accommodate the traffic generated by the solar farm in a safe manner.

Minore Road / Delroy Road

The intersection of Minore Road and Delroy Road is currently in poor condition. It is recommended and part of the project description that the intersection be provided with some minor upgrades to formalise the intersection to ensure vehicle movements are undertaken in a safe manner and to accommodate the increase in traffic generated by the solar farm. The proposed upgrades are shown within Appendix C of the Amber traffic report and includes:

- Provide a minimum carriageway width of 6.5 metres for Delroy Road, this would include some trimming of roadside trees
- Sealing the first part of Delroy Road to allow vehicles to safely exit Minore Road (refer to Figure 7-16 for intersection design).
- Providing Give Way signage and line marking for vehicles exiting Delroy Road.

No other intersection treatments or upgrades are required. No changes to intersection alignment or type is proposed.

A swept path assessment has been undertaken for the Minore Road / Delroy Road intersection using the AutoTurn software package which is presented in Appendix D. The swept path assessment has been based on a B-Double which represents the worst-case vehicle expected to access the site (excluding OSOM vehicles) and demonstrates simultaneous two-way movement is provided at the intersection.

Accordingly, the intersection of Minore Road and Delroy Road is expected to be able to readily accommodate the development traffic in a safe manner with the adoption of the recommended upgrades outlined above.

The works shown in (refer to Figure 7-16) would be adjacent to Minore Road but would not involve works to the road surface along Minore Road. As such the intersection works would only involve works within the curtilage of Delroy Road and would not require additional consent for works on Minore Road.


Figure 7-16 Minore Road / Delroy Road intersection design – minor upgrade, no change to intersection type or alignment. (Grey shading indicates the extent of the proposal sealed area)

## Operation

During operation, the solar farm is expected to generate a minimal level of traffic associated with maintenance and operation services. The solar farm is expected to generate up to 8 light vehicle movements per day which would result in a negligible change to the traffic environment. Some emergency responses are likely to occur outside these times, however such movements would be kept to a minimum. Operational staff would be confined to designated parking areas and access roads/tracks within the proposal site.

Additional transport may be required in the case of battery replacement for the BESS. If batteries require replacement at any time during the operation of the solar farm, then additional trucks would be required to bring in the new batteries and remove the old batteries. It is unlikely that additional traffic during this period would require special consideration beyond would has been considered during the initial construction. Any requirement for OSOM vehicle use during operation would require a permit following the same process that will be included in the OEMP.

## Decommissioning

At the end of the operational life of the project all above ground infrastructure would be dismantled and removed from the project site. Internal roads, if not required for ongoing farming purposes or fire access, would be removed and the site reinstated as close as possible to its original state. Traffic generation during decommissioning would be similar to traffic generation during the average construction period. A comprehensive Construction Traffic Management Plan would be prepared prior to the decommissioning phase in conjunction with the relevant road authorities. This would aim to ensure adequate road safety and road network operations are maintained.

### 7.6.4. Safeguards and mitigation measures

The potential traffic, transport and road safety impacts associated with the proposal are higher during construction than operation and decommissioning due primarily to the increased numbers of vehicles on the road network. The mitigation measures outlined below are to be implemented to reduce the risk of collision, damage to road infrastructure and disruption to services through design of road infrastructure and preparation and implementation of management plans.

Associated potential noise and dust impacts with increased traffic from the proposal would be reduced through mitigation measures outlined in other sections of this EIS (Section 7.2 and 8.10).

Table 7-44 Safeguards and mitigation measures for traffic, transport and safety impacts

*Construction, C: Construction; O: Operation; D: Decommissioning*

| ID | Safeguards and mitigation measures | C | O | D |
|---|---|---|---|---|
| T1 | A Construction Traffic Management Plan (CTMP) will be prepared prior to construction commencing by the appointed contractor. The CTMP will provide additional information regarding the traffic volumes and distribution of construction vehicles that is not available at this time, including:<br>• Road transport volumes, distribution and vehicle types broken down into:<br>    ○ Hours and days of construction.<br>    ○ Schedule for phasing/staging of the project.<br>• The origin, destination and routes for: | PC | | |

| ID | Safeguards and mitigation measures | C | O | D |
|---|---|---|---|---|
| | ○ Employee and contractor light traffic.<br>○ Heavy vehicle traffic.<br>○ Oversize and over mass traffic.<br>The following provides recommended measures that should be adopted within the CTMP to minimise the impact of construction traffic along the road network:<br>• Neighbours of the solar farm be consulted and notified regarding the timing of major deliveries which may require additional traffic control and disrupt access.<br>• Dwellings are located adjacent to Delroy Road along the access route. It is recommended that dust suppression measures be implemented within the vicinity of the dwelling to limit the impact to residents<br>• Loading and unloading is proposed to occur within the work area. No street or roads will be used for material storage at any time.<br>• Delivery of larger plant to occur outside of school bus service times and peak traffic times to prevent larger vehicles interacting with the school bus and congestion issues.<br>• All vehicles will enter and exit the site in a forward direction.<br>• Management of vehicular access to and from the site is essential in order to maintain the safety of the general public as well as the labour force. The following code is to be implemented as a measure to maintain safety within the site:<br>○ Utilisation of only the designated transport routes.<br>○ Construction vehicle movements are to abide by finalised schedules as agreed by the relevant authorities.<br>• All permits for working within the road reserve must be received from the relevant authority prior to works commencing.<br>• A map of the primary haulage routes highlighting critical locations.<br>• An induction process for vehicle operators and regular toolbox meetings.<br>• A complaint resolution and disciplinary procedure.<br>• Local climatic conditions that may impact road safety of employees throughout all project phases (e.g. fog, wet and significant dry, dusty weather). | | | |
| T2 | The intersection of Minore Road and Delroy Road is to be upgraded to formalise the intersection to ensure vehicle movements are undertaken in a safe manner and to accommodate the increase in traffic generated by the solar farm. The proposed upgrades are shown within Appendix C and includes:<br>• Provide a minimum carriageway width of 6.5 metres for Delroy Road<br>• Seal the first part of Delroy Road to allow vehicles to safely exit Minore Road<br>• Providing Give Way signage and line marking for vehicles exiting | PC, C | | |

| ID | Safeguards and mitigation measures | C | O | D |
|---|---|---|---|---|
| | Delroy Road. | | | |
| T3 | A Haulage Plan would be developed and implemented during construction and decommissioning, including but not limited to:<br>• Direction of traffic flow (both heavy and light).<br>• Loads, weights and length of haulage and construction related vehicles and the number of movements of such vehicles.<br>• Scheduling of deliveries of major components to minimise safety risks (on other local traffic).<br>• Traffic controls (signage and site speed limit restrictions etc.).<br>• All heavy vehicle movements to/from the access point are to be managed to ensure that only one inbound or outbound vehicle is travelling along the access route in the vicinity of the site at a time.<br>Heavy vehicle movements into and out of the proposal site will be controlled via traffic management means, including a traffic controller, temporary lowered speed limit and additional road signage alerting vehicles of truck movements in the area. | C | O | D |
| T4 | The proponent would engage an appropriately qualified person to prepare a Road Dilapidation Report for all road routes to be used during the construction (and decommissioning) activities, in consultation with the relevant road authority. This report is to address all road related infrastructure. Reports must be prepared prior to commencement and after completion of construction (and decommissioning). Any damage resulting from the construction (or decommissioning) traffic, except that resulting from normal wear and tear, must be repaired at the Proponent's cost. Such work shall be undertaken at a time agreed upon between the Proponent and relevant road authorities. | PC | | D |
| T5 | The proponent would repair any damage resulting from project traffic (except that resulting from normal wear and tear) as required at the proponent's cost. | C | | D |
| T6 | Obtain a Section 138 Consent from the relevant council/agency to carry out works within the road reserve. | C | | D |

# 8. Assessment of additional issues

## 8.1. Soils

**SECRETARY'S REQUIREMENTS**

*The EIS must also address the following specific issues:*

- ***Land** – including:*
- *an assessment of the potential impacts of the development on existing land uses on the site and adjacent land, including:*
    - *a consideration of agricultural land, flood prone land, Crown lands (including Delroy Road), mining, quarries, mineral or petroleum rights, (including mineral exploration rights licence EL 8961)*
    - *a soil survey to determine the soil characteristics and consider the potential for erosion to occur; and*
    - *a cumulative impact assessment of nearby developments;*
- *an assessment of the compatibility of the development with existing land uses, during construction, operation and after decommissioning, including:*
    - *consideration of the zoning provisions applying to the land, including subdivision, and;*
    - *completion of a Land Use Conflict Risk Assessment in accordance with the Department of Industry's Land Use Conflict Risk Assessment Guide;*
- ***Water** – including:*
- *an assessment of the likely impacts of the development (including flooding) on surface water and groundwater resources (including Whylandra Creek, Macquarie River and other watercourses traversing or surrounding the site, drainage channels, wetlands, riparian land, farm dams, key fish habitat, groundwater dependent ecosystems and acid sulfate soils), related infrastructure, adjacent licensed water users and basic landholder rights, and measures proposed to monitor, reduce and mitigate these impacts*
- *details of water requirements and supply arrangements for construction and operation; and*
- *a description of the erosion and sediment control measures that would be implemented to mitigate any impacts in accordance with Managing Urban Stormwater: Soils & Construction (Landcom 2004);*

### 8.1.1. Existing environment

The topography of the proposal site is generally flat (Figure 8-1). The proposal site is generally flat with a central valley with elevation ranging from to 283m to 325m Australian Height Datum (AHD).The elevation ranges from 283 – 325m Australian Height Datum (AHD) and is best characterised as central valley which falls from south-west to north-east. The proposal site is a similar elevation or slightly above the surrounding lands. The proposal site includes the following topographical features:

- Flats, low hills and lower slopes
- Limited rocky outcrops
- Few lower order ephemeral gullies.

Figure 8-1 Example of typical topography across the proposal site

The Narromine 2nd Ed 1:250,000 geological map (MinView, 2020) indicates that the geology underlying the proposal site consists of Quaternary alluvium for the majority of the proposal. Tertiary volcanic outcrops composed of Olivine Basalt occur in the north and south western sections of the site. There is also an occurrence of Silurian – Devonian Fine to medium grained sandy and calc-silicate hornfels at the western edge of the site.

Two soil types are derived from this geology occur at the proposal site: Rudosols and Tensols. The characteristics of these soil types include:

- Generally have a loose to firm surface
- Contain little to no shrink swell clays
- Generally not dispersive
- Contain very low salt levels
- Generally low to moderate fertility
- Generally well drained.

The proposal site is not mapped as BSAL (Biophysical Strategic Agricultural Land, identified to have high quality soil and water resources capable of sustaining high levels of productivity). The closest mapped BSAL is 800m west of the proposal site. As set out in Section 7.3 the site is LSC class 5 (moderate-low capability land) largely used for grazing with occasional cultivation for pastures. The class 5 area is not capable of supporting regular cultivation due to the various limitation such as erosion and low fertility.

A site condition inspection was undertaken on 7 to 9 of December 2020. During the visit erosion features, sedimentation features, and site vegetation cover was noted. Most of the proposal site is covered with perennial grasses, scattered trees and dams (Figure 8-2). Forested areas of land are also located on the proposal site (Figure 8-3). The 2nd order creek that runs through the site is moderately vegetated and did not display substantial erosion within its vegetated extent upon site inspection (Figure 8-4). Aerial imagery does, however, indicate that there are localised area of bank erosion and sedimentation within the creek (Figure 8-5). One gully erosion feature was observed onsite within the upper reaches of the 2nd order creek (Figure 8-6). Other erosion features onsite include areas of sheep grazing and compaction (Figure 8-7 and Figure 8-8) and localised rill erosion around unvegetated dam levee's and internal tracks (Figure 8-9).

Figure 8-2 proposal site pastures

Figure 8-3 Forested area within the proposal site

Figure 8-4 Indicative riparian vegetation

Figure 8-5 2019 Google Earth Aerial of bank erosion in creek

Figure 8-6 Gully erosion feature

Figure 8-7 Compaction and erosion in a shaded area frequented by sheep

Figure 8-8 Compaction and erosion along open pasture

Figure 8-9 Rill erosion onsite

Mitchell Landscapes are descriptions that apply to broad areas of New South Wales complied in 2002 by Dr. Peter Mitchell on behalf of the NSW National Parks and Wildlife Service (DECC NSW, 2002). The proposal site is encompassed by one Mitchell Landscape of the Brigalow Belt South Bioregion. One Mitchell Landscape of the NSW South West Slopes Bioregion is present on site but only includes a minor section of forested land in the west of the site. The Mitchell Landscape descriptions are provided in Table 7-9 below.

Table 8-1 Description of the Mitchell Landscape relevant to the proposal (DECC NSW, 2002).

| **Mitchell Landscape** |
|---|
| **Goonoo Slopes: Brigalow Belt South Bioregion** |
| Extensive undulating to stepped low hills with long slopes on sub-horizontal Triassic/Jurassic quartz sandstone, conglomerates, siltstone, shale and some coal. General elevation 300 to 500m with overall westerly slope, poorly defined drainage network, local relief to 30m. Stony yellow earths with sandstone outcrop on ridgelines to yellow harsh texture-contrast soils in shallow valleys. |
| **Geurie Granites: NSW South West Slopes Bioregion** |
| Low ranges and rounded hills with common rock outcrop and tors on massive Devonian granite, general elevation 400 to 610m, local relief 180m. Gritty gradational red earth on the crests, red texture-contrast soil on upper slopes grading to yellow harsh texture-contrast soil along valley floors. |

A search of the NSW OEH Contaminated Sites Register (NSW Government, 2021) was undertaken on 13 July 2021 to identify contaminated sites within the Dubbo Regional LGA. The search identified two sites within the Dubbo Regional LGA. None of these sites occur near or within the proposal site.

It is noted that the site has a history of agricultural land use and as such, agricultural sites may contain buried rubbish including contaminants such as herbicides that may be encountered during excavation. No indications of potential sources of contamination were identified during the site assessment.

The Australian Resource Information System (ASRIS) database (CSIRO, 2018) indicates there is a low to extremely low probability of acid sulfate soils occurring within the proposal site.

### 8.1.2. Potential impacts

### Construction

The proposed disturbance area for the proposal based on the indicative infrastructure layout with a 5m buffer is approximately 266ha. The disturbance breakdown for the project is outlined in Section 4.4.2 (Table 4-1).

Construction activities that may adversely impact soils include the use of equipment and earthworks. Risks for the site have been shown to be sheet, rill and gully erosion.

The construction of the solar farm would disturb soils through the following activities:

- Establishment of external access road, subject to final detailed design.
- Removal of existing fences and construction of perimeter security fencing.
- Foundations for the inverter stations, substation and maintenance buildings.
- Establishment of temporary staff amenities and offices for construction.
- Levelling the ground for buildings and structures.
- Localised areas of earth work (cut and fill, grading and compacting) may be required in areas where there are sudden, significant changes in ground slope.
- Construction of internal access roads approximately 6.5m in width.
- Excavation of cable trenches 600mm to 900mm wide and 1m deep
- Installation of mounting structures (pile driven or screwed to a depth of 2 - 3m).
- Vegetation clearance:
  - 0.6% forested land
  - 1.0% native grassland
  - 98.4% exotic grassland/pasture.

The soil disturbance has the potential to result in the following impacts:

- Reduce soil stability and increased susceptibility to erosion due to vegetation removal or soil exposure, especially if the subsoil is sodic and dispersive.
- Loss of topsoil and impacts on waterways due to increased erosion and sedimentation hazard.
- Reduced soil permeability and increased run-off as a result of soil compaction for internal access roads and hardstand areas.
- Risk of exposing buried contaminant (pesticides and hydrocarbons).

The earthworks and excavations associated with the access tracks, buildings and cabling trenches would require removal of vegetation cover and soil disturbance in some areas.

The pile driving or screwing of steel posts associated with the installation of arrays and the installation of security fencing would have a small discrete footprint at the pole location and is unlikely to result in substantial soil disturbance.

Ground cover would be maintained where possible during the pre-construction and construction stages of the proposal and would be rehabilitated upon decommissioning.

Sheep grazing would be limited to the area within the Development footprint as a maintenance strategy to reduce biomass and assist weed management. This would also provide an opportunity to rest, rehabilitate and improve land that has already been degraded by agricultural practices in the areas of the proposal site that are not within the Development footprint.

Erosion and sedimentation impacts that may arise as a result of construction and decommissioning works can be minimised by carrying out the activities in accordance with the provisions of the *Managing Urban Stormwater: Soils and Construction* series, in particular:

- *Managing Urban Stormwater: Soils and Construction, Volume 1, 4th edition* (Landcom, 2004), known as 'the Blue Book.'
- *Volume 2A Installation of Services* (DECC, 2008a)
- *Volume 2C Unsealed Roads* (DECC, 2008b).

Soil compaction occurring as a result of hardstand and access road construction and vehicle movements would reduce soil permeability; this may increase runoff and the potential for concentrated flows across the proposal site.

## Operation

The land within the proposal site has some gully and sheet erosion present and poses the primary risk during operation as a result of the following:

- Localised erosion as a result of concentrated runoff from solar panels during significant rain events if ground cover is not maintained underneath the solar arrays. This is particularly relevant to fixed solar array systems.
- Ongoing erosion from disturbed areas associated with unsealed tracks and drainage structures.
- Soil compaction.
- Other factors such as dispersive subsoils would be identified as part of the soil survey of the site, and appropriate management actions be identified to deal with this (refer to Section 7.3 for soil survey requirements).

Activities associated with the operation stage would be mostly confined to formalised access tracks. Vehicle access between panel arrays where there would not be access tracks would be required occasionally. It is anticipated this would occur infrequently and is unlikely to pose a significant erosion risk.

Soil disturbance would be minimised by rehabilitation measures undertaken during construction and establishment of groundcover following soil disturbance activities. The risk to soil impacts is considered low with the implementation of appropriate mitigation measures.

During operation, the primary land use would transition from agricultural land use to power generation. Grazing would be limited to the area within the Development footprint as a maintenance strategy to reduce biomass and assist weed management. There is mounting evidence to show that the 'resting' from agriculture and microclimate effects beneath the array will improve soil health and capability. This would provide an opportunity to rehabilitate the existing degraded land on the proposal site in areas outside of the Development footprint.

## Decommissioning

When the solar farm is no longer viable, all above ground infrastructure, with the possible exception of the 132kV substation, would be removed and decommissioning and rehabilitation of the site would commence. The solar arrays would be removed and the steel piles on which they are supported, would be removed. Both the steel piles and the solar panels would be recycled, where possible. All buildings would be removed, including the PCUs together with the associated footings. Cabling would be removed where practical and recycled. Any cabling greater than 500mm below the ground may be left in place since this would not impact on future agricultural activities on the site once the restoration is complete.

Groundcover management during decommissioning would be ensured through the development and implementation of a Ground Cover Management Plan.

Following decommissioning, rehabilitation of the site would be undertaken to restore the site to its pre-existing condition. Rehabilitation is discussed in Section 7.3.

### 8.1.3. Safeguards and mitigation measures

The main potential impacts of the proposal on soils are disturbance resulting in erosion, sedimentation and compaction. These potential impacts can be reduced through the design of the solar farm as well as through preparation and implementation of a Soil and Water Management Plan, erosion and sediment control plans and Groundcover Management Plan. These are outlined below.

Table 8-2 Safeguards and mitigation measures for soil.

*PC: Pre-Construction, C: Construction, O: Operation, D: Decommissioning*

| ID | Mitigation measures | C | O | D |
|---|---|---|---|---|
| S1 | As part of the CEMP, a Soil and Water Management Plan (SWMP) (with erosion and sediment control plans) would be prepared, implemented and monitored during the proposal, in accordance with Landcom (2004), to minimise soil (and water) impacts. These plans would include provisions to:<br>• Install, monitor and maintain erosion controls.<br>• Ensure that machinery leaves the site in a clean condition to avoid tracking of sediment onto public roads which may cause risks to other road users through reduced road stability.<br>• Manage topsoil in all excavation activities, separate subsoils and topsoils and ensure that they are replaced in their natural configuration to assist revegetation. Stockpile topsoil appropriately so as to minimise weed infestation, maintain soil organic matter, maintain soil structure and microbial activity.<br>• Minimise the area of disturbance from excavation and compaction; rationalise vehicle movements and restrict the location of activities that compact and erode the soils as much as practical. Any compaction caused during construction would be treated such that revegetation would not be impaired.<br>• Manage works in consideration of heavy rainfall events; if a heavy rainfall event is predicted, the site should be stabilised, and work ceased until the wet period had passed.<br>• Areas of soil disturbed by the proposal would be rehabilitated progressively or immediately post-construction, reducing views of bare | C | | |

| ID | Mitigation measures | C | O | D |
|---|---|---|---|---|
| | soil. | | | |
| S2 | A Groundcover Management Plan would be developed in consultation with an agronomist and to ensure final land use includes perennial grass cover establishment across the site as soon as practicable after construction and maintained throughout the operation phase. The plan would cover:<br>• Soil handling, restoration and preparation requirements.<br>• Plant Species election.<br>• Soil preparation.<br>• Establishment techniques.<br>• Maintenance and monitoring requirements.<br>• Perennial groundcover targets, indicators, condition monitoring, reporting and evaluation arrangements – i.e. A target of 70% live grass cover would apply to protect soils, landscape function and water quality. Additional measures would be implemented where practical when live grass cover falls below 70%. Grass cover would be monitored on a fortnightly basis using an accepted methodology.<br>• Contingency measures to respond to declining soil or groundcover condition. I.e. any grazing stock would be removed from the site when cover falls below the target of 70% live ground cover.<br>• Identification of baseline conditions for rehabilitation following decommissioning.<br>• Preserve the native composition as much as possible. | C | O | D |
| S3 | The array would be designed to allow sufficient space between panels to establish and promote groundcover beneath the panels and allow for implementation of weed controls. | Design | | |
| S4 | A Spill and Contamination Response Plan would be developed as part of the overall Emergency Response Plan to prevent contaminants affecting adjacent surrounding environments. The plan would include measures to:<br>• Respond to the discovery of existing contaminants at the site (e.g. pesticide containers or asbestos), including stop work protocols and remediation and disposal requirements.<br>• Requirement to notify the EPA for incidents that cause material harm to the environment (refer s147-153 of the POEO Act).<br>• Manage the storage of any potential contaminants onsite.<br>• Mitigate the effects of soil contamination by fuels or other chemicals (including emergency response and the EPA notification procedures and remediation.<br>• Ensure that machinery arrives on site in a clean, washed condition, free of fluid leaks.<br>• Prevent contaminants affecting adjacent pastures, dams, water courses and native vegetation.<br>• Monitor and maintain spill equipment | C | O | D |

| ID | Mitigation measures | C | O | D |
|---|---|---|---|---|
| | • Induct and train all site staff. | | | |
| S5 | The transformers will be filled with oil, and waterproof bunds built around them to manage oil spills. | Design | | |
| S6 | A protocol would be developed in relation to discovering buried contaminants within the proposal site (e.g. pesticide containers). It would include stop work, remediation and disposal requirements. | C | O | D |

## 8.2. Watercourses and hydrology

**SECRETARY'S REQUIREMENTS**

*The EIS must also address the following specific issues:*

- ***Water** – including:*
- *an assessment of the likely impacts of the development (including flooding) on surface water and groundwater resources (including Whylandra Creek, Macquarie River and other watercourses traversing or surrounding the site, drainage channels, wetlands, riparian land, farm dams, key fish habitat, groundwater dependent ecosystems and acid sulfate soils), related infrastructure, adjacent licensed water users and basic landholder rights, and measures proposed to monitor, reduce and mitigate these impacts*
- *details of water requirements and supply arrangements for construction and operation; and*
- *a description of the erosion and sediment control measures that would be implemented to mitigate any impacts in accordance with Managing Urban Stormwater: Soils & Construction (Landcom 2004);*

### 8.2.1. Approach

A Hydrological and Hydraulic Analysis Report was prepared by Footprint NSW Pty Ltd (2021) to assess potential impacts of the proposal on existing hydrological conditions of the site. The report has been provided as Appendix F and is summarised below.

### 8.2.2. Existing environment

#### Local catchment and waterways

The Dubbo City Local Flood Plan covers preparation for response to and recovery from emergencies including flooding (NSW SES, 2013) in the region. According to the Dubbo City Local Flood Plan, the plan covers the Macquarie River from a point approximately 33km upstream of Dubbo at its confluence with the Little River to a point approximately 52km downstream where the Brummagen Creek discharges into the Macquarie River. The principal tributaries of the Macquarie River are the Trabragar River, Little River and Coolbaggie Creek.

Whylandra Creek is the most significant nearby watercourse and is located 60m from south east corner and 2km from the north east corner of the proposal site. Whylandra Creek is a Strahler 4th order[12] stream that feeds into the Macquarie River approximately 9km downstream.

The dominant surface water feature within the proposal site is a 2nd order drainage line (unnamed), that runs through the centre of the proposal site and feeds small dams within the proposal site. There are also seven 1st order streams and 8 farm dams across the proposal site. All watercourses within the proposal site would be described as ephemeral and would only contain flowing water during and shortly after rainfall events. These watercourses are shown in Figure 8-11.

Exclusion areas of 20m each side of the 2nd order stream line are included in the construction design of the Development footprint. These areas present the highest risk factors for flooding. The exclusion areas corelate with the recommended riparian corridor widths shown in Figure 8-11.

The proposal site contains a central valley which falls from south-west to north-east with elevation ranging from to 283m to 325m AHD. These elevations are shown in Figure 8-10.

[12] Stream order describes the hierarchy of streams from the top to the bottom of a catchment. The most widely used system to determine stream order is the Strahler system defined as follows (DPI, 2018): A 1st order stream has no other streams flowing into it. When two streams with different orders join, the resulting stream has the same order as the highest order of the two joining streams. For example, when a first and second order stream join, the resulting stream is second order. When two streams with the same order join, the resulting stream has the next highest order than the joining streams. For example, when two second order streams join, the resulting stream is third order. A stream may separate and then converge—this is called a ‘braided stream’. A braided stream retains the same stream order throughout the braid, as though it were a single stream. A lake may be located on a stream. The occurrence of a lake does not change the stream order of a stream.

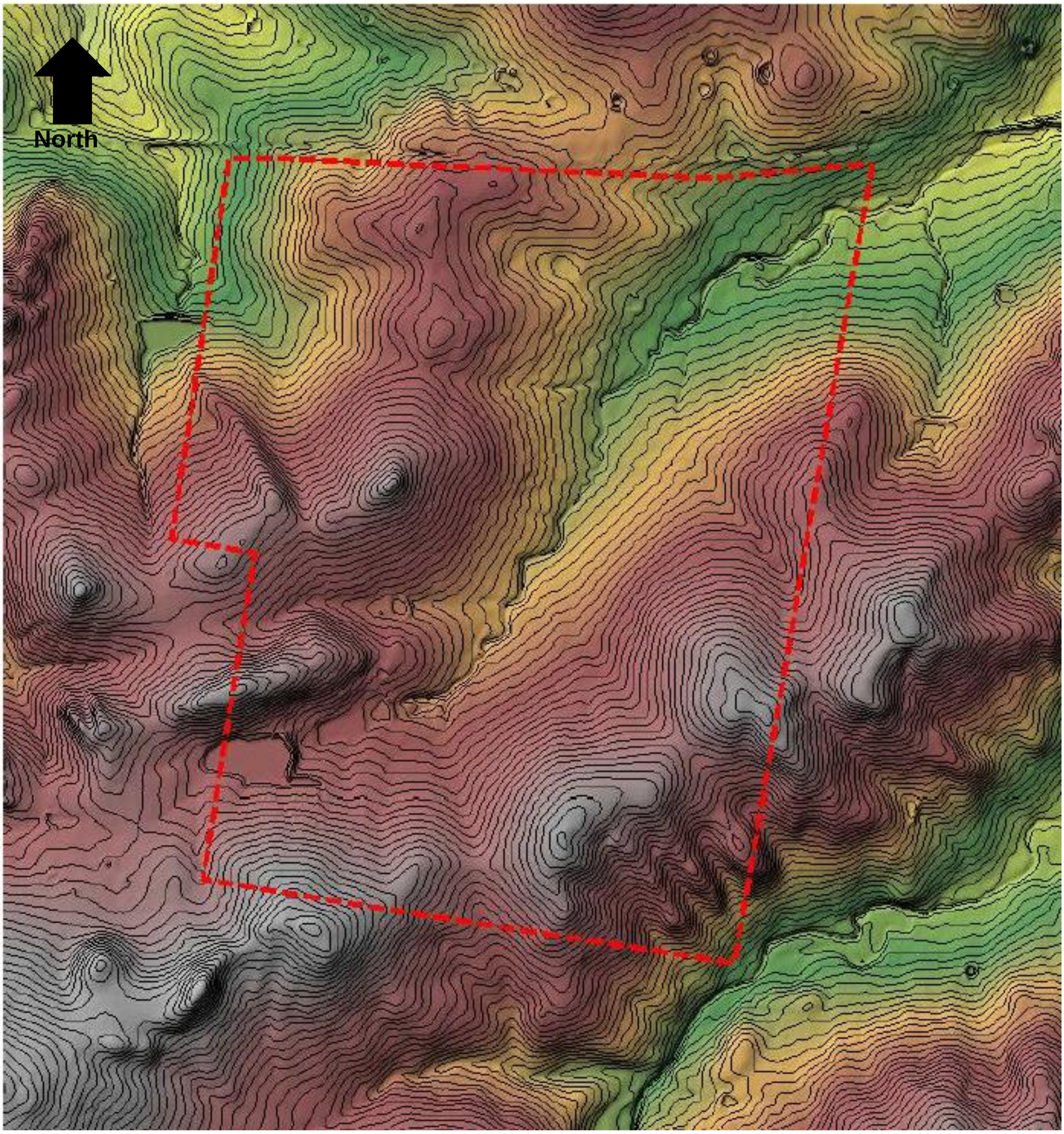


Figure 8-10 Terrain Analysis over proposal site (1m contour interval)

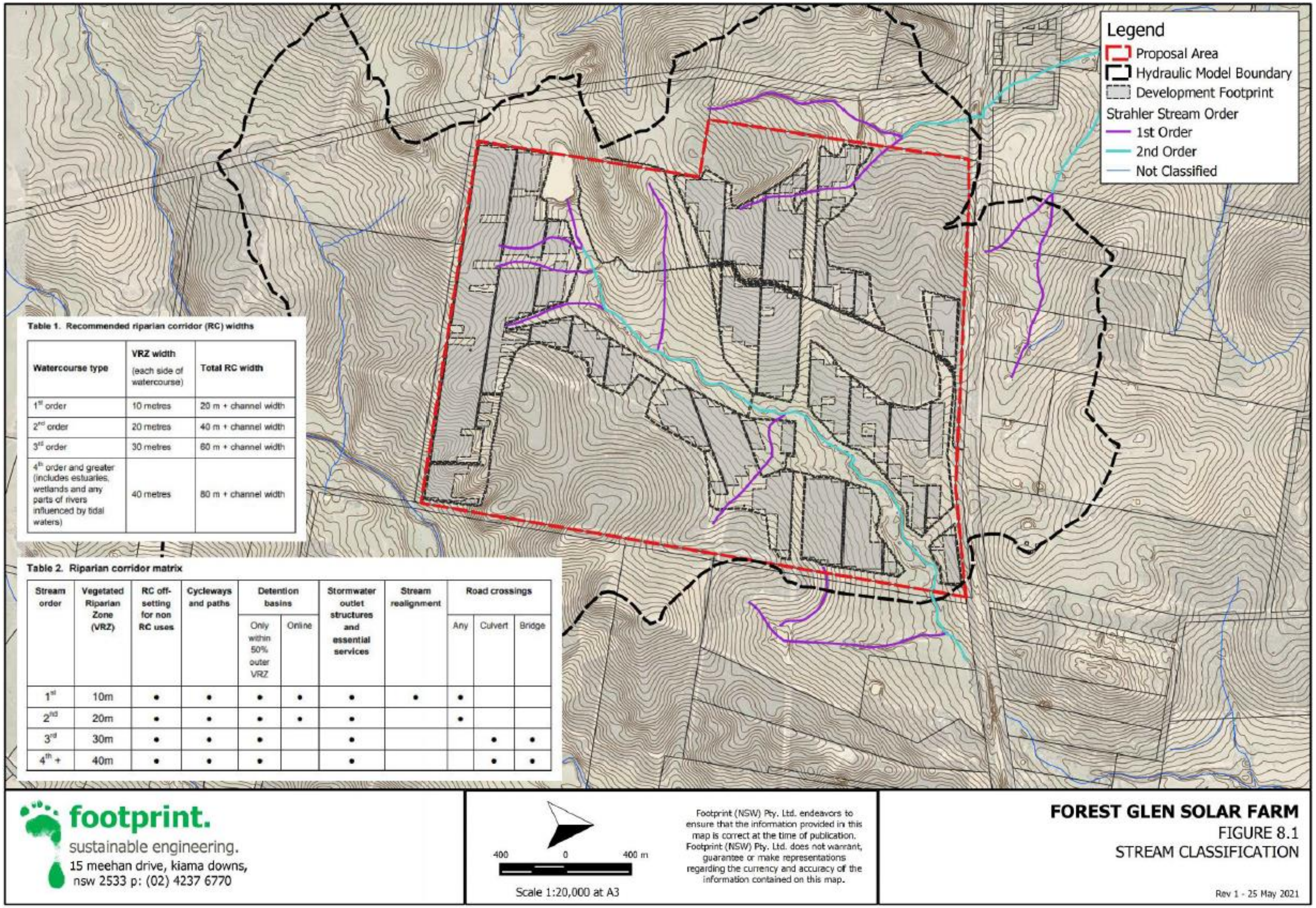


Table 1. Recommended riparian corridor (RC) widths

| Watercourse type | VRZ width (each side of watercourse) | Total RC width |
|---|---|---|
| 1st order | 10 metres | 20 m + channel width |
| 2nd order | 20 metres | 40 m + channel width |
| 3rd order | 30 metres | 60 m + channel width |
| 4th order and greater (includes estuaries, wetlands and any parts of rivers influenced by tidal waters) | 40 metres | 80 m + channel width |

Table 2. Riparian corridor matrix

| Stream order | Vegetated Riparian Zone (VRZ) | RC off-setting for non RC uses | Cycleways and paths | Detention basins | | Stormwater outlet structures and essential services | Stream realignment | Road crossings | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Only within 50% outer VRZ | Online | | | Any | Culvert | Bridge |
| 1st | 10m | • | • | • | • | • | • | • | | |
| 2nd | 20m | • | • | • | • | • | | • | | |
| 3rd | 30m | • | • | • | | • | | | • | • |
| 4th + | 40m | • | • | • | | • | | | • | • |

Figure 8-11 Watercourses and stream orders within the proposal site (Footprint, 2021)

## Delroy Road access

It was observed during site inspection that the culvert crossing of the 2nd order tributary and Whylandra Creek along Delroy Road may be subject to flooding (Figure 8-12). Hydrological modelling was not undertaken for this culvert as it will not be affected by new infrastructure and with consideration of anecdotal evidence from the landowner. Anecdotal accounts from the landowner indicates the following:

- Delroy Road is occasionally flooded, however the waters recede rapidly at the crossing:
  - For example, a rain event of 25mm took 3-4 hours to drain off the road surface, however during this inundation the waters were still able to be crossed.
- Within the owners lifetime (>50years) the most severe flood experienced took 12-14hours following the rain event to drain to existing traffic conditions.

According to these anecdotal accounts from the landowner, it is unlikely that Delroy Road would be blocked during high rainfall events.


Figure 8-12 Potential flood points along Delroy Road (crossings indicated in red)

Delroy Road is known to be subject to sporadic flooding. While no flood mapping exists for the area, the landowner has noted that a small section of the access track (up to 100m of Delroy Road) has been impassable to vehicles twice in the last 20 years at the crossing indicated in Figure 8-12. The waters recede rapidly; in less than a day following the rain event. This flooding frequency is not considered a constraint to the construction or operation of the project. However, it is noted that an alternative private track is available via an established internal track across the same land parcel (Lot 4 DP755102), exiting to Lagoon Creek Road 2km to the west. Lagoon Creek Road intersects Minore Road which connects the site with Dubbo.

The existing condition of this private track is as follows:

- approximately 4m wide
- graded and maintained by the landowner
- suitable for 2WD vehicles except in the case of major downpour (in which case it remains 4WD accessible).

This private track has been established for over 60 years and is regularly used (2-3 times a month) to manage the current site activities. It also provides the landowner an additional passage into Dubbo in the very rare occasions where Delroy Road may be flood affected. It is intended to remain under similar usage for the landowner during the life of the solar farm project, pending approval, and will therefore be maintained in its current condition. Exit onto Lagoon Creek Road is via a locked gate so the private track is not subject to public usage (refer to Figure 8-13). While the private track identified is not considered part of the project's access network or as a designated 'emergency access route', it may be considered as part of the preparation of the Emergency Response Plan incorporating a Flood Response Plan, to be prepared in consultation with the RFS and SES.

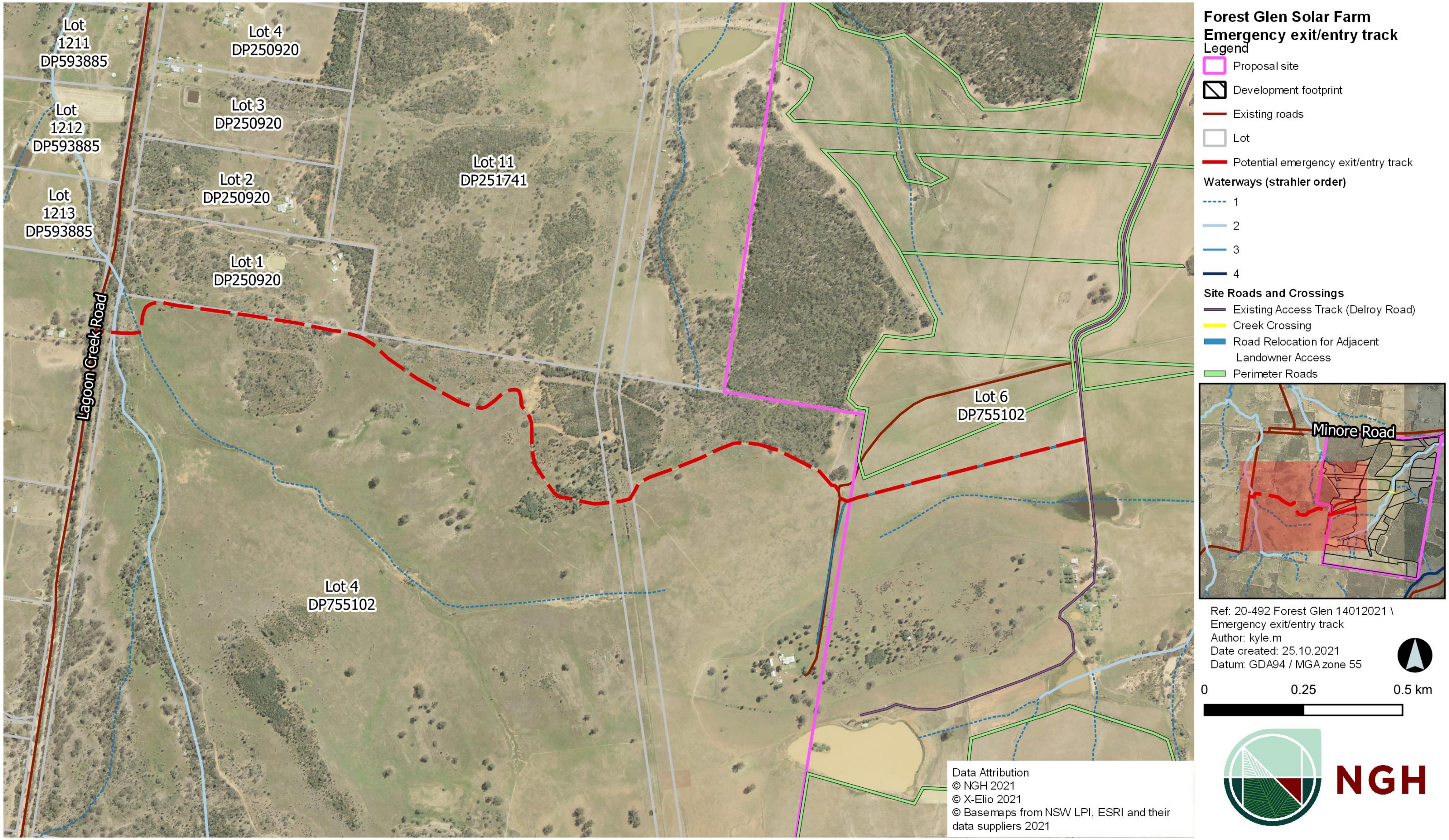


Figure 8-13 Private track

## Hydrological function of the proposal site

Modelling was used to characterise the local hydrology of the project site. In a 1% Annual Exceedance AGO Probability (AEP) event, the hydrological and hydraulic modelling shows that flood depths (>1m) are expected to occur within the onsite 2nd order tributary with a maximum flood velocity of 2m/s. Adjacent to the south east boundary of the proposal site, Whylandra Creek would have velocities of 3m/s where flood depth is highest (>1m). Within the other smaller tributaries and dams of the proposal site, flow depths can reach up to >1m in some dams, however, predominately do not exceed 0.80m in the 1% AEP event and velocity is predominately 0.5m/s to 1.5m/s (Figure 8-14).

## Hazard vulnerability

The flood hazard vulnerability of the proposal site was mapped in accordance with Table 6.7.4 of Australian Rainfall and Runoff (2019). Australian Rainfall and Runoff describes the hazard thresholds for community interaction with floodwaters, these are summarised in Table 8-3.

Table 8-3 Hazard vulnerability classifications

| Hazard vulnerability classification | Description |
|---|---|
| H1 | Generally safe for vehicles, people and buildings. |
| H2 | Unsafe for small vehicles |
| H3 | Unsafe for vehicles, children and elderly |
| H4 | Unsafe for vehicles and people |
| H5 | Unsafe for vehicles and people. All buildings vulnerable to structural damage. Some less robust buildings subject to failure. |
| H6 | Unsafe for vehicles and people. All building types considered vulnerable to failure. |

The flood hazard vulnerability over the proposal site is primarily classified as a H1 hazard vulnerability in the 1% AEP event (Figure 8-15),except for flooding within the second order watercourse and dams onsite. The central second order watercourse reached H5 classification in parts of the northern reach. As expected, hazard increases over the proposal site in the Probable Maximum Flood (PMF) event. The areas classified as H5 and H6 would therefore be unsuitable for development.

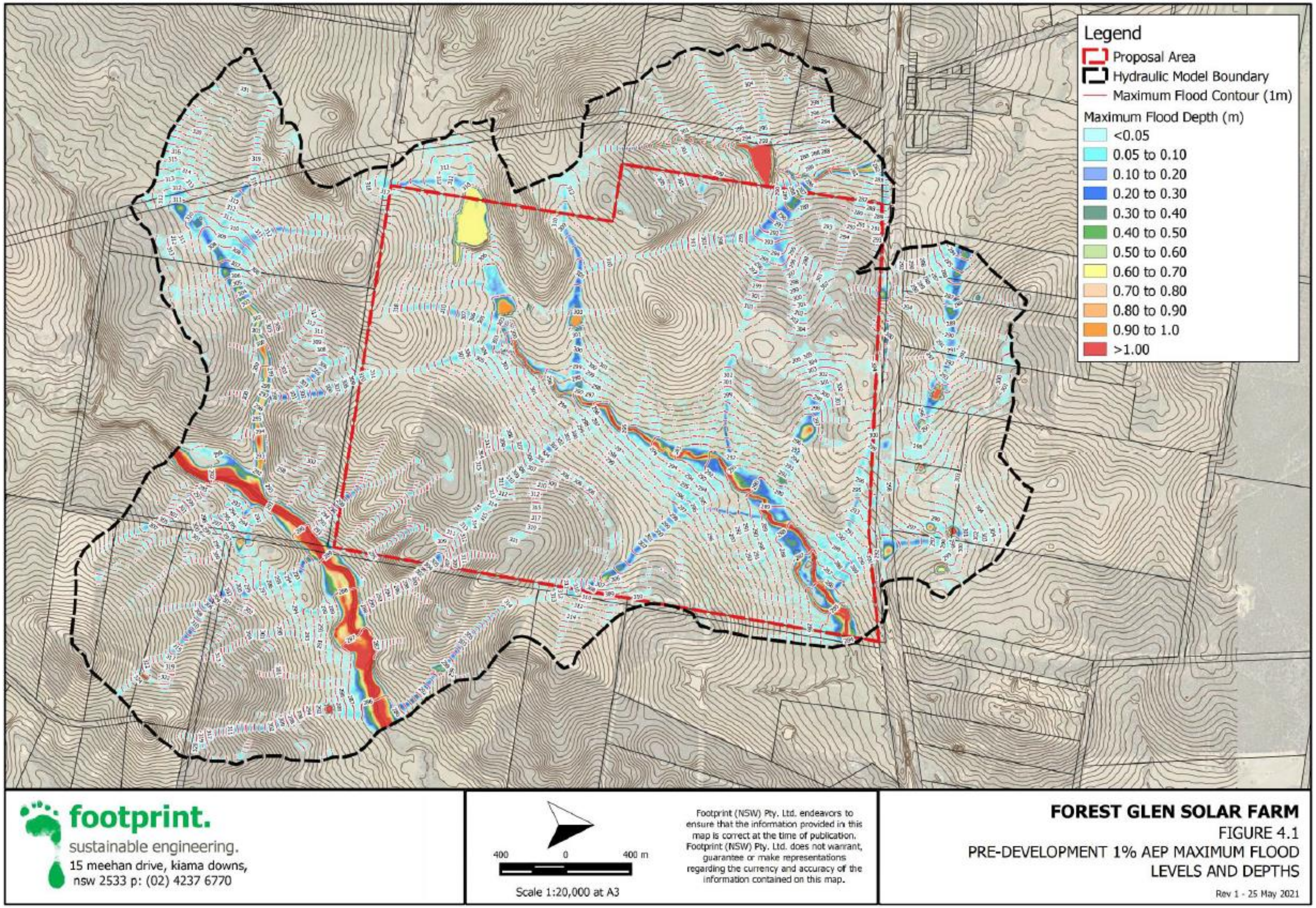


Figure 8-14 Pre-Development 1% AEP Maximum Flood Levels and Depths (Footprint, 2021)

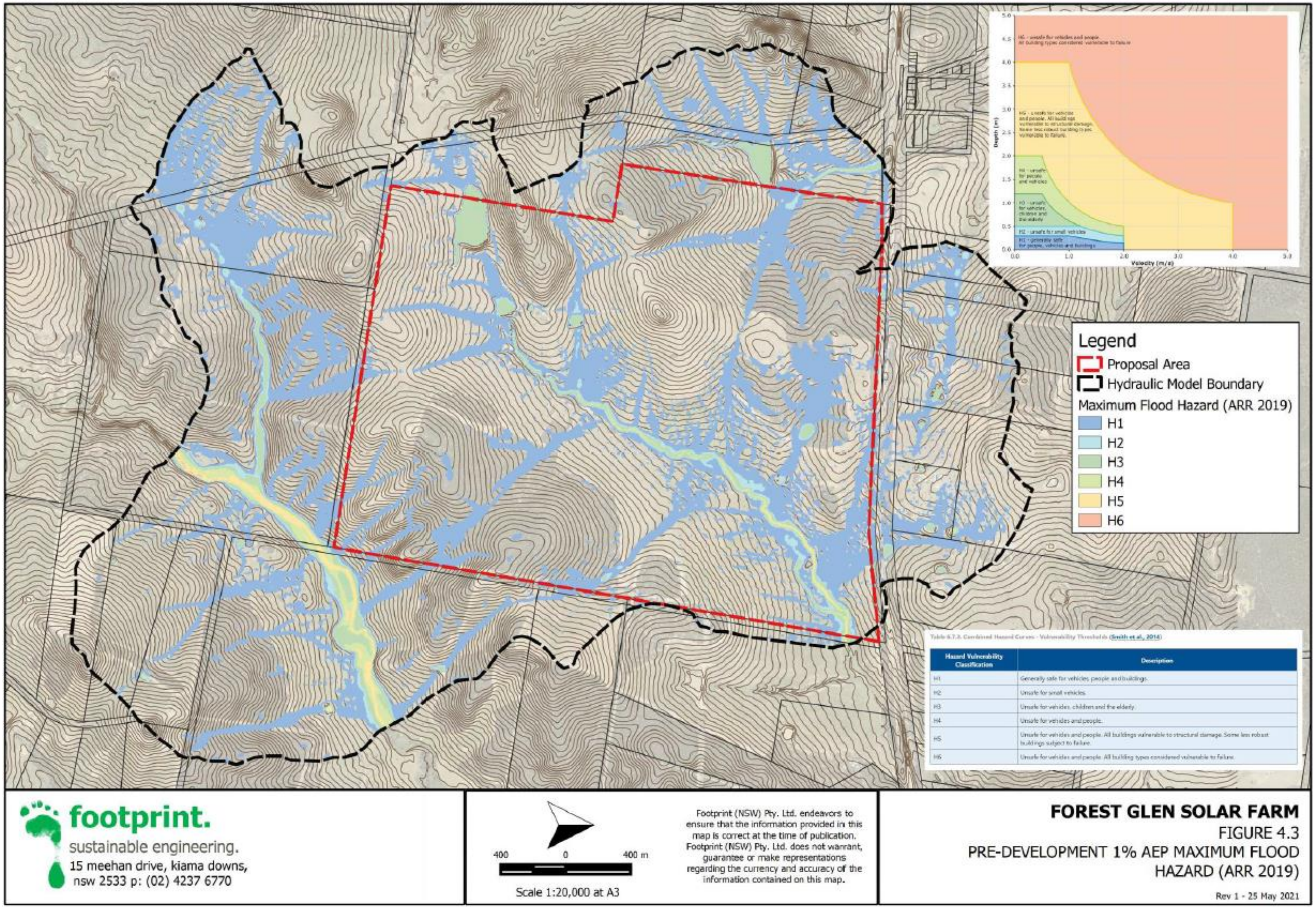


Figure 8-15 Pre-Development 1% AEP Maximum Flood Hazard (ARR 2019) (Footprint, 2021)

### 8.2.3. Potential Impacts

## Construction and decommissioning

The primary access point during construction and operation for light and heavy vehicles would be via Delroy Road north east of the site. It is considered sections of the road would be impassable during significant flood events due to flooding of the 2nd order drainage line and Whylandra Creek along Delroy Road. Anecdotal evidence indicates that it is rare that Delroy Road is impassable due to flooding. As such it is unlikely that the construction and decommissioning stages of the proposal would be affected by access road flooding. Alternative access routes for emergency evacuations will be considered during the development of management plans. An Emergency Response Plan (ERP) would be developed to manage the safety of workers, emergency access, evacuations, and equipment in the event of extended flooding in the region. An alternative emergency exit/entry track has been identified through the proposal site to Lagoon Creek Road in the west (refer to Figure 8-13). This is not a proposed access track for the proposal. Lagoon Creek Road intersects with Minore Road through an existing crossing, this may be considered in emergency scenarios. To ensure staff could exit the site during a flood event, all onsite work vehicles transporting workers to and from site would be 4WD or similar light vehicle. Use of the emergency track would intersect the properties of R21 and R25, consultation with the receivers would be considered in the drafting of the ERP.

Parts of the site may be at risk of temporary minor flooding during high rainfall events and high flows within the vicinity of the sites 2nd to 1st order tributaries and existing farm dams. Temporary localised flooding has the potential to interfere with construction and decommissioning, and poses a safety risk for workers onsite. The proposal has potential to create the following hazards in the event of a localised flood:

- Electrical hazards to staff, emergency workers and assets due inundation of infrastructure.
- Pollution risks from leakage of stored pollutants (hydrocarbons, pesticides, solvents).
- Physical damage from the mobilisation of components in flood waters.

No temporary components required for construction and decommissioning are considered susceptible to becoming mobile and entering waterways, as all plant and material would be restricted to areas outside the modelled flood risk area and delineated waterway exclusion zones. All potential pollutants stored on-site during construction would be stored in accordance with HAZMAT requirements and bunded.

Water crossings across the proposal site will be upgraded in accordance with *Guidelines for Riparian Corridors on Waterfront Land* (DPI Water, 2012).

Maintaining grass cover across the site as far as practicable during construction, particularly within the existing waterways, would help maintain soil stability during floods, and would improve soil permeability over time.

## Operation

### Arrays and ancillary infrastructure

The hydraulic modelling of the site (refer to Figure 8-16 and Figure 8-17) demonstrates that there is not predicted to be a significant impact on flood behaviour within the floodplain as a result of the proposed works, with flood levels, depths, velocities and hazards remaining relatively unchanged. The change in maximum flood level and peak velocity resulting from the proposed development are anticipated to remain unchanged, due primarily to the infrastructure being located outside of areas subject to flooding. Some minor increases in flood levels and corresponding decreases in velocity are shown to occur within the proximity of the proposed substation and BESS, however these changes are very localised and not anticipated to adversely affect adjoining properties or buildings/solar arrays on site.

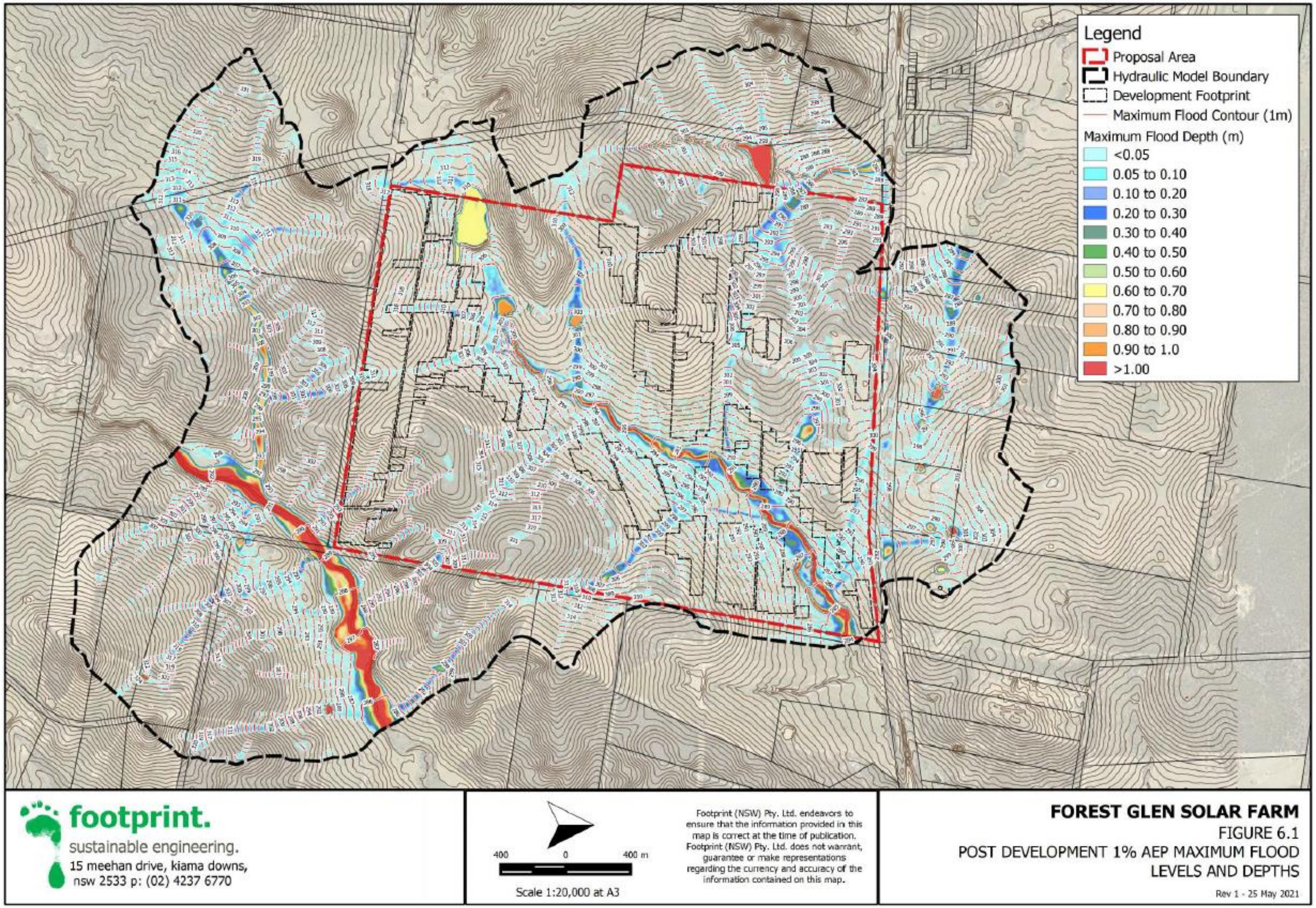


Figure 8-16 Post development 1% AEP Maximum Flood Levels and Depths (Footprint, 2021)

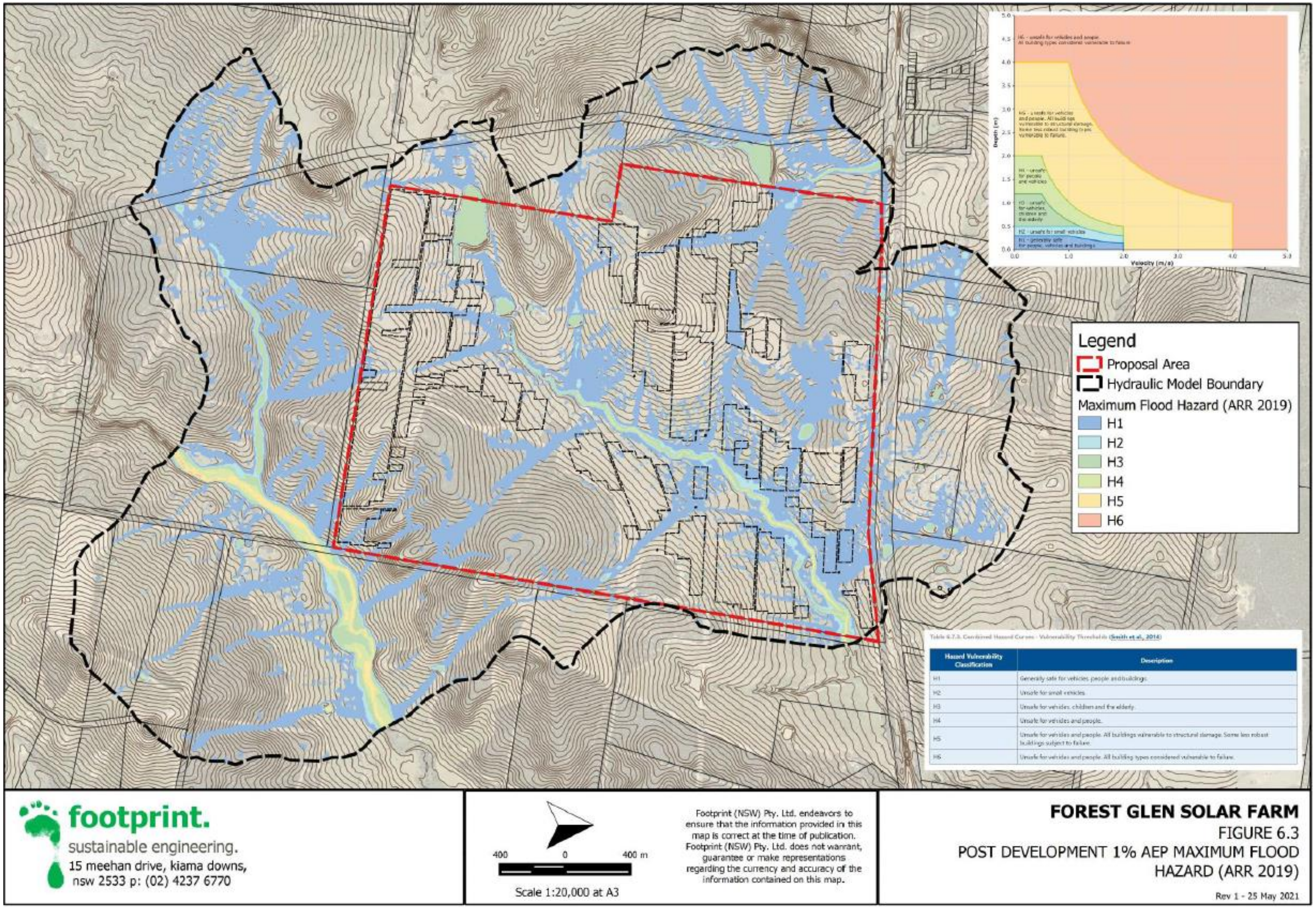


Figure 8-17 Post Development 1% AEP Maximum Flood Hazard (ARR 2019) (Footprint, 2021)

In terms of how the site functions hydrologically, the addition of the solar array and associated infrastructure to the site would result in an increase in surface roughness over the site, from grazed/cropped pasture to a regular grid of steel piers. The change in floodplain roughness associated with the proposed development was assessed using the Modified Cowan Method for Floodplain Roughness and is shown in Table 8-4. It demonstrates that the roughness is anticipated to slightly increase because of the proposed development.

It should be noted that only $n_3$ (effect of obstructions) has been modified to represent the introduction of an obstruction to the site, i.e. the change in floodplain roughness associated with the solar array piers, all other variables remain at pre-development values which are variable across the site and hence have remained at $n_b$, $n_1$ etc.

Table 8-4 Modified Cowan method for estimation of floodplain roughness (Footprint, 2021)

| Roughness component | Existing (grazed pasture) | Proposed (solar array) |
|---|---|---|
| Floodplain material ($n_b$) | $n_b$ | $n_b$ |
| Degree of irregularity ($n_1$) | $n_1$ | $n_1$ |
| Variation in floodplain cross section ($n_2$) | $n_2$ | $n_2$ |
| Effect of obstructions ($n_3$) | 0.000 | 0.003[13] |
| Amount of vegetation ($n_4$) | $n_4$ | $n_4$ |
| **Total change in roughness** | **0.000** | **0.003** |

## Access

It should be noted that the proposed development would include a network of access roads, and these would be constructed from gravel and within the floodplain itself would be constructed at the existing surface level so as not to result in adverse impact on flood behaviour.

In accordance with the Modified Cowan Method of Floodplain Roughness gravel has a similar floodplain roughness to that of the surrounding pre-development floodplain roughness. On this basis and considering the fact these will be less than 10m in width and therefore not well represented by the model, the marginal increase in floodplain roughness associated with the proposed road network was not included in the post development models.

Furthermore, watercourse crossings were not included in the models as fords or bridges, which minimise any hydraulic impact have been recommended.

The post development hydraulic model is therefore considered to be representative of the development as proposed and therefore reflective of the hydraulic impacts associated with the development.

Access to the site will cross the unnamed 2nd order tributary and Whylandra Creek (Figure 8-19). It is considered Delroy Road would be impassable during significant flood events, however these events are expected to be infrequent. As such, flood warning signs, flood level indicators, and a Business Floodsafe Plan would be implemented alongside an ERP.

In the context of the construction and operational requirements of the project, the very rare occasions when Delroy Road may be subject to flooding are considered highly manageable, with appropriate emergency access (including flood) protocols. These currently form a commitment of the proposal and would be

[13] Based on an obstruction of 2.5% of the available flow area (i.e. 150mm piers at 5-6m intervals)

developed on consultation with the Rural Fire Service (RFS) and State Emergency Service (SES). However, given the long time span of the proposed solar project (35 years) and in the context of climate change, more frequent extreme weather events might be expected.

As the construction program will be short in duration (approximately 12-18 months with peak construction at 10 months), and given the planning provisions that form commitments of the project, it is highly unlikely that the construction program will be affected by flood to any practical degree. In operation, the onsite monitoring requirements will be low (a maximum of 10 vehicles present onsite) and similarly are expected to be able to adapt to limited infrequent flood impacts. However, an alternative private track managed by the existing landowner could be used in the case of emergency, and is suitable for 2WD and 4WD vehicles, and this will be considered in emergency planning (i.e. RFS and SES will be advised of its location and condition in the finalisation of emergency response management planning). The private track would only be used to exit the site and is not proposed to provide entry. As the road is private, currently existing and will not be used as an access for the routine project activities, maintenance is not proposed as part of this project.

The CTMP will include information outlining how traffic will be managed during this time to ensure the continued safe and efficient operation of the internal and external road network. A CTMP will be prepared by the contractor prior to construction as proposed in Section 7.6.4.

#### Operational activities

Localised flooding during operation may pose the following risks:

- A safety risk for workers and assets, where electrical infrastructure becomes inundated.
- A pollution risk, where stored pollutants may be leaked to the environment.
- A local flooding risk should any components become mobile in flood waters.

Structural damage to buildings and structures (including solar arrays) could be expected in areas categorised as being within high hazard areas (H5 and above). Development in these areas is being avoided.

All infrastructure would be located above the 1% AEP flood level plus 500mm freeboard so as not to impact on existing flood behaviour and to prevent infrastructure from being damaged. Infrastructure would be designed to withstand periods of local flooding. No components are considered susceptible to becoming mobile and entering waterways.

### 8.2.4. Safeguards and mitigation measures

The proposed solar farm is unlikely to have potential impacts on existing hydrological conditions as the development is located outside of high flood hazard vulnerability zones and would be further reduced through the design mitigation measures outlined below. Further any potential safety risks during construction or operation are addressed through the preparation of plans and installation of signs and indicators where required.

*PC: Pre-Construction, C: Construction; O: Operation; D: Decommissioning*

Table 8-5 Safeguards and mitigation measures for hydrology impacts

| ID | Safeguards and mitigation measures | C | O | D |
|---|---|---|---|---|
| W1 | The design of buildings, equipment foundations and footings for electrical componentry and panel mounts would be designed to avoid the 1% AEP flood level to minimise impacts from potential flooding including:<br>• The solar array mounting piers would be designed to withstand the forces | | Design | |

| ID | Safeguards and mitigation measures | C | O | D |
|---|---|---|---|---|
| | of floodwater (including any potential debris loading) up to the 1% AEP flood event plus 500mm freeboard, giving regard to the depth and velocity of floodwaters.<br>• The tracking axis for solar tracking modules would be located above 1% AEP flood event plus 500mm freeboard.<br>• The mounting height of the solar module frames would be designed such that the lower edge of the module is clear of the predicted 1% AEP flood level.<br>• All electrical infrastructure, including inverters, would be located above the 1% AEP flood level plus 500mm freeboard.<br>• Where electrical cabling is required to be constructed below the 1% AEP flood level it would be capable of continuous submergence in water.<br>• The proposed perimeter security fencing would be constructed in a manner which does not adversely affect the flow of floodwater and should be designed to withstand the forces of floodwater, or collapse in a controlled manner to prevent impediment to floodwater.<br>• Fencing across the primary watercourse traversing the proposal site would be avoided (two separate fenced compounds on either side of the watercourse would be undertaken where required).<br>• Waterway exclusion zones would be marked as no go zones and included in the CEMP.<br>The finished floor level of all buildings should be a minimum of 500mm above the 1% AEP flood level. | | | |
| W2 | All buildings and structures (including solar arrays) associated with the proposal should be located outside high hazard areas (H5 and above) where they may be vulnerable to structural damage and have significant impact on flood behaviour. | Design | | |
| W3 | As the proposal site is flood affected it is recommended that:<br>• Flood warning signs and flood level indicators should be placed on each approach to any proposed watercourse crossings that is subject to inundation.<br>A Business Floodsafe Plan be prepared for the development to ensure the safety of employees during flood events in general accordance with the NSW SES "Business Floodsafe Toolkit and Plan" | C | O | D |
| W4 | Any road crossings on watercourses within the proposal site would be of the type defined in Table 2 of the Hydrological and Hydraulic Analysis Report was prepared by Footprint NSW Pty Ltd in Appendix F.<br>Any proposed crossings (vehicular or service) of existing watercourses on the subject site should be designed in accordance with the following guidelines, and in the case of vehicle crossing should preferably consist of bed level crossings constructed flush with the bed of the watercourse on first and second order watercourses to minimise any hydraulic impact:<br>• Guidelines for Watercourse Crossings on Waterfront Land (DPI, 2012)<br>• Guidelines for Laying pipes and Cables in Watercourses on Waterfront Land (Office of Water, 2010) | Design | | |

| ID | Safeguards and mitigation measures | C | O | D |
|---|---|---|---|---|
| | • *Why do fish need to cross the road? Fish Passage Requirements for Waterway Crossings* (Fairfull and Witheridge, 2003).<br>*Policy and Guidelines for Fish Friendly Waterway Crossings* (NSW DPI, 2003). | | | |
| W5 | Within the floodplain access roads should be constructed as close to natural ground levels as possible so as not to form an obstruction to floodwaters.<br>The surface treatment of roads should be designed giving regard to the velocity of floodwaters to minimise potential for scouring during flood events. | C | | |
| W6 | An Emergency Response Plan incorporating a Flood Response Plan would be prepared in consultation with the RFS and SES prior to construction covering all phases of the proposal. The plan would:<br>• Detail who would be responsible for monitoring the flood threat and how this is to be done.<br>• Detail specific response measures to ensure site safety and environmental protection.<br>• Outline a process for removing any necessary equipment and materials offsite and out of flood risk areas (i.e. rotate array modules to provide maximum clearance of the predicted flood level).<br>• Consider site access in the event that some tracks become flooded.<br>• Consider appropriate vehicles used to transport staff to and from site, with 4WDs being the preferred vehicle.<br>• Establish an evacuation point.<br>• Define communication protocols with emergency services agencies.<br>• The condition of the private track exiting to Lagoon Creek Road will be monitored in collaboration with the landowner throughout the life of the solar farm and be available to the project needs in the case of emergency. | C | O | D |

## 8.3. Water use and water quality

**SECRETARY'S REQUIREMENTS**

*The EIS must also address the following specific issues:*

- **Water** – including:
  - an assessment of the likely impacts of the development (including flooding) on surface water and groundwater resources (including Whylandra Creek, Macquarie River and other watercourses traversing or surrounding the site, drainage channels, wetlands, riparian land, farm dams, key fish habitat, groundwater dependent ecosystems and acid sulfate soils), related infrastructure, adjacent licensed water users and basic landholder rights, and measures proposed to monitor, reduce and mitigate these impacts
  - details of water requirements and supply arrangements for construction and operation; and

- a description of the erosion and sediment control measures that would be implemented to mitigate any impacts in accordance with *Managing Urban Stormwater: Soils & Construction* (Landcom 2004);

The quality of water resources is closely linked to the surrounding environment and land use. Water usage, surface water and groundwater quality impacts are discussed below.

### 8.3.1. Existing environment

#### Surface water resources

The Forest Glen SF proposal site is located in the Central West Local Land Services area within the 74,800km$^2$ Macquarie-Bogan Catchment area. The Macquarie River is a perennial river and is approximately 960km long starting with headwaters below the locality of White rock near Bathurst. The Macquarie River flows into the Burendong Dam which provides water for the Dubbo region. The river is mapped as Key Fish Habitat (KFH). There are no Nationally or Internationally important wetlands listed within 10km of the proposal site. The Macquarie River is located 7.2km north of the proposal site, with the closest Nationally Important Wetland and Ramsar Wetland to this section of river is the Macquarie Marshes and Nature Reserve, which is approximately 180km downstream.

Whylandra Creek is the most significant nearby watercourse and is located 60m from south east corner and 2km from the north east corner of the proposal site. The creek is intercepted near the Minore Road and Delroy Road, where in flows under two culverts. The creek also contains aquatic habitat and vegetation and is also mapped as KFH. Whylandra Creek is a 4$^{th}$ order stream that feeds into the Macquarie River approximately 9km downstream.

The existing surface water environment within the proposal site is characterised by eight dams, one minor 2$^{nd}$ order unnamed drainage line and six 1$^{st}$ order unnamed tributaries (Figure 8-22). The dams are located mostly along the watercourses that traverse the site. The largest dam on site has a footprint of approximately 5.9ha and is located in the southwest of the site, land encompassing this dam would not be leases by X-Elio (Figure 8-20). The waterways within the northern portion (2$^{nd}$ order unnamed drainage line and two 1$^{st}$ order streams) of the proposal site are well vegetation (riparian) with stable banks. The 2$^{nd}$ order unnamed drainage line become highly disturbed midway within the proposal site, the riparian vegetation become sparse, and banks are eroded (Figure 8-21). No aquatic vegetation was observed onsite in any of the waterways. The predominate groundcover of the site is mixed pasture for grazing.

Existing water quality within the proposal site is influenced by the surrounding agriculture activities specifically stock access, informal waterway crossings and potential for runoff of chemicals (e.g. fertilisers and herbicides) and animal waste.

All watercourses within the proposal site would be described as ephemeral and would only contain flowing water during and shortly after rainfall events. A site inspection on 8 December 2020 found all watercourses onsite contained pools of water but were not flowing. All dams were at capacity. The landowner currently uses the water available onsite for agricultural purposes. Based on consultation with the landowners, water has only been required to be purchased twice in approximately 55 years, both during droughts. These drought periods occurred in 1965-1967 and 2017-2020. The water availability onsite would be influenced by seasons, the mean maximum rainfall is received in Autumn (BOM 2021) and changes in the climate such as minimal rainfall during droughts and El Nino.

#### Groundwater and water entitlements

The NSW DPI database of groundwater lists one bore located 400m north of the proposal site (Figure 8-22). The bore ID is GW803691, the reported depth is 42m but not water level is given. No groundwater bores are mapped within the proposal site. The Forest Glen SF proposal site is not mapped as having groundwater vulnerability under the Dubbo Regional LEP.

The proposal site is subject to the following water sharing plans:

- Macquarie-Bogan Unregulated Rivers Water Sources 2012
- Macquarie-Castlereagh Groundwater Sources 2020.

Groundwater Dependent Ecosystems (GDEs) include ecosystems which may rely on the surface expression of groundwater (including surface water ecosystems that may have a groundwater component) and ecosystems which may rely on the subsurface presence of groundwater (including vegetation ecosystems).

The Groundwater Dependent Ecosystems Atlas (BOM, 2020) maps potential GDE's within the vicinity of the proposal site. Low to moderate terrestrial GDE's occur within and surrounding the proposal site (Figure 8-23). No aquatic GDE's have been mapped onsite or surrounding the proposal site.

Figure 8-18 2nd order drainage line in the north

Figure 8-19 Whylandra Creek at Delroy Road

Figure 8-20 Eastern edge of 5.9ha dam

Figure 8-21 2nd order drainage line in the south

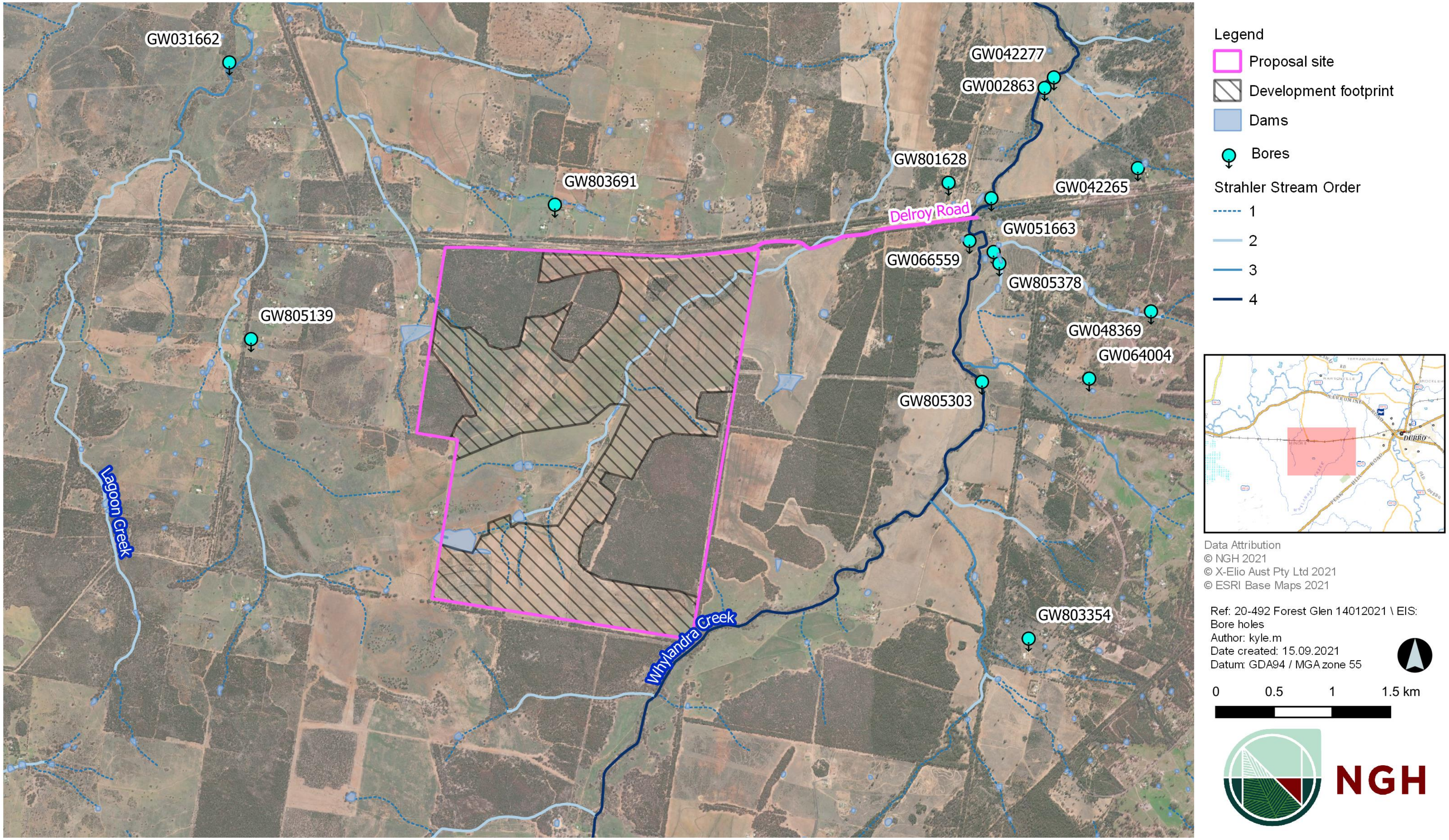


Figure 8-22 Waterway onsite and groundwater bores surrounding the proposal site

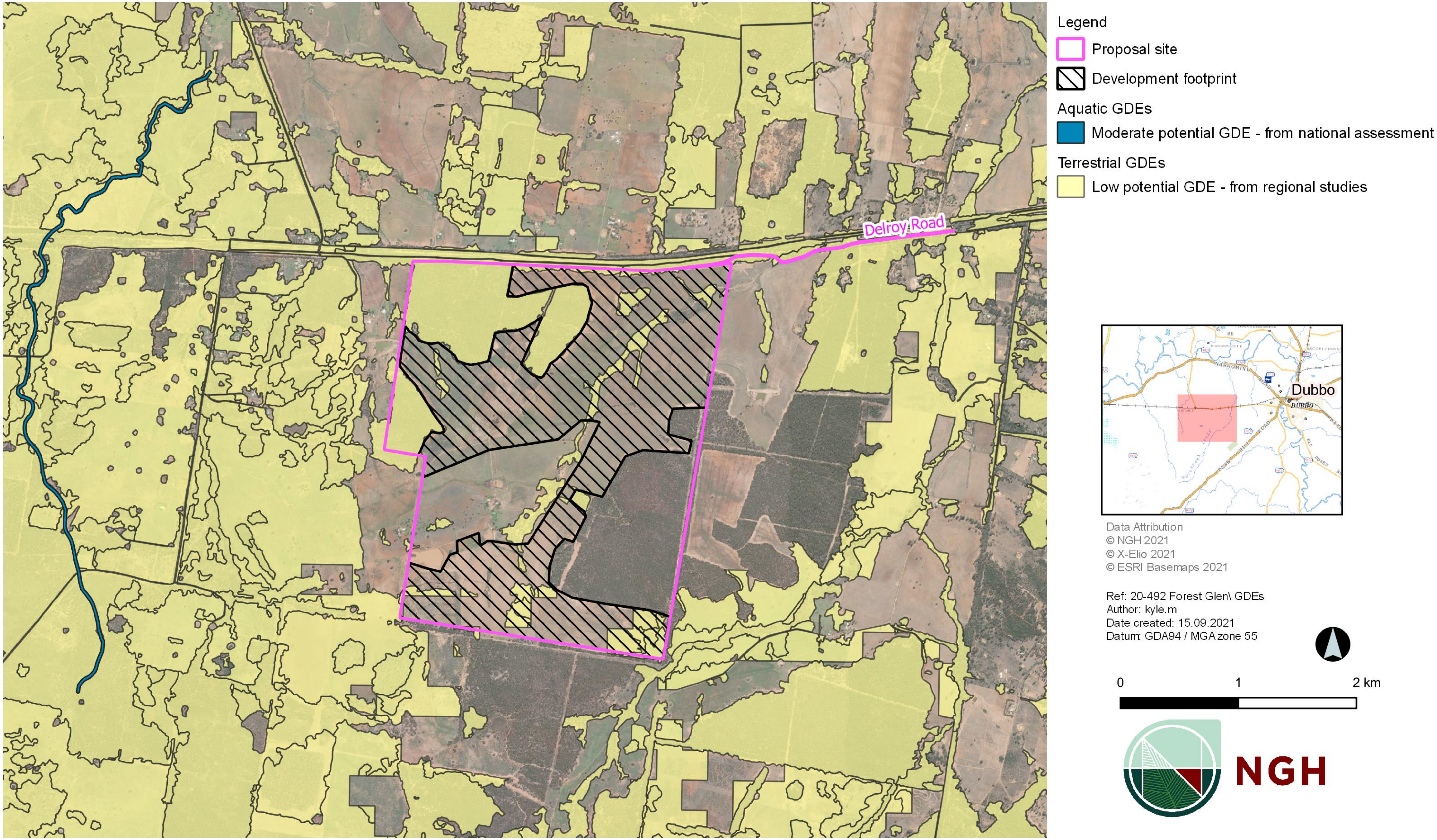


Figure 8-23 Terrestrial GDE's within the proposal site

### 8.3.2. Potential impacts

## Construction and decommissioning

#### Surface water

The construction phase has potential to impact water quality and quantity. Construction of the solar farm would disturb soils and potentially lead to sediment or other pollutants being present in runoff, mobilising and entering local waterways, adversely impacting on water quality. Activities that may contribute to this include:

- Excavations for the construction of internal roads and associated drainage, parking areas, footings for onsite substation, inverters and maintenance building and footings for temporary staff amenities and offices during construction.
- Trenching for underground cable installation.
- Construction of 1 waterway crossings for internal access roads. The crossing is indicated in Figure 1-10 and crosses the central 2$^{nd}$ order unnamed creek on site.
- Construction of hardstand areas and access tracks would result in soil compaction, consequently reducing soil permeability, increasing surface water runoff and the potential for concentrated flows.

During construction however, as much groundcover as possible would be retained and protected, by rationalising laydown areas and tracks. Only discrete footprints would be levelled where required or footings or hardstand areas. Groundcover and the soil profile would remain largely undisturbed in areas where the solar arrays would be mounted. These will use steel piles that are driven or screwed into the ground rather than excavated footings.

Construction may slightly alter surface water drainage patterns; this would be managed by ensuring flow is directed to existing locations. Surface water would still drain via the ephemeral drainage lines. The main tributaries and Whylandra Creek would not be altered by the proposal with the exception for the construction of crossings for the access roads and for the installation of underground cables. This is addressed in Section 7.2.

The construction phase would entail the following water pollution risks that will require management:

- A hydrocarbon spill risk from use and re-fuelling of construction vehicles and machinery.
- On-site concreting for building and equipment foundations.
- Wash off from curing asphalt pavement and road seal.
- Storage and use of paints, cleaning solvents and other chemicals.
- Pesticide and herbicide storage and use.
- Fertilisers used for revegetation.
- Runoff from waste materials.

Sediment and chemical pollutants which enter the drainage lines present on the site have the potential to flow into Whylandra Creek and be further transferred into the Macquarie River.

During the decommission stage, the potential impacts on water quality and quantity would be similar to construction. It is likely the risk and area of disturbance during decommissioning would be less than construction due the existing access tracks and reduced ground disturbance required, as footings and cables greater than 500mm would remain in place.

Activities with the potential for adverse water quality impacts would be managed through the development of site specific sediment control plans and spill control plans, as detailed in Section 7.2 and Section 8.1. Additionally, impacts to local water quality can be minimised by ensuring erosion and sediment control plans include measures to ensure *Managing Urban Stormwater: Soils and Construction, Volume 1* (Landcom) criteria are met prior to discharge of water offsite.

### Groundwater and Groundwater Dependent Ecosystems

No groundwater is anticipated to be intercepted, and no groundwater would be extracted. The maximum depth of infrastructure would be pile driven or screwed mounting structures up to a depth of 2 - 3m. Impacts to groundwater are considered unlikely to occur.

Groundwater supplies would not be affected, as such, impacts to Terrestrial and Aquatic GDE's that are known to occur within the proposal site would not occur as a result of impact to groundwater supplies. No groundwater is anticipated to be intercepted and no groundwater would be extracted.

### Water use

Water use during the construction phase would be minimal and used predominantly for dust suppression on unsealed tracks and for the construction of new roads. The requirement for water is dependent on weather conditions, such as wind and rainfall, and is anticipated to be up to 42ML in total. About 1ML of potable water would be required for employees and contractors (Table 8-6).

Table 8-6 Water requirements for construction of the proposal

| Water quality | Total construction water requirement (ML) | Sources | Availability |
|---|---|---|---|
| **Potable (drinking)** | 1ML (for about 12 – 18 months) | Bottled water | Available as required – commercial supply. |
| **Non-potable** | 42ML (for about 12 – 18 months) | Truck delivery<br>Dams<br>Rainwater tanks | Available as required. |

The Development footprint is approximately 444ha, of which approximately 266ha would incorporate the indicative infrastructure layout. It is likely that the runoff due to rainfall from the site will be similar despite the addition of solar panels, however additional flows may occur from access roads and hardstands.

Based on data collected at Dubbo airport weather station between 1946 and 2020, the area has an average annual rainfall of 552.8mm per annum (BOM, 2020). The average annual runoff is about 5% dependent on the year, the timing, intensity and duration of rainfall events. Based on 5% runoff, approximately 266ML is generated by the Development footprint over the construction period on average. The harvestable right is 10% of runoff. Based on 10% of 266ML, the harvestable right is approximately 26.6ML. This represents 71% of the total water required for the construction phase.

The indicative layout for solar farm infrastructure does not require any decommissioning of existing dams within the proposal footprint prior to construction. As such the eight dams located within the proposal site may be used to some capacity in the construction process depending on availability with the existing landowner. However the majority of water usage during the construction phase would be purchased from local permit holders trucked into site.

### Water sourcing

If required, additional offset site water may be sources. The closest major water source is the Macquarie River and is located approximately 7.2km north of the proposal site. Under the EP&A Act, SSDs do not require a water use nor water management work approval for activity approvals as per the WMA (refer to Section 5.3.2). Water for use in during the project would come from the Macquarie River above Burrendong with 99 Water Access Licences (WALs) (accessed from https://waterregister.waternsw.com.au/water-register-frame). Purchase agreements would be established by the proponent to truck water into the site. 8,032ML of unregulated water was made available in 2019/2020 of which 1,598ML were used. The water required for construction represents 0.52% of the of the volume available for that financial year. The impact of drawing the 42ML over the 12–18 month construction period is considered acceptable because ample remaining water is available in the system based on previous year's figures.

Whylandra Creek Water is adjacent to the proposal site. Wambangalong Whylandra Creek Water source has 3 WALs. As the creek is adjacent to the southern boundary of the proposal, an opportunity exists to establish a standpipe and draw water from the river when flows are sufficient. 141ML of unregulated water was made available in 2019/2020, of this volume, 0ML was used. The water required for construction represents 29.8% of the volume available for that financial year. Using a proportion of this water could also supplement the proposal's water needs.

The combined water sources would be available to supply the construction requirement of the solar farm many times over. The proposal's use of water over the construction period is not anticipated to create shortfall of water supply in the local area or impact other local users of water.

## Operation

### Surface water

During operation, there is minimal potential for any impacts to surface water quality to occur. Suitable drainage features would be constructed along internal roads to minimise the risk of polluted water leaving the site or entering the waterways.

As part of pre-construction, the site would be revegetated with grass cover with the exception of internal roads, parking areas and areas around the substation. The panels would additionally be placed in rows with 7m spacing therefore not concentrating flow off the leading edge to any substantive degree. Permeable soils and shading effects mean while slightly more vegetation may grow at leading edge of panels providing a natural protection to increased water flow / moisture in this area. As such, water quality impacts during operation would be low and not considered substantially different to the existing potential water quality impacts occurring from onsite activities including grazing, cropping and use of vehicles and machinery. There is potential for water quality onsite to be improved through revegetation of areas that are eroded with low levels of vegetation. Additionally, improvements to water quality may occur due to waterway crossings being constructed in accordance with waterfront land and water crossing guidelines and with the removal of agricultural impacts such as cattle access.

### Groundwater and groundwater dependent ecosystems

No operational activities would affect groundwater at the proposal site. No groundwater is proposed to be sourced during the operation of the solar farm.

### Water use

Panel cleaning may be required during or post drought conditions, dust storms, bushfires or controlled burns in the region. It is estimated that up to 240kL would be required per year during operation and if insufficient water is collected on site from rainwater tanks and dams, water would be obtained commercially.

Water would be sourced from farm dams or trucked in from established standpipes if required. A license under the WM Act is not required to draw water from onsite dams, and a water use approval is not required for SSD.

### 8.3.3. Safeguards and mitigation measures

Measures regarding flooding is addressed in Section 7.2 and soils are addressed in Section 8.1. Additional measures that would be implemented to manage water quality and water use impacts are provided below. The measures are in response to potential contaminations risks of the proposal.

Table 8-7 Safeguards and mitigation measures for water quality and water use impacts

*C: Construction; O: Operation; D: Decommissioning*

| ID | Safeguards and mitigation measures | C | O | D |
|---|---|---|---|---|
| WQ1 | All fuels, chemicals, and liquids would be stored at least 40m from any waterways or drainage lines, not on sloping land and would be stored in an impervious bunded area. | C | O | D |
| WQ2 | The refuelling of plant and maintenance would be undertaken in impervious bunded areas on hardstand areas only. | C | O | D |
| WQ3 | Machinery would be checked daily to ensure there is no oil, fuel or other liquids leaking from the machinery. All staff would be appropriately trained through toolbox talks for the minimisation and management of accidental spills. | C | O | D |
| WQ4 | All potential pollutants stored on-site would be stored in accordance with HAZMAT requirements and bunded. | C | O | D |
| WQ5 | An incident management procedure to address any spills and pollution incidents will be developed and implemented. The procedure would be incorporated into the Construction and Operation Environmental Management Plans and include a requirement to notify EPA for incidents that cause material harm to the environment (refer s147-153 Protection of the Environment Operations Act). | C | O | D |
| WQ6 | Ensure appropriate drainage controls are incorporated into the design to minimise the area of disturbance, runoff and pollutant generation. | Design | | |
| WQ7 | If groundwater is to be intercepted at any stage of the development the proponent must obtain the relevant entitlement and approval where required prior to any extraction. | C | O | D |
| WQ8 | Re-use of collected stormwater (from dams or sediment basins) should be considered wherever possible. | | O | |
| WQ9 | Inspect stormwater control measures before and after rainfall of more than 10mm in 24 hours and at least quarterly. | C | O | D |
| WQ10 | Water supply agreements would be secured in consultation with Dubbo Regional Council and/or local water suppliers prior to construction to ensure adequate water supply is secured for construction and operation. | C | O | |

## 8.4. Bush fire

**SECRETARY'S REQUIREMENTS**

*The EIS must also address the following specific issues:*

- ***Hazards** including:*
- *potential hazards and risks of the development*
- *bushfire risks of the development against the RFS Planning for Bushfire Protection 2019; and*
- *the proposed transmission line and substation against the International Commission on Non-Ionizing Radiation Protection (ICNIRP) Guidelines for limiting exposure to Time-Varying Electric, Magnetic and Electromagnetic Fields*

Bush fire presents a threat to human life and assets and can adversely impact ecological values. Bush fire risk can be evaluated and managed by considering environmental factors that increase the risk of fire (fuel load and type, topography and weather patterns), as well as specific activities (such as hot works) or infrastructure components that exacerbate combustion or ignition risks (such as transmission lines, energy storage systems and other electrical components).

This proposal is an SSD and is therefore exempt from requiring a bush fire safety authority (BFSA) under section 4.41(f) *Environmental Planning and Assessment Act 1979*. Section 5.16(3) requires "the Planning Secretary is to consult relevant public authorities and have regard to the need for the requirements to assess any key issues raised by those public authorities", which includes consulting with the New South Wales Rural Fire Service (NSW RFS) in regard to bush fire considerations.

### 8.4.1. Approach

The following Bush Fire impact assessment has undergone a process of review by a Senior Planner and Bushfire Planning & Design (BPAD) Accredited Bushfire Practitioner.

The assessment involved:

- Review of aerial imagery and bush fire prone land mapping
- Identification of the local bush fire management committee
- Identification of potential bushfire hazards within the proposal site
- Location of existing bushfire resources
- Assessment of impacts
- Mitigation commitments aligned with relevant guidelines and expert advice.

### 8.4.2. Existing environment

The Development footprint has been predominantly cleared of overstorey vegetation for agricultural purposes and has been targeted for the development to reduce bushfire and other risks. It is comprised mostly of grassland and patches of scattered trees are present throughout the same, namely associated with the watercourse which traverses the centre of the site. Large areas of forest occur in the north western and south eastern sections of the site which corelate to category 1 bushfire prone land described below (Table 8-8).

The topography of the proposal site is gently undulating, with some small hills such as the outstanding hillslope in the centre of the site and the south eastern forest. The elevation is 285 – 325m Above Sea Level. The land is undulating without any major steep hills and low points around 285 - 300m are generally associated with waterways in the area (ephemeral within the Development footprint).

The proposal site is identified as bushfire prone land on Dubbo Regional Councils bush fire prone land (BFPL) map. The three areas of forest in the proposal site have been identified as category 1[14] vegetation (Figure 8-24). In terms of bushfire mapping, category 1 vegetation is considered to be the highest risk for bush fire, has the highest combustibility and likelihood of forming fully developed fires (NSW RFS, 2015a). Category 1 bushfire prone land is given a 100m vegetation buffer[15] Other areas within the proposal site are mapped as category 2 vegetation. Category 2 bush fire prone vegetation onsite consists of remnant vegetation and considered a lower fire risk than category 1 and is given a 30m vegetation buffer. Table 8-8 shows the areas of categories 1 & 2 land within the proposal site.

Table 8-8 Area of Bush Fire Prone Land within the proposal site

| Bushfire Prone Land category | Total area (ha) within the proposal site |
|---|---|
| Vegetation Category 1 | 278 |
| Vegetation Category 2 | 193 |

The Orana Bush Fire Risk Management Plan (NSW RFS, 2015b) identifies the proposal site as being within the Orana Bush Fire Management Committee (OBFMC) area and managed by the NSW RFS Orana Team. The NSW RFS Orana Team services the LGAs of Dubbo, Narromine and Wellington with 60 Rural Fire Brigades and over 1,919 members. The Team covers 12,803km$^2$ with a population size of 57,000 (NSW RFS, 2021).

Section 1.3.4 of the Orana Bush Fire Risk Management Plan  states that there are on average 250 bush fires per year, 10-15 of which are considered major fires. The fires are typically ignited by escaped private burns, farm machinery, lightning strikes, and arson. The area has a warm climate with rainfall throughout summer, and a bush fire season running from October to March.

The main bushfire hazards for the proposal site include the following:

- Forested areas within and surrounding the proposal site
- Unmanaged grassland vegetation within and adjacent the proposal site.
- Transmission lines transecting the northern section of the proposal site.
- The battery energy storage system proposed to be constructed in the northern section of the proposal site.
- The substation proposed to be constructed in the north-western section of the site.
- Car accidents and incorrect cigarette disposal along the minor local roads passing the site.

Existing water resources available for firefighting include eight farm dams that will be retained on the proposal site and many of the nearby residents appear to have dams, farm sheds, watering points, silos and other equipment. Dubbo RFS headquarters are 8.7km away (14km and 15mins by road). It should be noted that the water resources listed do not guarantee water resources especially during drought, and thus water storage facilities are recommended for inclusion in the Bush Fire Emergency Management and Operations Plan (BFEMOP).

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[14] This has a different meaning than Category 1 land under the Local Land Service Act, which relates to legally cleared land.

[15] Vegetation buffers are defined as land directly adjacent to bushfire prone vegetation

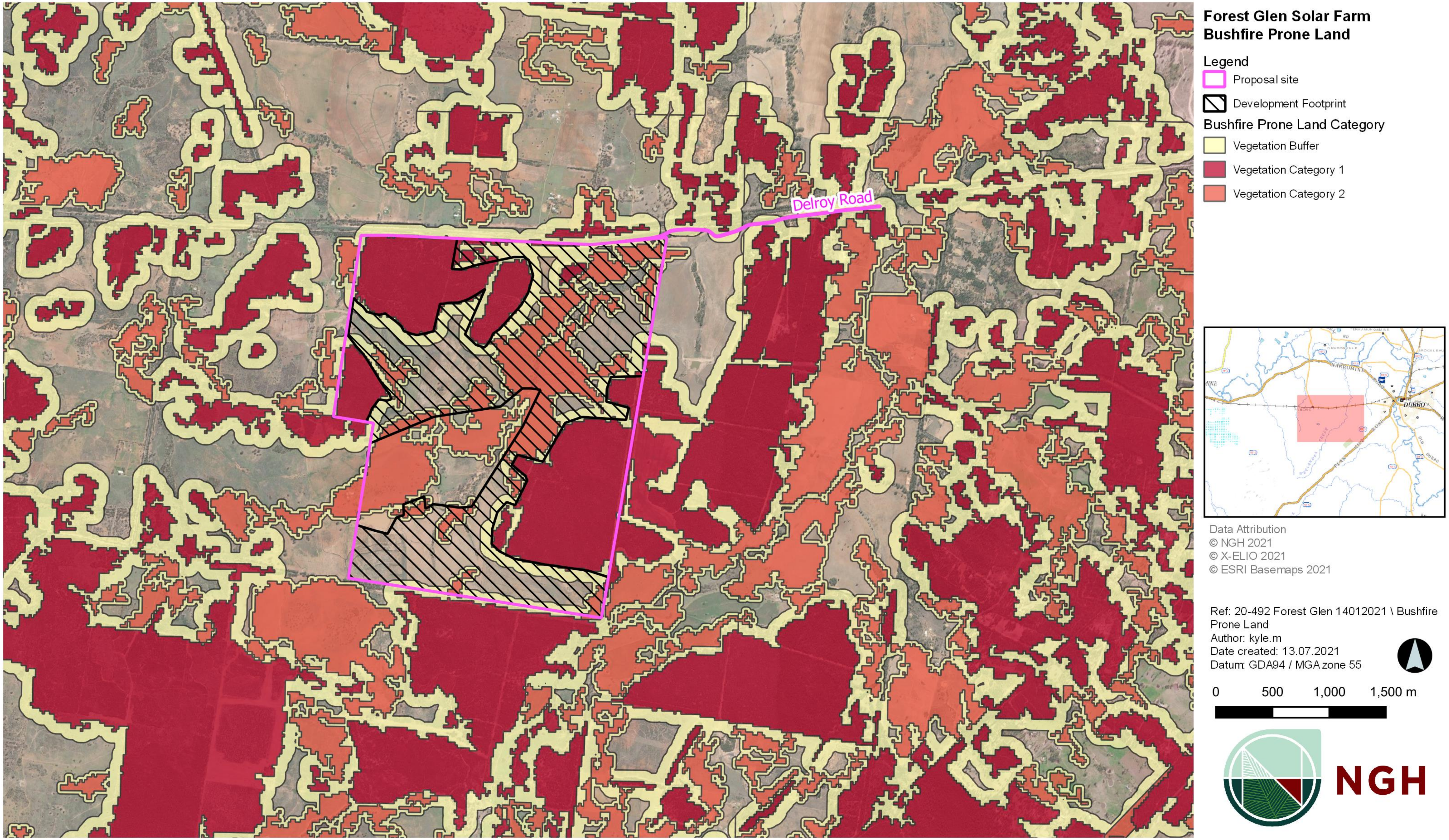


Figure 8-24 Bush fire prone land

## Planning for bushfire protection guidelines

According to NSW RFS *Planning for Bush Fire Protection 2019* (PBP) (RFS 2019), an acceptable level of protection from bushfires is achieved for developments through a combination of strategies which:

- *Control the types of development permissible in bush fire prone areas;*
- *Minimise the impact of radiant heat and direct flame contact by separating development from bush fire hazards;*
- *Minimise the vulnerability of buildings to ignition and fire spread from flames, radiation and embers;*
- *Enable appropriate access and egress for the public and firefighters;*
- *Provide adequate water supplies for bush fire suppression operations;*
- *Focus on property preparedness, including emergency planning and property maintenance requirements; and*
- *Facilitate the maintenance of Asset Protection Zones (APZs), fire trails, access for firefighting and on site equipment for fire suppression.*

The PBP guidelines provide six key Bush Fire Protection Measures (BPMs) for developments:

- *APZs;*
- *Access;*
- *Construction, siting and design;*
- *Landscaping;*
- *Services; and*
- *Emergency and evacuation planning.*

Regarding Section 8.3.5 (of PBP) Solar Farms are identified and require the following measures to be incorporated into the design and operation of the Proposal:

- A minimum 10-metre Asset Protection Zone (APZ) for the structures and associated buildings/infrastructure.
- The APZ must be maintained to the standard of an inner protection area (IPA) for the life of the development (to the specifications identified in Appendix 4 of PBP).

PBP also requires a bush fire emergency management and operations plan, covering:

- Work that should not be carried out during total fire bans.
- Detailed measures to prevent or mitigate fires igniting.
- Notification of the local NSW RFS Fire Control Centre for any works that have the potential to ignite surrounding vegetation, proposed to be carried out during a bush-fire fire danger period to ensure weather conditions are appropriate.
- Appropriate bush fire emergency management planning and availability of fire-suppression equipment, access and water.
- Storage and maintenance of fuels and other flammable materials., covering:
  - The suspension of work involving risk of ignition during total fire bans.
  - The availability of fire-suppression equipment, storage and maintenance of flammable materials.
  - Notification of the local NSW RFS District Fire Control Centre for any works during the fire danger period that have the potential to ignite surrounding vegetation.
  - Bush fire emergency management planning.

A 10m APZ and bush fire emergency management and operations plan are proposed as part of the Forest Glen SF, as discussed more specifically below

### 8.4.3. Potential impacts

## Construction and decommissioning

The potential for increased bushfire risk may coincide with the construction and decommissioning stages of the proposal. Ignition sources during these stages include:

- Earthworks and slashing machinery causing sparks.
- Hot works activities such as welding, soldering, grinding and use of a blow torch.
- Sparks and contact ignition from vehicles in long combustible vegetation.
- Smoking and careless disposal of cigarettes.
- Use of petrol powered tools.
- Operating plant fitted with power hydraulics on land containing combustible material.
- Electrical faults during testing and commissioning.
- Storage of chemicals and hazardous materials.

The Development footprint proposed within the proposal site is predominantly on undulating land in a low fuel (grassland) environment. As such, bushfire risks during construction and decommissioning are considered to be low and would be managed through the mitigation measures recommended in this EIS.

Areas of bushland on site pose the greatest bushfire risk on site and these risks will be mitigated accordingly. Existing access roads and informal farm roads, as well as proposed APZ tracks, and solar farm service roads will provide RFS and emergency service access to the perimeter of most forest stands (but could be upgraded if required).

## Operation

The operational stage of the proposal has the following associated bushfire risks:

- Powerline failure or contact with vegetation within clearances.
- Overheating in the substation.
- Grass fire ignition from vehicles and maintenance machinery.
- Poor groundcover management and associated increase in fuel loads.

During operation of the solar farm, bushfire and structural fire risks are considered manageable provided the following strategies are adopted:

- Control of grass fuels including maintenance of groundcover beneath panels.
- Maintenance of equipment.
- Application of best practice and technical standards.
- Design of electrical components to minimise ignition potential.

The key risk identified and discussed below is in relation to the operation of Lithium-ion batteries.

### Lithium-ion batteries

All energy storage systems carry risks associated with the uncontrolled release of energy. While lithium-ion batteries (LIB) offer significant advantages over competing commercialised storage technologies in terms of energy density, efficiency and charging times, these advantages also elevate the risk of fire. The Lithium-ion based Energy Storage Facility would be designed with proper disconnects, relays, thermal management, enclosures, layout, monitoring and controls to mitigate the fire risk to the required level of safety.

Operating strategies spanning proper planning, risk assessment, storage methods, maintenance protocols, and response protocols are the other important factors in mitigating Lithium-ion fire risks (Butler, 2013).

<u>Fire risks</u>

Lithium-ion cells contain highly flammable electrolytes within a metal prismatic can or metalized pouch that have seals designed for a 10 to 20-year service life. The ambient operating temperature range for Lithium-ion systems can span -10 to 50 degrees Celsius but the cells inside the containers are kept within a smaller range, 10 to 30 degrees Celsius, through the enclosure's thermal management system that is sized to keep the cells within the recommended operating temperature range under normal conditions. Excessive overcharging leads to heating within cells that can initiate 'thermal runaway' triggering new chemical reactions through breakdown of the electrolyte, additional heat generation and ultimately the venting of gases containing carbon monoxide, carbon dioxide and hydrogen.

Gas combustion occurs when the electrolyte vapours or combustible decomposition products come into contact with air and there is an ignition source, or the temperature reaches the autoignition point of 350 - 400°C (Recharge, 2013). Monitoring of module temperature and voltage combined with a well-designed controls system prevents excessive overcharging and heating by taking the system offline before critical conditions are reached. Since thermal runaway in one battery cell can initiate thermal runaway in adjacent cells it is important to design features that prevent propagation of fire among modules in the event that a fire is initiated.

<u>Fire causes</u>

Battery overheating may be caused by a range of factors including electrical shorting, rapid discharge, overcharging, manufacturers defect, poor design and mechanical damage (Butler, 2013). LIB do not produce any exhaust gases during normal operation, but they can produce flammable and toxic gases if there is a fault (Department of Commerce, 2017). The main failure modes for these battery systems are either latent (manufacturing defects, operational heating, etc.) or abusive (mechanical, electrical, or thermal) (Blum and Long, 2016).

A large majority of incidents involving Lithium-ion batteries have been due to failure to adhere to packing and transport requirements, use by non-professionals for innovative applications or use in non-controlled storage conditions (Recharge, 2013).

<u>Risk and incident management</u>

Factors listed in Department of Commerce (2017) to avoid and mitigate battery fire impacts include:

- Building codes applicable to batteries (national and local), changes to floor loadings and National Construction Code requirements for battery installations.
- Manufacturer's recommendations to protect the system from weather and extreme heat, light and temperature.
- Adequate ventilation.
- Containment of electrolyte spills.
- Adequately fire-rated walls are used to avoid or delay the spread of fire.
- Adequate access/egress for installation and maintenance.
- Adequate mechanical protection.

Battery location and spatial design are also important safety factors. Large-scale Lithium-ion energy storage systems can further mitigate widespread impact by isolating different parts of a system.

Fire containment and suppression systems need to be employed to deal with a potential battery fire event, applying the Suppression through Cooling, Isolation, and Containment (SCIC) approach (Butler, 2013). However, while most current systems have automated and manually triggered fire suppression systems, the technology is new and there is limited knowledge about the usefulness of the suppression systems in the event of fire (Blum and Long, 2016).

Lithium-ion fires require specific training, planning, storage, and extinguishing interventions, catering for both progressive burn-off or explosive events (Butler, 2013).

Though the specific battery manufacturer and model has not yet been determined, it is anticipated that each battery module within the implemented solution would have its temperature and voltage monitored.

The fire suppression system within the Energy Storage System would comprise the storage and release of inert gas within each battery container using either electrical detectors/ionisers, or a mechanical system in which the heat destroys a seal to release the gas.

There would be spare air-conditioning units in storage on site for replacement. In the event of failure of one of the units, the system would be able to maintain safe operating temperatures. If all air-conditioning units fail, the auto shutdown of the batteries would prevent overheating.

<u>Standards and guidelines</u>

The installation of lithium-ion batteries has been identified as in need of relevant standards and Standards Australia is developing a new standard (AS/NZS 5139) for smaller scale battery installations (Standards Australia, 2017). The Clean Energy Council provides requirements for accredited installers, the Australian Energy Storage Council has produced a Guide for Energy Storage Systems, and the WA Department of Commerce has released a guide for electrical contractors in relation to battery storage systems (Department of Commerce, 2017).

<u>Asset Protection Zone</u>

Section 8.3.5 of the PBP guidelines provides minimum APZ requirements for solar farm developments located in designated bush fire prone land. These APZ prescriptions would be applied to the solar farm infrastructure to provide defendable space and to manage heat intensities at the infrastructure interface.

In accordance with section 8.3.5 of PBP, an APZ of a minimum width of 10 metres would be provided around the solar farm buildings, substation and BS, and around the outside perimeter of the solar array. The 10-metre APZ setback requirement would also be applied to any woody vegetation plantings undertaken around the perimeter of the solar farm. All the APZs would be managed as an Inner Protection Area, to the specifications of Appendix 4 of PBP.

The APZ surrounding the proposed BESS unit and substation would include gravel surfacing to minimise the risk of fire escaping from the facilities and the risk of external fire affecting the facilities.

<u>Fuel Hazard Management</u>

According to the PBP guidelines, the APZ should provide a tree canopy cover of less than 15% located greater than 2 metres from any part of the roofline of a building and should not overhang any building. Trees should have lower limbs removed up to a height of 2 metres above the ground. The understorey should be managed (mowed) to treat all shrubs and grasses on an annual basis in advance of the fire season.

There would be no trees or shrubs within the APZ established for the solar farm, or within the solar array area. Grassland Fuel Hazard is a function of grass height and cover, with variation according to curing and species fuel characteristics. Grass fuel would be monitored and managed using stock grazing or mowing to maintain safe fuel levels. Grass height within the APZ would be maintained at or below five centimetres throughout the October-March fire season. Grass height outside the APZ, including beneath the solar array, would be maintained at or below 10cm throughout the fire season.

<u>Site Access</u>

Access specifications would comply with section 7.4a of the PBP guidelines, including:

- A minimum carriageway width of four metres
- Minimum vertical clearance of 4 metres
- Capacity for passing using reversing bays and/or passing bays every 200 metres suitable for fire tankers
- Property access roads are two-wheel drive, all-weather roads
- Property access must provide a suitable turning area in accordance with Appendix 3 (of PBP).

The turn radius and swept path clearance on access roads would be suitable for Category 1 Tankers (Medium Rigid Vehicle), refer to Section 7.5.

Fire-fighting Resources and Preparedness

A water storage tank would be installed adjoining the main internal access road for fire-fighting and other non-potable water uses, with a 65mm Storz outlet, a metal valve and a minimum of 20,000 litres reserved for fire-fighting purposes. Rainwater tanks installed beside site buildings for staff amenities would also enable RFS connectivity of Storz outlets. Suitable fire extinguishers and PPE would be maintained at site buildings.

A BFEMOP would be developed prior to commissioning in consultation with the local NSW RFS District Fire Control Centre to manage fire risks, resources and preparedness. Following commissioning of the solar farm, the preparedness of local RFS and Fire and Rescue brigades would be enhanced through site orientation and information events and the facilitation of training in the management of Li-ion battery fires. An Emergency Response Plan, including an Evacuation Plan, BFEMOP (with a specific battery fire response section) Flood Response Plan and Spill and Contamination Response Plan would also be developed to enable rapid, safe and effective incident response.

The proposal would not present a substantial bushfire threat or represent an unacceptable hazard in the event of a bushfire affecting the proposal site. Implementation of the mitigation measures in this EIS are considered sufficient in managing the identified risks.

### 8.4.4. Safeguards and mitigation measures

Bush fire risks during construction and decommissioning are low and would be managed through standard mitigation strategies. During operation of the solar farm, specific fire risks strategies would be adopted including:

- Adequate setbacks, access and firefighting facilities maintained onsite.
- Control of grass fuels including maintenance of groundcover beneath panels in addition to an area around the BS and other ancillary infrastructure.
- Proper design and maintenance of equipment.
- Application of best practice and technical standards.

These form commitments of the proposal, as set out below.

Table 8-9 Mitigation measures for bushfire

*C: Construction; O: Operation; D: Decommissioning*

| ID | Safeguards and mitigation measures | C | O | D |
|---|---|---|---|---|
| BF1 | Dangerous or hazardous materials would be stored and handled in accordance with AS1940-2004: *The storage and handling of flammable and combustible liquids*. | C | O | D |
| BF2 | Develop a BFEMOP to include but not be limited to:<br>• detailed measures to prevent or mitigate fires igniting;<br>• work that should not be carried out during total fire bans;<br>• availability of fire-suppression equipment, access and water;<br>• storage and maintenance of fuels and other flammable materials;<br>• notification of the local NSW RFS Fire Control Centre for any works that have | C | O | D |

| ID | Safeguards and mitigation measures | C | O | D |
|---|---|---|---|---|
| | the potential to ignite surrounding vegetation, proposed to be carried out during a bush-fire fire danger period to ensure weather conditions are appropriate;<br>• and appropriate bush fire emergency management planning.<br>In developing the BFEMOP, NSW RFS and FRNSW would be consulted on the volume of water supplies, fire-fighting equipment maintained on-site, fire truck connectivity requirements, proposed APZ and access arrangements, communications, vegetation fuel levels and hazard reduction measures. | | | |
| BF3 | An APZ of minimum 10m would be maintained between remnant or planted woody vegetation and solar farm infrastructure. The APZ around the perimeter of the site would incorporate a 4m wide gravel access track.<br>Average grass height within the APZ would be maintained at or below 5 centimetres on average throughout the August - March fire season. Average grass height outside the APZ, including beneath the solar array, would be maintained at or below 10 centimetres throughout the fire season. | C | O | |
| BF4 | The overhead powerlines at the site would be managed by maintaining appropriate vegetation clearance limits to minimise potential ignition risks, in accordance with the *ISSC 3 Guideline for Managing Vegetation Near Power Lines*. | | O | |
| BF5 | A non-combustible (steel or concrete) water storage tank should be installed adjoining the main internal access road, or nearby the BS, for fire-fighting and other non-potable water uses, with a 65mm Storz outlet, a metal valve and a minimum of 20,000 litres reserved for fire-fighting purposes, in accordance with PBP. | C | | |
| BF6 | Appropriate fire-fighting equipment would be held on site to respond to any fires that may occur at the site during construction. This equipment would include fire extinguishers, a 1000 litre water cart (fitted with suitable hosing, fittings and diesel firefighting pump) retained on site on a precautionary basis, particularly during any blasting and welding operations. Equipment lists would be detailed in Work Method Statements. | C | | |
| BF7 | The NSW RFS and Fire and Rescue NSW would be provided with a contact point for the solar farm, during construction and operation. | C | O | |
| BF8 | Following commissioning of the solar farm, the local NSW RFS and Fire and Rescue brigades would be invited to an information and orientation day covering access, infrastructure, firefighting resources on-site, fire control strategies and risks/hazards at the site | | O | |
| BF9 | The perimeter access track would comply with the requirements of property access roads in accordance with Table 5.3b of the PBP. All access and egress tracks on the site would be maintained and kept free of parked vehicles to enable rapid response for firefighting crews and to avoid entrapment of staff in the case of bush fire emergencies. Access tracks would be constructed as through roads | C | O | D |

| ID | Safeguards and mitigation measures | C | O | D |
|---|---|---|---|---|
| | as far as practicable. Dead end tracks would be signposted and include provision for turning firefighting vehicles. | | | |
| BF10 | A Hot Works Permit system would be applied to ensure that adequate safety measures are in place. Fire extinguishers would be present during all hot works. Where practicable hot works would be carried out in specific safe areas (such as the Construction Compound temporary workshop areas). | C | O | D |
| BF11 | Machinery capable of causing an ignition would not be used during bushfire danger weather, including Total Fire Ban days. | C | O | D |
| BF12 | Prior to operation of the solar farm, an Emergency Response Plan (ERP) would be prepared in consultation with the RFS and Fire and Rescue NSW. This plan must include but not be limited to:<br>• Specifically addresses foreseeable on site and off site fire events and other emergency incidents.<br>• Risk control measures would include the level of personal protective clothing required to be worn, the minimum level of respiratory protection required, decontamination procedures, minimum evacuation zone distances and a safe method of shutting down and isolating the PV system (either in its entirety or partially, as determined by risk assessment).<br>• Outline other risk control measures that may need to be implemented in a fire emergency due to any unique hazards specific to the site.<br>• Two copies of the ERP are stored in a prominent 'Emergency Information Cabinet' which is located in a position directly adjacent to the site's main entry point/s.<br>Once constructed and prior to operation, the operator of the facility would contact the relevant local emergency management committee (LEMC). | PC, C | O | |
| BF13 | Fire risks associated with the lithium-ion energy storage facility would include:<br>• Locating the Energy Storage Facility as far as practicable from any sensitive receptors or large stands of vegetation.<br>• Installing reliable automated monitoring (voltage and temperature), alarm and shutdown response systems.<br>• Installing reliable integrated fire detection and fire suppression systems (inert gas).<br>• Ensuring the battery containers are not vulnerable to external heat effects in the event of a bushfire.<br>• Designing appropriate separation and isolation between battery containers and between batteries and other infrastructure, including gravel surfacing around the facility for a minimum 10m in accordance with APZ.<br>• Compliance with all relevant guidelines and standards. | | Design | |

| ID | Safeguards and mitigation measures | C | O | D |
|---|---|---|---|---|
| | • Preparation of a specific Battery Fire Response Plan, under the general BFEMOP, in consultation with fire authorities, fire suppression experts and in reference to relevant standards and guidelines.<br>Facilitation of first responder training in the management of Lithium-ion battery fires at the site for local brigades. | | | |

## 8.5. Aboriginal Heritage

**SECRETARY'S REQUIREMENTS**

*The EIS must also address the following specific issues:*

- ***Heritage** – including an assessment of the likely Aboriginal and historic heritage (cultural and archaeological) impacts of the development and consultation with the local Aboriginal community in accordance with the Aboriginal Cultural Heritage Consultation Requirements for Proponents;*

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

### 8.5.1. Approach

A specialist ACHA was undertaken by NGH (Appendix G) to provide an assessment of the Aboriginal cultural values associated with the Forest Glen SF (proposal) site and to assess the cultural and scientific significance of any Aboriginal heritage sites recorded. The full report is provided in Appendix G and is summarised below.

The ACHA Report was prepared in line with the following:

- *Guide to Investigating, Assessing and Reporting on Aboriginal Cultural Heritage in NSW* (OEH, 2011).
- *Code of Practice for the Archaeological Investigation of Aboriginal Objects in New South Wales* (DECCW, 2010a)
- *Aboriginal cultural heritage consultation requirements for proponents 2010* (ACHCRP) (DECCW, 2010b)

Consultation with Aboriginal stakeholders (Registered Aboriginal Parties) was undertaken in accordance with Section 60 of the National Parks and Wildlife Amendment (Aboriginal Objects and Aboriginal Places) Regulation 2019 following the consultation steps outlined in the ACHCRP guide. A comprehensive account of the consultation steps undertaken to comply with the guide, as well as a summary of the actions completed by NGH, and responses received from RAPs are provided in Appendix G. As a result of this process, two (2) Aboriginal groups registered their interest in the proposal. These were:

- Dubbo Local Aboriginal Land Council (DLALC); and
- Peter Chatfield (Tubbagah Aboriginal Co-op).

A project methodology was provided for comment, which was provided to the two (2) RAPs listed above. An archaeological survey was then undertaken on the 4th May – 6th May 2021 by two (2) local Aboriginal representatives from the DLALC and NGH Archaeologists of the proposal site. A copy of the draft ACHA report was provided to the registered Aboriginal parties for review and comment and any comments received have been incorporated into the final ACHA report.

## 8.5.2. Existing environment

### Archaeological context

The assessment included a review of relevant information relating to the culturally sensitive landscapes within the proposal site. A search of the AHIMS database was conducted over an area approximately 22km east-west x 22km north-south centred on the proposal on the 4th of November 2020. No Aboriginal sites have previously been recorded within the proposal site.

The results of the AHIMS search are shown in Table 8-10 and Figure 8-25. No AHIMS sites were recorded within the Forest Glen SF proposal site.

Table 8-10 Breakdown of previously recorded Aboriginal sites in the region

| Site Type | Number |
|---|---|
| **Artefact** | 33 |
| **Modified Tree** | 33 |
| **Artefact and Potential Archaeological Deposit (PAD)** | 3 |
| **Potential Archaeological Deposit (PAD)** | 2 |
| **Ochre Quarry** | 2 |
| **Hearth , Artefact and Modified Tree (Carved or Scarred) -** | 1 |
| **TOTAL** | **74** |


Figure 8-25 AHIMS surrounding the proposal site

The results of previous archaeological surveys in the region show that sites and artefacts are present throughout the landscape. High density sites are generally located in elevated flat areas adjacent to waterways. Grinding grooves are usually evident where there is raw material conducive to this use, generally near waterways. Lower density background artefact scatters and isolated finds also occur on undulating landforms in proximity to water. The artefact lithology within the area appears to be variable and related to the locally available and suitable rock types.

Modified trees are recorded in the area. These are not associated with any particular landforms, but occur in areas where old growth trees remain. There is a high proportion (44.6% n=33) of scarred trees recorded in the region especially where there are remnant stands of native trees. Scarred trees provide a tangible link to the past and provide evidence of Aboriginal subsistence activities through the deliberate removal of bark or wood. It is likely that the high proportion of scarred trees in the area surrounding the proposal site is related to the more obtrusive nature of scarred trees when compared to small artefact scatters and isolated stone artefacts.

Based on previous archaeological investigations in the region, it was determined that the proposal site has potential to contain Aboriginal objects,

## Archaeological investigation method and results

An archaeological survey was undertaken of the proposal site in accordance with the *Code of Practice for Archaeological Investigation of Aboriginal Objects in NSW* (DECCW 2010a). The survey conducted for the purposes of this assessment was undertaken on the 4th May – 6th May 2021.

Survey transects were undertaken on foot and traversed the entire Development footprint (Figure 8-26). The survey was noted to be impeded at times by dense grass with under cropping of clover and knee to waist height grasses, however a number of exposures were present across the proposal site and all landforms. Areas of increased visibility consisted of disturbed exposures on tracks, fence lines, contour banks, dam banks, areas along the creek banks, and patches of bare ground. On average, visibility within the surveyed area was low to moderate, ranging between 1% and 65% at an average of 15%, with visibility in exposures averaging between 50 and 95%. Small exposures were present across all landforms, allowing an accurate view into the archaeological record, present within the project area.

Between the four team members, a total of approximately 1,186km was walked across the proposal site. Allowing for an effective view width of 5m for each person and given the variability in the ground visibility across the proposal site, overall, the survey effectively examined 3.92% of the proposal site. It is considered by NGH that the survey of the Development footprint (including access upgrades for Delroy Road) had sufficient and effective survey coverage.

There were no Aboriginal objects or areas of cultural sensitivity identified during the field survey.

Discussions were held in the field with the Aboriginal community representatives present to assess the potential for subsurface deposits across the proposal site. The field survey results for the proposal site and archaeological modelling for the area were considered. In conclusion no areas with archaeological sensitivity were identified within the Development footprint.

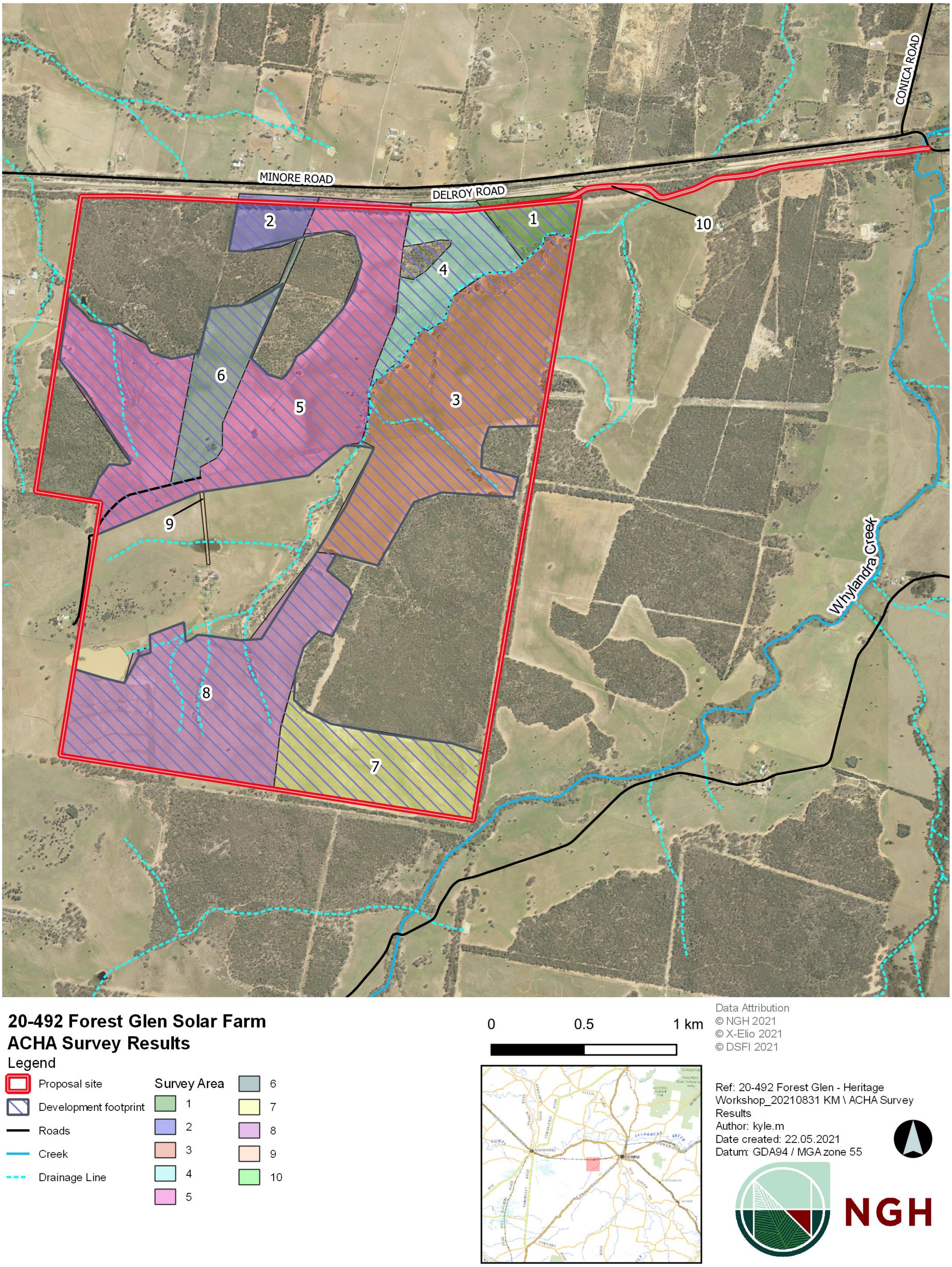


Figure 8-26 ACHA survey areas

### 8.5.3. Potential Impacts

The installation of the ground-mounted PV solar arrays will involve ground surface disturbance, as will the construction of site facilities such as operations buildings, parking perimeter fencing, access tracks throughout the site. However, the proposed construction methodology for the Forest Glen SF would result in only small areas of soil disturbance. The construction of access and maintenance tracks may involve some grading but given the generally cleared nature of the terrain, this is likely to be minimal. The major ground disturbances will likely be trenching for cables and vehicle movement during construction.

Impacts to Aboriginal heritage during construction and operation of the proposal have potential to directly or indirectly impact objects of heritage value. However, as no Aboriginal objects or areas of potential archaeological deposits (PADs) identified during the archaeological field investigations for the Forest Glen SF, the risk of this is considered very low.

### 8.5.4. Safeguards and mitigation measures

The proposal is unlikely to impact on Aboriginal Heritage, mitigation measures are outlined below in the event of an unexpected finds.

Table 8-11 Safeguards and mitigation measures for impacts to heritage

*C: Construction; O: Operation; D: Decommissioning*

| ID | Safeguards and mitigation measures | C | O | D |
|---|---|---|---|---|
| AH1 | Further archaeological assessment would be required if the proposal activity extends beyond the area assessed in this report. This would include consultation with the registered Aboriginal parties and may involve further field survey. | C | O | D |
| AH2 | No ground disturbing activities or removal of remnant vegetation is to occur outside the survey area as outlined in Figure 8-26. | C | O | D |
| AH3 | During construction and ongoing use of the Forest Glen Solar Farm, the unexpected finds procedure outlined in Appendix B of the ACHA report must be followed. | C | O | D |
| AH4 | In the unlikely event that human remains are discovered during the construction of the Forest Glen Solar Farm, all work must cease in the immediate vicinity. Heritage NSW and the local police should be notified. Further assessment would be undertaken to determine if the remains are Aboriginal or non-Aboriginal. If the remains are deemed to be Aboriginal in origin the Registered Aboriginal Parties should be advised of the find as directed by Heritage NSW. | C | O | D |

## 8.6. Historic Heritage

**SECRETARY'S REQUIREMENTS**

*The EIS must also address the following specific issues:*

- ***Heritage** – including an assessment of the likely Aboriginal and historic heritage (cultural and archaeological) impacts of the development, including consultation with the local Aboriginal* *community in accordance with the Aboriginal Cultural Heritage Consultation Requirements for Proponents;*

### 8.6.1. Approach

A desktop study was undertaken to identify any historic (non-Aboriginal) heritage items or places in proximity to the proposal, with a focus on the proposal site and surrounding landscape.

Heritage databases searched as part of this assessment were:

- The Australian Heritage Database, this includes items on the National and Commonwealth Heritage Lists, to identify any items that are currently listed within or adjacent to the proposal site.
- The NSW State Heritage Inventory (SHI), this includes items on the State Heritage Register and items listed by state agencies and local Government, to identify any items currently listed within or adjacent to the proposal site.
- Heritage schedule of the Dubbo LEP 2011, for locally listed heritage items, that are within or adjacent to the proposal site.

### 8.6.2. Results

#### Database searches

The results of the heritage searches listed above indicate that no known historic items or places are present within the proposal site. A summary of the results of the heritage searches are illustrated in Table 8-12 Details of listed items are provided below.

Table 8-12 Summary of heritage listed items in the Dubbo LGA

| Name of register | Number of listings |
|---|---|
| World Heritage List | 0 |
| National Heritage List | 1 |
| Commonwealth Heritage Places | 1 |
| NSW State Heritage Register | 15 |
| NSW State Agency Heritage Register (section 170) | 27 |
| Dubbo Local Environmental Plan (LEP) 2011 | 428 |

**Australian heritage database**

The Australian Heritage Database search was undertaken on the 21 December 2020. 24 items were found to be listed under the National Heritage List for the Dubbo Regional LGA. None of these occur within, or adjacent to, the proposal site. The nearest item to the proposal site listed on the Commonwealth Heritage List is: *RAAF* Base at Dubbo. The former RAAF base is about 12km east of the proposal site. Therefore, the site would not be impacted by the proposal.

The 19th century Dundullimal homestead is the nearest item to the proposal site listed on the National Heritage List. The homestead is located 12km southeast of the proposal site and therefore will not be impacted by the proposal.

#### NSW State Heritage Inventory

The SHI database search was undertaken on the 21 December 2020. There were 15 items listed under the NSW State Heritage Register and 27 items listed under the NSW State Agency Heritage Registers (Section 170) for the Dubbo Regional LGA. None of these items were identified as being within the proposal site. The closest listed items are in the Dubbo township over 10km away and will therefore not be impacted by the proposal. The Nearest state heritage item is 'Kemwah' now the Milestone Hotel and is 10.2km northeast of the proposal.

#### Dubbo Local Environment Plan (LEP) 2011

The Dubbo LEP database search was conducted on the 21 December 2020. No local heritage items have been recorded within, or adjacent to, the proposal site. The closest listed item, Dickyundi Inn, is located approximately 7km to the north of the proposal site and will not be impacted by the proposal.

#### Unlisted potential heritage items

During site inspections no potential heritage items were observed on site. No sightlines to any listed heritage items or potential heritage items exist from the proposal site.

### Historic land use

More recent land disturbances within the proposal site are largely those commonly associated with farming practices. These include low and high intensity farming practices across the landscape with soils at the site extensively disturbed by repeated cultivation and stock grazing. High intensity farming practices include the ploughing of fields and the initial creation of dams and paddocked areas, while lower intensity practices include pastoral activities and the grazing of stock.

The Brigalow Belt South bioregion was first visited by Europeans when Oxley arrived in 1817 and again in 1818, when he reached the junction of the Macquarie and Talbragar Rivers near current day Dubbo. Oxley noted that the land would be suitable for agricultural use, and in 1823 pastural occupation began when Governor Brisbane led the first European community to the west of Bathurst in an Agricultural Convict Establishment. Around Dubbo, pastural occupation quickly escalated, with squatters arriving in the area from 1824 and squatting licences being issued from 1826. Squatters runs began to be setup from the early 1830s, including 'Dubbo' run, and by the 1840s most of the Macquarie and Talbragar river frontages had been occupied.

From the 1840s to 1880s working relationships between the Europeans and local Aboriginal people were established. European station owners created "station camps" on their stations where many Aboriginal people lived and provided labour to the pastoral practices between the late 19th and mid-20th century and increasing during the gold rushes.

In 1881, the Main Western railway line that runs along the north edge of the proposal site reached Dubbo. This line was extended to the site that would become Narromine in 1883 with the railway station being the first building constructed in the town. The railway line allowed for the carrying of passengers and increased the ability to send goods, with wool and livestock being transported along the line. Passenger transport was not extended beyond Dubbo until 1974.

## 8.6.3. Potential impacts

Several heritage items were identified during the desktop study as outlined above. None of the above registered items are located within or adjacent to the proposal site and no views or sightlines to or from historic heritage items will be impacted. It is identified that some items are within the haulage route, it is unlikely these would be impacted by vibration or dust from construction, operation or decommissioning traffic.

The proposal is not considered likely to have a significant impact in accordance with the NSW *Heritage Act 1977*, the EP&A Act, or the EPBC Act, in terms of non-Aboriginal heritage.

There are no anticipated impacts on any of the above identified heritage items during construction, operation or decommissioning, due to the location of the proposed solar farm.

### 8.6.4. Safeguards and mitigation measures

Historic heritage impacts are considered a very low risk for the proposal. However in the event of an item of heritage significance being uncovered, works should cease in the vicinity of the find and the site manager must be contacted immediately. Works should not recommence until an investigation has been completed by suitably qualified person in accordance with Heritage NSW guidelines.

Table 8-13 Safeguards and mitigation measures for non-Aboriginal heritage

*C: Construction; O: Operation; D: Decommissioning*

| ID | Safeguards and mitigation measures | C | O | D |
|---|---|---|---|---|
| HH1 | Should an item of historic heritage be identified, Heritage NSW (NSW Department of Premier and Cabinet) must be contacted prior to further work being carried out in the vicinity. | C | O | D |

## 8.7. Resource use and waste generation

**SECRETARY'S REQUIREMENTS**

*The EIS must also address the following specific issues:*

- ***Waste** - identify, quantify and classify the likely waste stream to be generated during construction and operation, and describe the measures to be implemented to manage, reuse, recycle and safely dispose of this waste.*

### 8.7.1. Existing environment

Renewable energy is a growing industry and as such recycling technologies are improving rapidly alongside it to meet developing government and community expectations.

The National Waste Policy: Less Waste, More Resources (DEE 2018) sets out the objectives, principles, outcomes and strategies for waste management. The policy aims to:

- Avoid the generation of waste, reduce the amount of waste (including hazardous waste) for disposal, manage waste as a resource and ensure that waste treatment, disposal, recovery and re-use is undertaken in a safe, scientific and environmentally sound manner, and
- Contribute to the reduction in greenhouse gas emissions, energy conservation and production, water efficiency and the productivity of the land.

In NSW, waste management and pollution are regulated under the *Protection of the Environment Operations Act 1997* (POEO Act) and the Protection of the Environment Operations (Waste) Regulation 2005. Unlawful transportation and deposition of waste is an offence under section 134 of the Act. Littering is an offence under section 145 of the Act.

The NSW *Waste Avoidance and Resource Recovery Act 2001* contains waste minimisation and management objectives, including:

- Encourage the most efficient use of resources and to reduce environmental harm in accordance with the principles of ecologically sustainable development
- Ensure that resource management options are considered against a hierarchy of the following order:
    - i. Avoidance of unnecessary resource consumption,
    - ii. Resource recovery (including reuse, reprocessing, recycling and energy recovery),
    - iii. Disposal.

The NSW Waste Avoidance and Resource Recovery Strategy (EPA 2014), the 'WARR Strategy', provides a framework for achieving these statutory objectives, focusing on the following key result areas:

- Avoid and reduce waste generation
- Increase recycling
- Divert more waste from landfill
- Manage problem wastes better
- Reduce litter
- Reduce illegal dumping.

Adopting the above principles would encourage the most efficient use of resources and reduce costs and environmental harm in accordance with the principles of ecologically sustainable development.

The Central West Regional Organisation of Councils (CENTROC) and Orana Regional Organisation of Councils (OROC) have collaborated to prepare the NetWaste Strategic Waste Plan 2017-2021, which was developed in line with EPA guidelines and aims to achieve a coordinated approach to waste management based on the WARR Strategy key result areas. Warrumbungle Shire Council is a member of the regional voluntary Netwaste Group.

The following waste facilities are located within the Dubbo LGA:

- Ballimore Recycling Centre
- Ballimore Transfer Station
- Eumungerie Recycling Centre
- Eumungerie Transfer Station
- Geurie Waste Depot
- Stuart Town Waste Depot
- Toongi Transfer Station

In order to facilitate the logistics of waste disposal for remote areas of the NetWaste region, specific contracts have been set up with member councils to provide access services that overcome the economic and geographic constraints for these remote areas. The following regional contracts are currently in place (source: www.netwaste.org.au/projects/existing-regional-contracts):

Table 8-14 Potential waste streams and associated recycling services

| Waste stream | Recycling service |
|---|---|
| Processing of Garden Organics and Wood | 17 member NetWaste Councils participate in this regional contract which serves to chip garden organic material and produce a mulch product for Councils. |

| Waste stream | Recycling service |
|---|---|
| and Timber Contract | The existing contract is with Ausshredding Pty Ltd and is a 2-year initial contract with possible extension options available.<br>Since 2006, 667,825 m3 of garden organic and wood timber material has been chipped and diverted from landfill. |
| Dubbo – Narromine Joint Recycling Contract | Dubbo City and Narromine Shire Councils commenced a joint recycling contract with JR Richards and Sons in 2010 for a 10-year term. The product is collected and delivered to a large Transfer Station in Dubbo, where it is transported to Sydney facility for sorting and recycling.<br>Since the contract commenced, 17,905 tonnes of material has been recycled. |
| Collection of Scrap Metal | Scrap metal is a prominent waste type received by Councils to their landfills and waste transfer stations, which has significant reuse and recycling opportunities. 22 of the NetWaste Councils are part of a regional contract which sees a regular collection service for this material while receiving a price for the commodity.<br>This was the first regional contract established by the group back in 2004. Since its commencement, 127,659 tonnes of scrap metal have been collected. |
| Collection of Used Motor Oil | Following the installation of used oil collection units at a number of landfills and waste facilities across the region, NetWaste worked to establish a regional contract for the collection and recycling of this material. The current service contract is held by Cleanaway Pty Ltd.<br>Since 2009 when the first contract was established, over 1,181 KL has been collected and recycled. |

### 8.7.2. Resource use

The key resources and estimated quantities (pending the completion of the detailed proposal design) required to construct the proposed Forest Glen Solar Farm are listed in Table 8-15. The majority of the required resources would be used during the construction of the proposed solar farm. During operation and decommissioning, resource requirements would relate to maintenance activities including the use of machinery, vehicles and water resources. Water resources would be required throughout construction, operation and decommissioning. Water use is considered in Section Figure 8-18 of this EIS.

Table 8-15 Resource requirements for the Forest Glen Solar Farm

| Resource | Quantity |
| --- | --- |
| **Gravel (access tracks)** | 4,473 $m^3$ |
| **Sand (bedding for cables)** | 4,658 $m^3$ |
| **Concrete** | 663 $m^3$ |
| **Estimated no of solar panels** | 150,000-200,000 |
| **Estimated number of mounting structures (Single Axis Tracker)** | 3,000 |
| **Estimated number of inverters** | 612 |
| **Water during construction** | 42ML |

### 8.7.3. Waste

The *Waste Avoidance and Resource Recovery Act 2001* includes resource management hierarchy principles to encourage the most efficient use of resources and to reduce environmental harm. The proposal's resource management options would be considered against a hierarchy as shown in Figure 8-27.

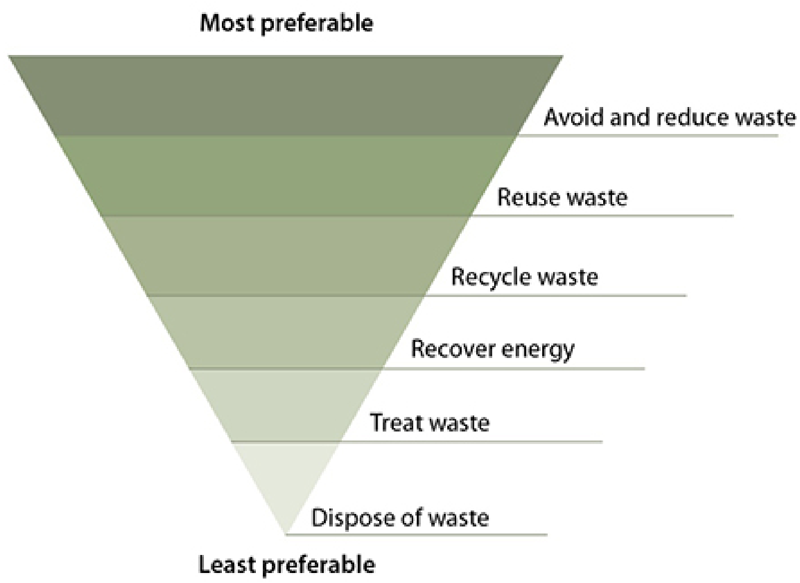


Figure 8-27 Waste hierarchy (source: (EPA, 2020))

Adopting the above principles would encourage the most efficient use of resources and reduce costs and environmental harm in accordance with the principles of ESD.

## 8.7.4. Potential impacts

## Construction

### Resource use

While increasing scarcity of resources and environmental impacts are emerging from the use of non-renewable resources, the supply of the materials required for the proposal are not currently limited or restricted. In considering the volumes required, the proposal is unlikely to place significant pressure on the availability of local or regional resources. The use of the required resources is considered reasonable in light of the benefits of offsetting fossil fuel electricity generation.

Water would be required during construction for activities including watering of roads and in the site office and amenities. Water use is considered in Section 8.1.

### Waste

The management of waste during the construction phase would observe the objectives of the WARR Act.

Solid waste is one of the major pollutants caused by construction. A number of different construction activities associated with the proposal would produce solid wastes, including:

- Spoil from trenching.
- Packaging materials.
- Excess building materials.
- Scrap metal and cabling materials.
- Plastic and masonry products, including concrete wash.
- Excavation of topsoils and vegetation clearing (expected to be minimal).
- Bio wastes, from onsite septic systems.

In accordance with the definitions in the POEO Act and associated waste classification guidelines, most waste generated during the construction and decommissioning phases would be classified as building and demolition waste within the class general solid waste (non-putrescibles). Ancillary facilities in the site compound would also produce sanitary wastes classified as general solid waste (putrescibles) in accordance with the POEO Act. Waste produced during construction would be disposed of at an appropriately licensed waste facility. Green waste from tree clearing would be mulched for use in rehabilitation at the site or removed from the site.

The impact from waste generation, on regional waste facilities is assessed to be moderate without the implementation of any recycling or re-use measures. However, with the implementation of a Waste Management Plan and identification of recycling waste facilities in the LGA, the impacts from construction waste disposal on regional landfills, the biological environment and social environment is assessed to be minor.

The Waste Management Plan would include a requirement for separate waste receptors to be located on site during construction to receive recyclable and non-recyclable waste. Recyclable waste is likely to be generated from packaging (carboard, plastic, wood). Non-recyclable waste would be disposed of at an appropriate licensed facility. The following waste facilities are located within the Dubbo LGA:

- Ballimore Recycling Centre
- Ballimore Transfer Station
- Eumungerie Recycling Centre
- Eumungerie Transfer Station
- Geurie Waste Depot

- Stuart Town Waste Depot
- Toongi Transfer Station.

In the event that these waste facilities cannot accept the volume of waste generated, commercial landfills and waste management companies (including those which recycle polystyrene) would be engaged to dispose of the material legally at other facilities.

Where possible, more sustainable packaging material options would be selected (e.g. reduced insulation/padding thickness and the use of biodegradable starch over cardboard and polystyrene). The proponent would work with Dubbo Regional Council and commercial services to recycle as much packaging as practicable.

The impact from waste generation, on regional waste facilities is assessed to be moderate without the implementation of any recycling or re-use measures. However, with the implementation of a Waste Management Plan, identification of recycling waste facilities in the LGA and Orana region and consulting with the NetWaste Strategic Waste Plan, the impacts from construction waste disposal on regional landfills, the biological environment and social environment is assessed to be minor.

## Operation

### Resource use – lifecycle analysis

Lifecycle analysis (LA) assesses and quantifies the energy and material flows associated with a given process to identify the resource impacts of that process and potential for resource recovery. LA estimates energy and emissions based on the total life cycle of materials used for a project, being the total amount of energy consumed in procuring, processing, working up, transporting and disposing of the respective materials (Schleisner, 2000).

A life cycle inventory of polycrystalline PV panels has been undertaken by the International Energy Agency Photovoltaic Power System Program. In their report, Life Cycle Inventories and Life Cycle Assessments of Photovoltaic Systems (IEA-PVPS-T12-04:2015) the ‘energy payback time’ for thin film modules has been estimated at less than 1 year for a solar installation in Southern Europe. This is consistent with the estimation that the Proposal would have an energy payback period of approximately 1.5 years. Over the panel’s 30-year lifetime, they are expected to produce less than 18 grams of GHG per kWh generated, almost 50% lower than for Csi (Fthenakis *et al.,* 2015).

The purification of the silicon, which is extracted from quartz, accounts for 30% of the primary energy to produce the panels. This stage also produces the largest amount of pollutants with the use of electricity and natural gas for heating (Fthenakis *et al*. 2011). The waste produced during production of the panels which can be recycled include graphite crucibles, steel wire and waste slurry (silicon and polyethylene glycol). However, silicon crystals cannot be recycled during this stage (Fthenakis *et al*. 2011). The production of the frames and other system components, including cabling, would also produce some emissions and waste.

The energy yield ratio of a product is a ratio of the energy produced by, in this case, a solar PV system over its lifetime, to the energy required to make it, which is referred to as the system’s lifecycle (GA and ABARE, 2010). PV system energy yield ratio in Northern Europe was estimated to be more than ten, indicating the system would produce more than ten times the amount of energy required to make it (Fraunhofer Institute for Solar Energy Systems (ISE), 2015). This positive energy yield ratio also means that GHG emissions generated from the production of solar energy systems are more than offset over the systems’ lifecycle.

When compared to the major electricity generating methods employed in Australia, solar farms are favourable for the following reasons:

- $CO_2$ emissions generated per kilowatt hour of energy produced.
- Short energy payback time in comparison to the life span of the project.
- Potential to reuse and recycle component parts.

### Waste

During operation, the solid waste streams would be associated with maintenance activities and presence of employees. Some materials, such as fuels and lubricants, and metals may require replacement over the operational life of the solar farm. These materials would be reused or recycled wherever possible. Given the minimal amount of moving parts and limited wear tear of equipment, the operational waste streams generated by the solar farm would be very low and impacts to regional waste disposal facilities would be minor.

### Li-ion Batteries

The average life of the Li-ion PV solar batteries is assumed to be 10 years (Randell Environmental Consulting 2016) and the batteries may require replacement 1-2 times during the life of the solar farm.

Li-ion batteries are classified as hazardous waste under the Commonwealth *Hazardous Waste Act 1989*, and Dangerous Goods under the Australian Code for the Transport of Dangerous Goods by Road and Rail (ADG Code). The code has a special provisions and packaging instructions for Li-ion batteries transported for disposal or recycling.

Presently, there are few facilities to recycle Li-ion batteries in Australia. Li-ion batteries that are recovered are typically collected with other e-wastes (Randell Environmental Consulting 2016). The Australian Battery Recycling Initiative (ABRI) website indicates four companies which provide a collection and recycling service for used Li-ion batteries.

Any spent batteries that would be exported would require an export permit under section 40 of the *Hazardous Waste Act*. The Proponent would coordinate this activity and the associated commercial arrangements with the selected battery supplier.

Given the rapid rise of Li-ion battery use in Australia, including in renewable energy projects and electric cars, cost-effective local recycling may be available at the time of battery replacement or decommissioning. AEMO (2015) predict strong growth in the consumption of Li-ion batteries for both electric vehicles and PV solar over the next 20 years. This growth would begin to significantly affect the waste stream from 2025 (Randell Environmental Consulting 2016).

## Decommissioning

During decommissioning, all above ground infrastructure and materials would be removed, with the possible exception of the 132kV substation. It is noted that the 132kV substation would form part of Essential Energy’s transmission link between Forest Glen and Dubbo. Some fencing may also remain at the request of the landowner. Underground cables buried at 500mm deep and greater would likely remain in situ.

The following materials would either be recycled or reused:

- Solar panels and mounting system.
- Metals from posts, cabling, fencing.
- Buildings and equipment such as the PCUs, transformers and similar components would be removed for resale or reuse, or for recycling as scrap.

Buildings and major electrical equipment would be removed for resale or reuse, or for recycling as scrap. Items that cannot be recycled or reused, such as excess of above, would be disposed in accordance with applicable regulations and to appropriate facilities.

The proposed energy storage facility would be accompanied with MSDS (Material Safety Data Sheets) which details the exact chemical composition and disposal/recycling requirements of facility components. Potentially hazardous waste is discussed in Section 8.9.

It is noted that lithium-ion batteries are not currently regulated as a hazardous waste NSW and hence transport within the state is not required to be tracked in hazardous waste tracking systems (Randell

Consulting, 2016). Lithium-ion batteries do not contain any heavy metals. They do contain valuable material that can be recycled. The Australian Battery Recycling Initiative (ABRI) website indicates companies which provide collection and recycling services for used lithium-ion batteries.

The majority of the proposal components are recyclable and mitigation measures are in place to maximise reuse and recycling in accordance with resource management hierarchy principles.

### 8.7.5. Safeguards and mitigation measures

A Waste Management Plan would be developed to minimise waste and maximise the opportunity for reuse and recycling. Potential impacts are to be addressed with regards to the mitigation measures in Table 8-16.

Table 8-16 Safeguards and mitigation measures for resource use and waste generation impacts

*C: Construction; O: Operation; D: Decommissioning*

| ID | Safeguards and mitigation measures | C | O | D |
|---|---|---|---|---|
| WR1 | A Waste Management Plan (WMP) would be developed to minimise wastes. It would include but not be limited to:<br>• Identification of opportunities to avoid, reuse and recycle, in accordance with the waste hierarchy.<br>• Quantification and classification of all waste streams.<br>• Provision for recycling management onsite.<br>• Provision of toilet facilities for onsite workers and identify that sullage would be disposed of (i.e., pump out to local sewage treatment plant).<br>• Tracking of all waste leaving the site.<br>• Disposal of waste at facilities permitted to accept the waste.<br>• Requirements for hauling waste (such as covered loads). | C | O | D |
| WR2 | Septic system is installed and operated according to the Dubbo Regional Council regulations. | C | O | |

## 8.8. Electric and Magnetic Fields (EMFs)

**SECRETARY'S REQUIREMENTS**

*The EIS must also address the following specific issues:*

- ***Hazards** including:*
- *potential hazards and risks of the development*
- *bushfire risks of the development against the RFS Planning for Bushfire Protection 2019; and*
- *the proposed transmission line and substation against the International Commission on Non-Ionizing Radiation Protection (ICNIRP) Guidelines for limiting exposure to Time-Varying Electric, Magnetic and Electromagnetic Fields.*

### 8.8.1. Existing environment

Electric and magnetic fields (EMFs) are produced whenever electricity is used. EMFs also occur naturally in the environment, such as the Earth's magnetic field and discharges during thunderstorms (WHO, 2012).

Electric fields are produced by voltage and magnetic fields are produced by current. When electricity flows, EMFs exist close to the wires that carry electricity and close to operating electrical devices and appliances (WHO, 2007). Electric and magnetic field strength reduces rapidly with distance from the source, and while electric fields are insulated by air and insulation material, magnetic fields are not.

Fields of different frequencies interact with the body in different ways. EMF field sources to which people may be exposed are predominantly in three frequency ranges. The Extremely Low Frequency (ELF) range of 0-300 Hz incorporates the 50 and 60 Hz frequencies of the electric power supply and of electric and magnetic fields generated by Transmission Lines and other electrical devices and infrastructure (Repacholi, 2003).

Over decades of EMF research, no major public health risks have emerged, but uncertainties remain (WHO, n.d.). While it is accepted that short-term exposure to very high levels of electromagnetic fields can be harmful to health, the International EMF Project, established by the World Health Organisation, has thus far concluded that there are no substantive health consequences from exposure to Extremely Low Frequency (ELF) electric fields at the low levels generally encountered by the public (WHO, 2007), such as those that would be produced by electricity generation at the proposed solar farm.

Exposure to ELF magnetic fields is mostly considered to be harmless, however, a policy of prudent avoidance has been taken to account for any uncertainty. The Australian Radiation Protection and Nuclear Safety Agency (ARPANSA) advises that:

> *"…the scientific evidence does not establish that exposure to ELF EMF found near Transmission Lines is a hazard to human health', and that 'current science would suggest that if any risk exists, it is small".*

The International Commission on Non-Ionizing Radiation Protection (ICNPR) published *Guidelines for limiting exposure to time-varying electric, magnetic and electromagnetic fields (up to 300GHz)* in 1998. The guidelines were updated in 2010. The objective of the paper was to establish guidelines for limiting EMF exposure that would provide protection against known adverse health effects.

To prevent health-relevant interactions with Low Frequency fields, ICNIRP recommends limiting exposure to these fields so that the threshold at which the interactions between the body and the external electric and magnetic field causes adverse effects inside the body is never reached.

The exposure limits, called basic restrictions, are related to the threshold showing adverse effects, with an additional reduction factor to consider scientific uncertainties pertaining to the determination of the threshold. They are expressed in terms of the induced internal electric field strength in V/m. The exposure limits outside the body, called reference levels, are derived from the basic restrictions using worst-case exposure assumptions, in such a way that remaining below the reference levels (in the air) implies that the basic restrictions would also be met (in the body) (ICNIRP, 2016). Reference levels for occupational and general public exposure are shown in Table 8-17.

Table 8-17 ICNIRP reference levels (ICNIRP, 2010)

| Exposure characteristics | Electric field strength (kVolts per metre – kV/m) | Magnetic flux density (microteslas - µT) |
|---|---|---|
| Occupational | 10 | 1000 |
| General public | 5 | 200 |

The proposal includes six main types of infrastructure that could create EMFs:

1. Solar arrays (up to 1600V DC).
2. PCU's
3. Underground cables.

4. 132kV overhead transmission lines.
5. 132kV onsite substation.
6. Energy storage facility with a capacity of up to 25MW/25MWh.

Typical and maximum EMF levels for these types of infrastructure is discussed below.

## Solar arrays

Research into electric and magnetic fields undertaken at utility scale PV installations in California[16] by Chang and Jennings (1994), indicated that magnetic fields were significantly less for solar arrays than for household applications. Chang and Jennings (1994) found magnetic fields from solar arrays were not distinguishable from background levels at the site boundary, suggesting the health risk of EMFs from solar arrays is minimal.

The proposal would require installation of DC wiring between panels and the PCUs. This cabling would be underground and would have a voltage of around 1600V. The potential for electromagnetic interference as a result of the solar array cabling is considered to be negligible.

## Power conversion units

Between 20-25 PCUs would be installed across the site. The units would have an output of approximately 5MW. The PCUs would convert the DC electricity output from the panels to AC electricity and transform the voltage to the collection system voltage of 33 kV. In addition, the PCUs would be located within the fenced proposal site with no public access and would operate only during the day reducing the total time that EMFs are generated by the solar panel infrastructure.

## Underground cabling

The electric and magnetic fields generated by underground cabling are expected to be low and restricted to the proposal site.

## Overhead powerlines

Figure 8-28 displays the typical electric fields emanating from different voltage overhead powerlines. The proposal site has an existing 132kV powerline at the northern section of the proposal site. These connect to the existing Armidale 330/132kV substation. The proposed solar farm would connect to the existing 132kV powerlines through the proposed onsite substation via an overhead or underground powerline.

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[16] Note the U.S.A electricity supply operates at 60 Hz frequency.

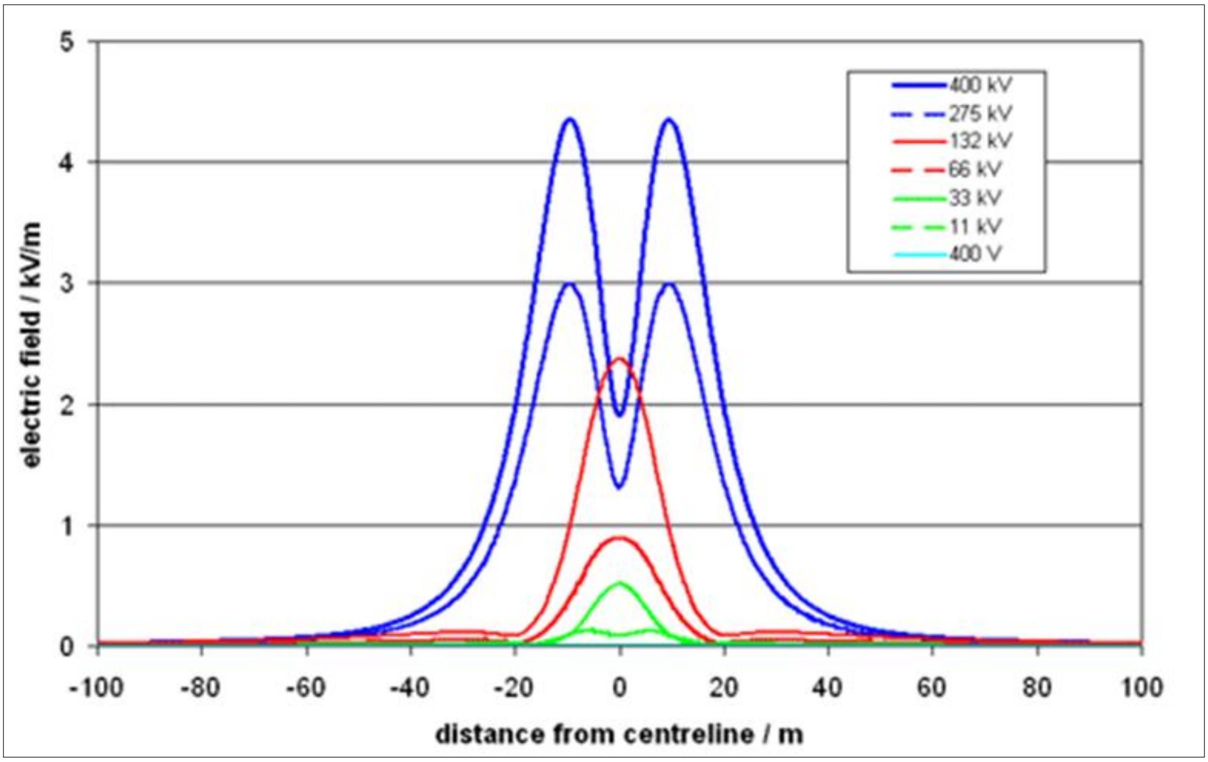


Figure 8-28 Typical electric fields from overhead powerlines (EMFs.info 2017)

### Substation

For the substation and transformers, the magnetic fields at distances of 5-10m from the substation fence are generally indistinguishable from typical background levels in a home. The closest non-involved residence is approximately 1km west of the proposed substation location. Works undertaken to facilitate the connection of the transmission line would require mitigation measures to ensure reduced exposure.

### Energy storage facility

Lithium-ion batteries are not associated with high levels of EMF and the EMF produced by the proposed ESF would be well below ICNIRP reference levels.

## 8.8.2. Potential impacts

### Construction and decommissioning

There is low potential for EMF impacts during the construction and decommissioning phases of the proposal. Staff would be exposed to EMFs over intermittent periods during works at and around the existing 132kV transmission line. Exposure to EMFs during the construction would be short term, therefore the effects are likely to be negligible.

### Operation

During operation, EMF sources would include overhead transmission lines, underground cabling, and the solar array incorporating PCUs.

Electric fields can be reduced with distance from operating electrical equipment and by shielding, while magnetic fields are reduced more effectively with distance. Through prudent design and siting of this infrastructure, the exposure to EMFs can be minimised and potential for adverse health impacts minimised also.

The site is surrounded by agricultural land. Public access would be restricted by site fencing around the site and existing substation during the operational phase. Given the levels associated with the infrastructure components, and the distance to the site perimeter fence, EMFs from the solar farm are likely to be indistinguishable from background levels at the boundary fence. The underground cabling would not produce external electric fields due to shielding from soil, and its magnetic fields are expected to be well within the public and occupational exposure levels recommended by ARPANSA and ICNIRP.

By prudently designing and siting infrastructure, exposure to EMFs and potential for adverse health impacts can be further reduced. Adverse health impacts from EMFs are therefore unlikely as a result of the proposal.

### 8.8.3. Safeguards and mitigation measures

The potential risks associated with EMFs for the solar farm can be reduced by designing the infrastructure in accordance with the codes and best practice standards by a suitable qualified person. These measures are outlined below.

Table 8-18 Mitigation measures for EMFs

*C: Construction; O: Operation; D: Decommissioning*

| ID | Safeguards and mitigation measures | C | O | D |
|---|---|---|---|---|
| E1 | All electrical equipment would be designed in accordance with relevant codes and industry best practice standards in Australia. | | Design | |
| E2 | All design and engineering would be undertaken by qualified and competent person/s with the support of specialists as required. | | Design | |
| E3 | Design of electrical infrastructure would minimise EMFs. | | Design | |

## 8.9. Hazardous materials and development

**SECRETARY'S REQUIREMENTS**

*The EIS must also address the following specific issues:*

- ***Hazards and Risks** including:*
- *a preliminary risk screening in accordance with State Environmental Planning Policy No. 33 – Hazardous and Offensive Development and Applying SEPP 33 (DoP, 2011), and if the preliminary risk screening indicates the development is "potentially hazardous", a Preliminary Hazard Analysis (PHA) must be prepared in accordance with Hazard Industry Planning Advisory Paper No. 6 – Guidelines for Hazard Analysis (DoP, 2011) and Multi-Level Risk Assessment (DoP, 2011); and*

### 8.9.1. Potential impacts

SEPP 33 Hazardous and Offensive Development requires a Preliminary Hazard Assessment (PHA) to be prepared for potentially hazardous or offensive development. Appendix 3 of the Applying SEPP 33 Guidelines (DOP, 2011) lists industries that may fall within SEPP 33; the guidelines do not include solar farms and/or energy storage facilities. Based on the results of previous projects and communication with DPIE, a BESS with capacity below 30MW/h does not require a PHA to be undertaken. As such the proposed 25MW/25MW/h BESS forecasted for installation at the Forest Glen SF does not require a PHA under these conditions. Appendix 2 of the guidelines provides a risk screening procedure and a checklist to identify Hazardous and Offensive Development in instances where the applicability of SEPP 33 is not immediately apparent. Information relevant to the risk screening and the checklist is provided below.

## Construction and Operation

## Risk screening

The SEPP 33 screening procedure is based on the quantity of dangerous goods stored or transported, the frequency of transportation movements and, in some cases, the distance of the materials from the site boundary. The guidelines require goods to be classified according to the Australian Code for the Transport of Dangerous Goods by Road and Rail (ADG Code). The ADG Code lists the following classes of dangerous goods:

- Class 1 Explosives.
- Class 2 Gases.
- Class 3 Flammable liquids.
- Class 4 Flammable solids.
- Class 5 Oxidising substances and organic peroxides.
- Class 6 Toxic and infectious substances.
- Class 7 Radioactive material.
- Class 8 Corrosive substances.
- Class 9 Miscellaneous dangerous substances and articles, including environmentally hazardous substances.

A development which exceeds screening thresholds in the guidelines would be considered potentially hazardous, and a PHA would need to be submitted with the development application. For quantities below the given thresholds, the SEPP indicates that there is unlikely to be a significant off-site risk, in the absence of other risk factors.

The dangerous goods that would require transportation and storage during construction and operation of the proposed solar farm are identified in Table 8-19 with ADG Code classification, relevant quantity and transportation thresholds, and storage arrangements. The proposed storage sites would be located at the O&M building and the Energy Storage Facility would be located south of the onsite substation (refer to Figure 1-10). In terms of the class, transportation and storage of dangerous goods, the proposal would not exceed SEPP 33 thresholds, would not be considered potentially hazardous and would not require the preparation of a PHA.

Table 8-19 Dangerous good and SEPP thresholds relevant to the proposal

| Hazardous material | Storage threshold | Transport threshold | | Onsite storage arrangements for the proposal | Exceeds SEPP 33 thresholds? |
|---|---|---|---|---|---|
| | | Movements | Quantities | | |
| **Class 2.1 Flammable gases** | | | | | |
| **LPG** | 10 tonnes or 16m$^3$ (above ground) | >500 cumulative >30/week | 2-5 tonnes | Up to 45kg cylinders beside control building, 20m from boundary. | No |
| **Class 2.2 Non-flammable, non-toxic gases** | | | | | |

| Hazardous material | Storage threshold | Transport threshold | | Onsite storage arrangements for the proposal | Exceeds SEPP 33 thresholds? |
|---|---|---|---|---|---|
| | | Movements | Quantities | | |
| **Inert fire suppression gas** | NA | NA | NA | Compressed in steel bottles in Energy Storage Facility. | No |
| **Class 3 – Flammable liquids (PGII)** | | | | | |
| **Fuel (petrol)** | 5 tonnes | >750 cumulative >45/week | 3-10 tonnes | Stored in a bunded Area. | No |
| **Class 6.1 Toxic substances (PG II, III)** | | | | | |
| **Pesticides (herbicides)** | 2.5 tonnes | All | 1-3 tonnes | Secure operations storage building. | No |
| **Class 9 Miscellaneous dangerous substances and articles** | | | | | |
| **Li-ion batteries** | NA | >1000 cumulative >60/week | No limit | Energy Storage Facility buildings in a secure compound. | No |

## Class 2.2 non-flammable, non-toxic gases

The inert gas stored in compressed form in the Energy Storage Facility for fire suppression would belong to Class 2.2 Non-flammable, non-toxic gases. Gases within this class/division are excluded from the SEPP 33 risk screening process and are not considered to be potentially hazardous with respect to off-site risk. These materials have a Workcover notification threshold of 10,000 litres.

The use of inert gases for fire suppression in enclosed spaces carries asphyxiation risks for staff, site visitors and emergency personnel. Gases commonly used are blends of argon, nitrogen and carbon dioxide. Inert gases are used to reduce oxygen content to below 15% to extinguish fires. Levels below 18% are hazardous for humans, and levels below 10% are extremely dangerous. The risk of accidental asphyxiation can be minimised by:

- Proper installation and operation.
- Regular equipment inspection maintenance.
- Provision of warning signs and information to staff.
- Staff and emergency responder training (including during maintenance and rescue/first aid).
- Fixed or personal oxygen monitoring equipment.
- Activation of an audible and visible internal and external alarm prior to gas release.
- Incorporation of an odour in the gas.
- Effective ventilation and air exchange.
- Safe and effective purging system.

## Battery energy storage system – lithium-ion batteries

The proposed BESS would provide electricity storage capacity of approximately 2MWh for each container (40 foot) subject to final specifications. The location and description of the BESS is provided in Section 4.3.7. The average life of the lithium-ion PV solar batteries is assumed to be 15 years. Batteries may require replacement up to a maximum of two times during the life of the solar farm.

The batteries are designed for outdoor use, generally only require a secure foundation i.e. concrete slab, and specified clearances for service access. The batteries are designed for excellent energy density, the ability to operate at any state of charge and reliability and safety (Photon energy, 2018).

Lithium-ion batteries are classified as a Class 9 miscellaneous dangerous goods and Class 9 hazardous goods (both new and waste batteries). They pose little threat to people or property, although they may pose an environmental hazard (DOP, 2011). Class 9 goods are excluded from the SEPP 33 risk screening process.

Lithium-ion batteries are classified as hazardous waste under the Commonwealth *Hazardous Waste Act 1989* and are classified as Dangerous Goods under the ADG Code. The ADG Code requires dangerous goods to be carried in a secure, safe and environmentally controlled manner. The code specifies 'special provisions' and 'packing instructions' applying to the transportation of Lithium-ion batteries. The *National Environment Protection (Movement of Controlled Waste between States and Territories) Measure 1998* (the NEPM), which sets the regulatory framework for transporting 'controlled wastes' between Australian states and territories, does not currently cover Lithium-ion batteries.

Waste lithium-ion batteries are not currently regulated as a hazardous waste by state governments and hence transport within the state is not required to be tracked in hazardous waste tracking systems (Randell Consulting, 2016). Lithium-ion batteries do not contain any heavy metals. They do contain valuable material that can be recycled. Recycling processors for lithium-ion batteries are similar to recycling of other electronic device battery packs (Photon energy, 2017). The Australian Battery Recycling Initiative (ABRI) website indicates four companies which provide a collection and recycling service for used lithium-ion batteries.

The major hazard offered by lithium-ion battery technologies is fire, as a result of the flammability of the substances used in the battery (Recharge, 2013). Fire risks associated with lithium-ion batteries are discussed in Section 8.9. Class 9 materials have a Workcover notification threshold of 10,000 litres or kilograms, the proposal is above this threshold. Workcover notification will be required.

#### Other risk factors

The proposal would not involve the storage or transport of incompatible materials, generation of dusts within confined areas, activities involving hazardous materials, incompatible, reactive or unstable materials and process conditions, storage or processing operations involving high (or extremely low) temperatures. There are no known past incidents (or near misses) involving hazardous materials and processes at solar farms.

#### Potentially offensive industry

The proposal would result in vehicle and machinery exhaust emissions during the construction phase, as in any construction project. The emissions occur outside, in a rural locality, and would be readily dispersed. The emissions would not be considered hazardous within the context of SEPP 33. Noise impacts would also largely be confined to standard working hours during the construction phase and would not be hazardous to employees or neighbouring residents. Noise impacts have been assessed in Section 7.2. Water pollution risks are assessed as low, subject to identified mitigation measures, with longer term benefits following cessation of cultivation and establishment of groundcover across the site.

### 8.9.2. Safeguards and mitigation measures

The potential risks associated with hazardous materials the solar farm can be reduced by handling them in accordance with Australian Standards and codes as well developing protocols for maintenance and incident response. These measures are outlined below.

*C: Construction; O: Operation; D: Decommissioning*

Table 8-20 Mitigation measures for hazards

| ID | Safeguards and mitigation measures | C | O | D |
|---|---|---|---|---|
| H1 | Dangerous or hazardous materials would be stored and handled in accordance with AS1940-2004: *The storage and handling of flammable and combustible liquids* and the ADG code where relevant. | C | O | D |
| H2 | Protocols would be developed for lithium-ion battery storage, maintenance, and incident response to mitigate Li-ion fire risks. | C | O | D |
| H3 | The transportation of new and waste lithium-ion batteries would comply with the requirements of the Dangerous Goods Code, including specific 'special provisions' and 'packing instructions' applying to the transportation of Li-ion batteries. | C | O | D |

## 8.10. Air quality and climate

### 8.10.1. Existing environment

#### Air quality

Air quality for the Dubbo LGA is generally expected to be good and typical of that found in a rural setting of NSW. Existing sources of air pollution within the LGA would include:

- Vehicle emissions – expected to be low for the site considering the low traffic amounts in the vicinity of the site and low intensity of land use and low density of settlement.
- Dust during dry periods – expected to be higher in dry and windy weather, generated from traffic on unsealed roads and bare areas of ground.
- Agricultural activities, particularly ripping, stubble burning and harvests.

During colder months, there may be a small increase in air contaminants due to smoke emissions from the operation of solid fuel heating. As above, locally this would be negligible given the low density of settlement.

A search of the National Pollutant Inventory (Australian Government, 2019) identified 12 facilities within the Dubbo LGA that are required to record emissions. The facilities include two quarries, three gas manufacturers/wholesalers, four petrol wholesalers, two Agricultural businesses and one sewage treatment plant. The closest facility is SUPAGAS Dubbo, approximately 9km north west of the proposal site.

The proposal site is located within the 200km radius of the *Dark Sky Region* and is approximately 120km south-west of the Siding Spring Observatory. The Dark Sky Region is centred upon the site of this observatory, which is considered Australia's most important visible-light observatory.

The proposed solar farm is located on land zoned as RU1 Primary Production. The land surrounding the proposal site is predominately grazed agricultural land and rural properties. One residence is located within the proposal site and is an involved landowner. There are 61 residences within 2km of the proposal site. The closest residential receiver is 153m north from the site. Traffic on the surrounding roads of the proposal site would be limited to private transport, with heavy vehicles being used in the harvest season or cattle transport.

## Climate

The proposal site is located within the Brigalow Belt Bioregion. The Brigalow belt region is dominated by a subhumid climate with no dry season characterised by warm summers (NSW Government, 2016b). The closest climate data for the proposal site is the Dubbo Airport Automatic Weather Station (AWS) (site number 065070)

Table 8-21 outlines the available data for this weather station from the Bureau of Meteorology (BOM, 2021).

Table 8-21 Dubbo Airport AWS weather station (site number 065070 1946-2021)

| Aspect | Annual Mean | Mean Minimum Range | Mean Maximum Range |
|---|---|---|---|
| **Temperature**[17] | 24.7°C maximum<br>10.3 °C minimum | 18.5 °C (January) to<br>3.0 °C (July) | 33.7 °C (January) to<br>15.6 °C (July). |
| **Rainfall**[18] | 552.8mm | 30.2mm (April) | 68.5mm (March) |
| **Wind**[19] | NA | 12.9km per hour (9am) (July)<br>16.2km per hour (3pm) (May) | 21.5km per hour (9am) (Jan)<br>20.2km per hour (3pm) (November) |

## Climate change

Climate change refers to the warming temperatures and altered climatic conditions associated with the increased concentration of greenhouse gases in the atmosphere. Climate change projections for Australia includes more frequent and hotter hot days and fewer frost days, rainfall declines in south eastern Australia and more extreme weather events including intense rainfall, severe drought and harsher fires (CSIRO, 2020). 2019 was Australia's hottest and driest year on record, with the annual mean temperature 1.52 °C above average and rainfall 40% below average nationally (BOM, 2020). At the global level, 2019 was the second-warmest year on record, and the fifth hottest year in a row (BOM, 2020). The annual mean air temperature in Eastern Australia is projected to increase by 2.8-5.0°C by 2090 (above the 1986-2005 period) (CSIRO, 2015).

In 2014, the NSW OEH published climate change projection snapshot reports for the NSW and ACT governments as part of the NSW and ACT Regional Climate Modelling (NARCliM) project. The study focused on projections for two future 20 year time periods: 2020-2039 as the near future and 2060-2079 as the far future. The snapshot included the analysis of over 100 climate variables, including temperature, rainfall and wind. Temperatures have been increasing since about 1950, with the largest increase in temperature experienced in recent decades (OEH 2014). The projected climate change impacts for the far west region of NSW are summarised in Figure 8-29 below.

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[17] Based on data collected between 1993 - 2021

[18] Based on data collected between 1994 -2021

[19] Based on data collected between 1993 -2010

| Projected **temperature** changes | |
|---|---|
| Maximum temperatures are projected to increase in the near future by 0.4 – 1.0°C | Maximum temperatures are projected to increase in the far future by 1.8 – 2.7°C |
| Minimum temperatures are projected to increase in the near future by 0.5 – 0.9°C | Minimum temperatures are projected to increase in the far future by 1.5 – 2.6°C |
| The number of hot days will increase | The number of cold nights will decrease |

| Projected **rainfall** changes | |
|---|---|
| Rainfall is projected to decrease in spring | Rainfall is projected to increase in autumn |

| Projected **Forest Fire Danger Index (FFDI)** changes | |
|---|---|
| Average fire weather is projected to increase in summer, spring and winter | Severe fire weather is projected to increase in summer, spring and winter |

Figure 8-29 Projected climate change impacts for the central west region of NSW (OEH 2014)

Rural and regional communities are disproportionately affected by the impacts of climate change, through worsening extreme weather events and impacts to capacity, productivity and resilience in some rural industries (Climate Council, 2016). A significant proportion of Australian exports are agricultural products that are sensitive to global warming impacts (AGO, 2003). Some incremental adaptations in agricultural enterprises would be straightforward, but the more transformational adaptive changes may be risky and expensive, especially for individual farmers (Climate Council, 2016).

## Criteria

It is noted that the POEO Act regulates pollution including air pollution. It requires that no vehicle shall have continuous smoky emissions for more than ten seconds. Limits on dust emission of less than 4 mg/m/m2 are also specified.

The Forest Glen SF will displace approximately 164,000 metric tonnes of greenhouse emitting carbon dioxide per annum. As such the proposal supports and adds value to the following Global agreements and NSW policies (Detailed in Section 2.2.2 and 2.2.3):

- The Paris Agreement
- NSW Climate change policy framework.
- NSW Large-scale Solar Energy Guideline for State Significant Development 2018.
- Climate Change Fund Draft Strategic Plan 2017 to 2022
- Net-Zero Plan: Stage 1 2020-2030
- NSW Electricity Infrastructure Roadmap.

The proposal also supports the following local renewable energy targets (Detailed in Section 2.2.4):

- Central West and Orana Regional Plan 2036
- Central Orana Regional Economic Strategy 2018-2022.

### 8.10.2. Potential impacts

## Construction and decommissioning

#### Air quality

Air quality can be affected by dust and emissions generated during the construction works. The sources of dust and emissions at the proposal site during construction would include:

- Excavation and earthworks, such as ground-breaking, levelling (cutting and filling), piling works, trenching, etc. – generally, the impacts would be in discrete areas and located well away from receivers.
- Vehicle movements over unsealed surfaces including internal and external access tracks. Up to 50km of track would be installed. There are currently a limited number of unsealed informal tracks onsite.
- Dust from uncovered stockpiled powdery materials or truckloads.
- Emissions (e.g. Nox, Sox and CO) and particulates from vehicles, diesel generators, heavy plant and other mechanical equipment.
- Stored Volatile Organic Compounds (VOCs) and other volatile hazardous materials such as paints, fuels and solvents. These would be limited.

Dust and air emissions can be a nuisance to nearby receivers including residences, farm workers and motorists. 61 residences occur within 2km of the proposal site. The closest non-involved residential receiver is 153m north of the site and would potentially be impacted by dust generated by the proposal's traffic. However the receiver is screened by vegetation along the road reserve, which would reduce any potential dust impacts from traffic along Delroy Road.

The degree of impact can be influenced by weather and climate. Work carried out during long periods of dry weather and high winds have a greater potential to generate dust which can impact air quality (refer to Table 8-21). Construction work during summer months may require greater dust suppression measures to manage any increased impacts.

The construction phase is expected to be approximately 12 -18 months in duration. The air quality impacts from construction works on the proposal site, are considered to be negligible due the proposed minor earthworks and the distance from receivers. Potential air quality impacts are likely to occur along Delroy Road due to the road being predominantly unsealed. However, the potential impacts are considered manageable with the implementation of mitigation measures.

No air quality impacts in addition to those mentioned for construction are anticipated during the decommissioning phase. Traffic requirements would be similar in type but of shorter duration than that required for the construction phase.

#### Climate and climate change

No climatic impacts are anticipated as a consequence of the construction and decommissioning activities for the solar farm. Haulage traffic and plant and equipment would generate emissions, however, the short duration of the work and the scale of the solar farm proposed suggests this contribution would be negligible in a local or regional context.

## Operation

#### Air quality

Operational and maintenance process of the solar farm would generate very low emissions of pollutants. Specifically, the source of these pollutants is vehicle emissions from staff vehicles and maintenance equipment. However, it is likely that no vehicles would be present at the site on a permanent basis, with only occasional visits by standard vehicles. Fuel would also be required for temporary power generation in the event of an unplanned outage.

Maintenance activities during operation would result in some minor, localised dust generation from vehicles travelling on the unsealed access roads. A groundcover management plan would be implemented to reduce dust production from disturbed areas. The impacts on local and regional air quality are expected to be negligible during normal operation.

### Climate

Concerns have been previously raised regarding the possibility of the heat created from solar arrays resulting in a ‘heat island’ effect surrounding infrastructure. A ‘Heat island’ is defined as an area having higher average temperature than its surroundings owing to the greater absorption, retention, and generation of heat by buildings, pavements and activities. This is usually used in reference to the impact of an urban area on its rural surroundings. Studies have shown that Photovoltaic (PV) panels convert incident solar radiation into heat, and this can alter the air-flow and temperature profiles near the panels. Whether such changes may subsequently affect the thermal environment of near-by populations of humans and other species have been questioned (Fthenakis and Yu, 2013). However, to date there have been limited empirical studies on the potential for a heat island effect in utility scale solar farms.

Fthenakis and Yu (2013) undertook an analysis of the potential for large solar farms to generate a heat island effect and increase air temperature within the solar farm area. The study found at the center of the solar farm, the annual average air temperature at a height of 2.5m increased by up to 1.9$^{0}$C. However, this increase in temperature dissipated at a height of 5m. Additionally, the solar farm completely cooled overnight. The research suggested a small potential effect on climate within the proposal site. This effect may actually enhance retention of ground cover in very cold or hot conditions onsite. No impacts on adjacent properties and agricultural activities would occur.

The limited studies that do exist also show results that can be seen as contradictory, as they are so site and project specific. Some studies conclude that whilst air temperatures may increase within the solar farm itself, they rapidly decrease to the ambient temperature beyond the perimeter of the solar farm (Fthenakis and Yu, 2013). Other studies suggest that PV systems can actually cause a cooling effect on the local environment, depending on the efficiency and placement of the PV panels while others demonstrate a warming effect (Barron-Gafford, Minor, Allen, Cronin, Brooks, and Pavao-Zuckerman, 2016).

The topic has also been subject to recent consideration by a Victorian Planning Panel for solar farms proposed in Greater Shepparton for solar farms proposed by Neoen and X-Elio. This is detailed in the *Panel Report for the Greater Shepparton Solar Energy Facility Planning Permit Application 2017-162, 2017-274, 2017-301 and 2017-344* (Victorian Planning Panel Report 2018). Neoen, in preparation of a response to key issues raised in objecting submissions, commissioned a *Statement of Evidence by Greg Barron-Gafford* from the Research Group Biography, Ecosystem Science (University of Arizona) (Barron-Gafford, 2018).

Barron-Gafford (2018), in his Statement of Evidence (SoE) to the Victorian Planning Panel included results on the radius of the measured heat effects. This identified that the PVHI effect was indistinguishable from air temperatures over native vegetation when measured at 30m from the edge of the PV array (Figure 8-30). In his SoE he states that:

*“…this pattern held true for both daytime and night-time conditions. Because the PV panels themselves trap the energy from diffuse sunlight that was able to reach the ground underneath them, air temperatures remain elevated within a PV array. As you leave this “overstorey” of PV panels, energy is able to radiate back towards the atmosphere, as it does in a natural setting, and the PVHI quickly dissipates”.*

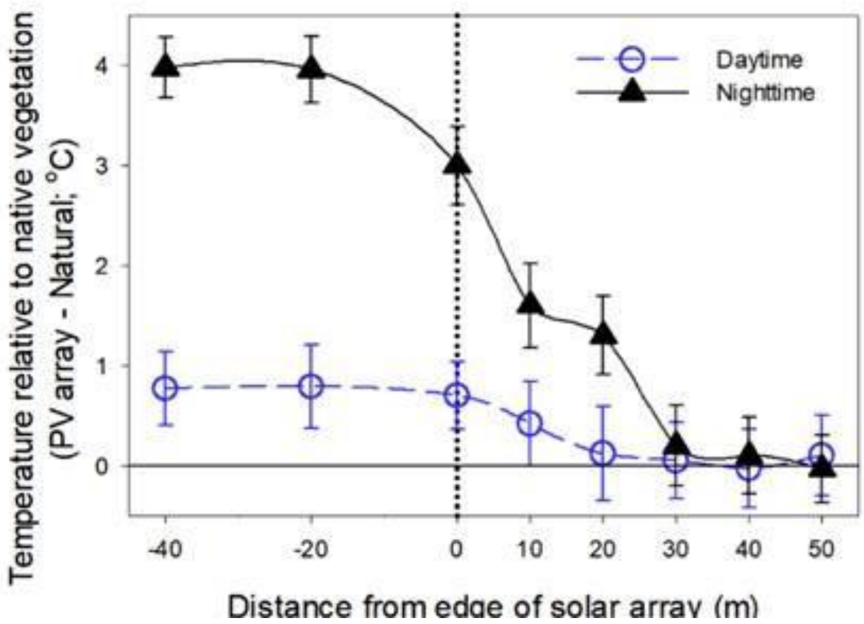


Figure 8-30 Measures of air temperature within and outside of the PV array (Barron-Gafford, 2018)

Measures of air temperature within and outside of the PV array (Barron-Gafford, 2018)

In conclusion, the Victorian Planning Panel Report (Panel Report, 2018), accepted that solar arrays will affect air and soil temperatures within the solar array perimeter, but that in relation to outside of the solar array perimeter a heat island effect is unlikely to occur.

### Climate change

The proposal would, as part of the transition to renewable energy sources, contribute to reducing greenhouse gas emissions and the mitigation of the negative effects of climate change. On an annual basis, the proposed Forest Glen SF would provide enough clean, renewable energy for about 40,000 average NSW homes per annum. At the same time, it would displace approximately 164,00 metric tonnes of carbon dioxide per annum.

The operation of the solar farm would produce minimal $CO_2$ emissions when compared to conventional coal and gas fired power stations, refer to Table 8-22.

Table 8-22 Comparison of CO2 equivalent emissions produced per kilowatt hour

| Generation method | Emissions produced (grams $CO_2$ equivalent per kWh) | Source |
|---|---|---|
| **PV solar farm** | 19-59 | Wright and Hearps (2010) |
| **Coal-fired power station** | 800-1000 | Wright and Hearps (2010) |
| **Combined cycle gas turbine** | 400 | Alsema *et al*. (2006) |

## 8.10.3. Safeguards and mitigation measures

The proposal is low risk of impacting of air quality and climate change and would be managed through the mitigation measures outlined below.

Table 8-23 Safeguards and mitigation measures for climate and air quality impacts

_C: Construction; O: Operation; D: Decommissioning_

| ID | Safeguards and mitigation measures | C | O | D |
|---|---|---|---|---|
| A1 | Track width of internal tracks would be minimised during detailed design. | Design | | |
| A2 | The Community Consultation Plan will be implemented to promote information sharing for air quality and include a complaints process:<br>• Notification of relevant stakeholders defined.<br>• An accessible complaints process with a timely response protocol. | C | O | D |
| A3 | Dust control measures, including on site access roads and ground cover management will be specified in the CEMP and Decommissioning Environmental Management Plan (DEMP) and may include water applications or other means as required. | C | O | D |
| A4 | Dust generation by vehicles accessing the site and earthworks at the site would be suppressed using water applications or other means as required. | C | | D |
| A5 | Vehicle loads of material which may create dust would be covered while using the public road system. | C | | D |
| A6 | All vehicles and machinery used at the site would be in good condition, fitted with appropriate emission controls and comply with the requirements of the POEO Act, relevant Australian standards and manufacturer's operating recommendations. Plant would be operated efficiently and turned off when not in use. | C | O | D |
| A7 | Fires and material burning is prohibited on the proposal site. | C | O | D |

## 8.11. Cumulative impacts

**SECRETARY'S REQUIREMENTS**

_The EIS must also address the following specific issues:_

- **Land** – including:
    - an assessment of the potential impacts of the development on existing land uses on the site and adjacent land, including:
        - a cumulative impact assessment of nearby developments;

### 8.11.1. Existing environment

Cumulative impacts relate to the combined effect of impacts from several activities on a particular value or receiver. They may occur concurrently or sequentially. Considering the Forest Glen SF proposal, the relevant cumulative impacts are those associated with other known or foreseeable developments occurring in proximity to the Proposal.

The Forest Glen SF is located within the Central-West Orana NSW REZ. Following from this it is expected that a number of new solar and wind farm developments will be constructed in the region in the coming years. There is potential in this case that land holdings previously utilised exclusively for agriculture will be acquired for renewable energy generation. While on the whole this transformation will have a net positive impact locally and state-wide, there will be cumulative impacts associated with these developments. Primarily these will be traffic, visual, land use related.

Major projects listed on the Major Projects Register within the Dubbo Regional LGA and Narromine Shire LGA are presented in Table 8-24. In summary, the Forest Glen SF has potential to generate cumulative impact risks:

Table 8-24 Major projects within the Dubbo Regional LGA and adjacent LGA's (orange indicates potential cumulative impact)

| Project title | Status | Potential for cumulative impact | Distance from proposal site | Cumulative impact type |
|---|---|---|---|---|
| **Macquarie Foreshore Event Precinct and Trails** | In Development | Unknown. Anticipated construction timing is not provided within documentation available on the Dubbo Regional Council website. | NA | NA |
| **Victoria Park Ovals Redevelopment** | In construction | Unlikely, construction currently underway with minimal scale of works impact. Forest Glen Solar Farm won't start construction until 3Q 2022. | NA | NA |
| **NSW RFS Training academy** | In construction | Yes. There is a potential for an overlap with construction periods, no completion date is listed on the council website. If approved Forest Glen SF would commence construction in 3Q 2022. | 9km north east of Forest Glen SF | The training academy is being constructed to the north of the Dubbo airport. The construction would share a haulage route from Sydney, however the small scale of the academy construction makes potential cumulative impacts unlikely. Impacts if they occur would include:<br>• Local Traffic pressure in Dubbo. |
| **Wellington Solar Farm** | In construction | No. Construction for the project commenced in December (Q4) 2019 with a 12 month construction estimate (Q4 2020), construction at this solar farm should be coming to completion. Unless there | NA | NA |

| Project title | Status | Potential for cumulative impact | Distance from proposal site | Cumulative impact type |
|---|---|---|---|---|
| | | are setbacks in construction of Wellington Solar Farm there should be no overlap with Forest Glen SF. | | |
| **Wellington North Solar Farm** | Determination | Yes, Approval for Wellington North Solar Farm was granted on the 21/05/2021. Construction was originally forecasted for 2019, so it is likely that construction will be imminent following the recent approval and will likely overlap with construction of the Forest Glen SF. | 51km south east of the proposal site along the Mitchell Highway, south of Dubbo. | The project is likely to partially share a haulage route, accommodation and services within the region. Therefore the cumulative impacts are related to:<br>• Traffic.<br>Pressure on local facilities, goods and services. |
| **Suntop Solar Farm Stage 1**<br>**&**<br>**Stage 2** | In construction<br><br>Prepare EIS (stage 2) | Yes. Construction for the first stage of the project commenced in Q4 of 2020 with completion scheduled for Q3 of 2021 construction at this solar farm should be coming to completion. Unless there are setbacks in construction of Suntop Solar Farm there should be no overlap with Forest Glen SF.<br>Stage 2 of the Suntop Solar Farm project is at the prepare EIS stage so it is possible that there will be overlap in construction | 88km north east of the proposal site along Cobbora Rd, north east of Dubbo. | The project is likely to partially share a haulage route, accommodation and services within the region. Therefore the cumulative impacts are related to:<br>• Traffic.<br>Pressure on local facilities, goods and services. |
| **Uungula Wind Farm** | Determination | Yes. The project website lists the construction forecast to begin in 2021 and operational by 2023, if this takes place there will be overlap between Forest Glen SF. | 70km south east of the proposal site along the Mitchell Highway. | The two projects may share sections of the haulage route.<br>Therefore the cumulative impacts are related to:<br>• Traffic |
| **Maryvale Solar Farm** | Determination | Yes. Construction was anticipated to commence | 45km south east of the | The project is likely to partially share a haulage |

| Project title | Status | Potential for cumulative impact | Distance from proposal site | Cumulative impact type |
|---|---|---|---|---|
| | | in Q4 2021 for a total of 12-14 months. Construction may be concurrent with the Forest Glen SF. | proposal site along the Mitchell Highway. | route, accommodation and services within the region. Therefore the cumulative impacts are related to:<br>• Traffic<br>• Pressure on local facilities, goods and services. |
| **Dunedoo Solar Farm** | Determination | Yes. Construction was anticipated to commence in Autumn 2021(Q2) for a total of 10-12 months with completion in Autumn 2022(Q2). Construction may be concurrent with the Forest Glen SF for a short duration at the beginning of construction if Dunedoo Solar Farm extends its construction period. | 95km north east of the proposal site along the Golden Highway. | The project is likely to partially share a haulage route, accommodation and services within the region. Therefore the cumulative impacts are related to:<br>• Traffic<br>• Pressure on local facilities, goods and services. |
| **Wollar Solar Farm** | Determination | No, construction would overlap however due to the distance away from the project cumulative impacts would be minor. Construction of the Wollar Solar farm was estimated to begin in late 2020 and last for 12-18 months. Construction may be concurrent with the Forest Glen SF for a short duration at the beginning of construction. | 150km south east of the proposal site. | Only a small overlap of the haulage route will be shared. |
| **Gilgandra Solar Farm** | Determination | Yes. Construction of the Gilgandra Solar farm was estimated to commence in 2019, however desktop review of current 2021 imagery shows construction may yet to be undertaken. As a result there is the | 40km north of the proposal site along the along the Newell Highway. | There may be some cumulative traffic impacts associate with haulage route overlap, accommodation and services in the region Therefore the cumulative impacts are related to:<br>• Traffic |

| Project title | Status | Potential for cumulative impact | Distance from proposal site | Cumulative impact type |
|---|---|---|---|---|
| | | potential for an overlap in construction timeframes. | | • Pressure on local facilities and services. |
| **Nevertire Solar Farm** | Determination | No, the construction of the Nevertire Solar Farm has been completed. | | NA |
| **Beryl Solar Farm** | Determination | No, the construction of the Beryl  Solar Farm has been completed. | | NA |
| **Dubbo Quarry Continuation Project** | Assessment | Yes, the proposed expansion to the Quarry does not have a defining timing at this stage however the continuation of any quarry activities during the construction phase of the Forest Glen SF has the potential to have a cumulative impact on air quality. | 15km east of the proposal site. | There may be some cumulative air quality impacts during the construction phase of the Forest Glen SF. There may also be cumulative traffic impacts from heavy vehicle movements around Dubbo. |
| **Mumbil Solar Farm** | Prepare EIS | Yes, the project is at prepare EIS stage, as such there is to possibility that there will be overlap with the construction of the Forest Glen SF. | 71km south east of the proposal site along the Mitchell Highway. | The project is likely to partially share a haulage route, accommodation and services within the region. Therefore the cumulative impacts are related to:<br>• Traffic<br>• Pressure on local facilities, goods and services. |
| **Bunrrendong Wind Farm** | Prepare EIS | Yes, the project is at prepare EIS stage, as such there is to possibility that there will be overlap with the construction of the Forest Glen SF. | 84km south east of the proposal site off the Mitchell Highway. | The project is likely to partially share a haulage route, accommodation and services within the region. Therefore the cumulative impacts are related to:<br>• Traffic<br>• Pressure on local facilities, goods and services. |

### 8.11.2. Potential impacts

Potential cumulative impacts are primarily associated with the following issues:

- Biodiversity impacts;
- Visual and landscape character impacts;
- Noise impacts;
- Traffic impacts;
- Pressure on local facilities, goods and services; and
- Land compatibility impacts.

#### Biodiversity

Cumulative biodiversity impacts may include loss of connectivity and loss of habitat, when factoring in the addition of this project to agricultural land clearing and modification; the largest land clearing impact operating in NSW.

In reality, approximately half of the Development footprint (around 52%) will consist of solar panels. In grasslands, which predominate onsite, the impacts of shading and diversion of rainfall runoff from the panels themselves is largely unknown and therefore the entire Development footprint is assumed to be removed. However, as the indicative layout shows, substantial peripheral areas are likely to be unimpacted and it is likely that a number of perennial native species will persist underneath the solar arrays, as they do in open woodlands subject to a degree of shading. Certainly, only a minor proportion of the seed bank will be impacted by the project, given the limited excavation proposed. It is considered likely that with the establishment of more long term ground cover monitoring programs for solar farms in NSW, as would be undertaken for this project, that the impacts of shading will become better understood and this overestimation of impacts better quantified.

#### Visual and landscape character impacts

During construction, the additional traffic and dust generation impacts pose the greatest potential for cumulative visual impacts. The visual impact of increased traffic movements to the site would be predominantly limited to construction. A Traffic Management Plan (TMP) would be developed to minimise vehicle movements as much as practicable during construction.

During operation, with the exception of infrequent maintenance operations such as inverter or transformer replacement, a small maintenance team using standard vehicles is all that will be required. One non-associated receivers (R4 refer to Table 7-5), would have some views of the Development footprint. Cumulative visual traffic impacts are considered negligible.

Due to the proposal site being unlikely to be visible from any non-associated receivers or public viewpoints, it is unlikely the project would generate a cumulative visual impact (refer to viewshed mapping in Figure 7-1 and Figure 7-2 of Section 7.1). Additionally there are no other project proposed solar farms in the direct vicinity of the site.

#### Noise impacts

Noise impacts through the use of plant, machinery and vehicles would ordinarily be increased if the construction of other developments is undertaken concurrently.

There are no proposed major projects within 5km of the proposal site that would overlap the construction period of Forest Glen SF. Additionally the predicted construction noise levels from the proposal are mostly lower than noise management levels, with the exception of works within 480m of dwellings. Construction noise is considered manageable through the implementation of mitigation measures outlined in Section 7.2.5.

## Traffic impacts

The existing traffic volumes within the road network relevant to the proposal site (refer Section 8.2) have included the potential construction overlaps of the following projects:

- NSW RFS Training academy
- Suntop Solar Farm Stage 1 and Stage 2
- Maryvale Solar Farm
- Wellington Solar Farm
- Wellington North Solar Farm
- Dunedoo Solar Farm
- Uungula Wind Farm
- Dubbo Quarry Continuation Project.

Cumulative traffic impacts may occur if construction of the Forest Glen SF occurs concurrently with the projects outlined above. It is noted that in in the West Dubbo area where the proposal site is located, there is very little development taking place. As such cumulative traffic impacts are restricted to haulage routes and within internal road of Dubbo itself, with consideration of the local Dubbo Quarry and NSW RFS Training academy projects.

Where construction does occur concurrently with Forest Glen SF, there may be some pressure on haulage routes from Sydney, however due to the mixture of haulage routes into the region from both Sydney and Newcastle it is likely this traffic would be well dispersed. The amount of traffic generated by these projects would be negligible relative to the amount of daily traffic along Castlereagh, Golden and Newell Highway's.

The traffic assessment provided in Section 7.5 and Appendix I demonstrates that the local road network is expected to continue to operate with a good level of service with ample spare capacity. As such, the combined increase in traffic generated by the site and these projects is expected to have a minimal cumulative impact on the road network. Further, it is noted that the peak traffic generated by these projects during construction occurs before 7am and after 6pm which is outside of the peak times of the road network.

It is recommended that any delivery of large plant be coordinated with the other solar and wind farm projects to ensure the vehicle movements do not conflict considering that during peak construction the Forest Glen Solar farm will generate an additional 132 daily vehicle movements on the associated road network.

## Pressures on local facilities, goods and services

The construction of the Suntop Solar Farm Stage 1 and Stage 2, Maryvale Solar Farm, Wellington Solar Farm, Wellington North Solar Farm, Dunedoo Solar Farm, and Uungula Wind Farms would result in a large influx of workers required for the projects. It is proposed for projects that workers would be accommodated in Dubbo and other surrounding towns such as Wellington, Dunedoo, Mudgee and Narromine throughout the construction period.

This has the potential to put substantial strain on local facilities, good and services. The use of accommodation for workers would reduce the amount of accommodation available for tourists visiting the region. However, there is also a potential for positive cumulative economic effects from the construction of multiple developments in the area. Socio-economic benefit in relation to developments in the region will be a continuous ongoing benefit for the community with increased jobs and economic input into local business.

Consultation with community liaison representatives for the Suntop Solar Farm Stage 1 and Stage 2, Maryvale Solar Farm, Wellington Solar Farm, Wellington North Solar Farm, Dunedoo Solar Farm, and Uungula Wind Farms would be ongoing to ensure this influx is managed appropriately so as to not place stress on stakeholders including business owners in Dubbo.

The proposal would not result in significant impacts to local businesses, residents and road users, subject to the range of identified mitigation measures. It is unlikely that there would be negative cumulative impacts to local facilities, goods and services.

## Land compatibility impacts

Approximately 444ha of agricultural land would be converted into solar farm development. The proposal would not fragment any resource lands throughout the operational period. Upon decommissioning of the solar farm, the Development footprint would require rehabilitation to restore it to its pre-existing productive capacity for agricultural land use.

The development of a solar farm would potentially result in the following agricultural impacts:

- Limited resource loss for the lifetime of the solar farm.
- A potential change to biosecurity risks.
- Potential increased bushfire risks.

However, only the Development footprint would stop being used for agriculture. The remaining parts of the proposal site will continue to be used agricultural use including sheep grazing and intermittent cropping These impacts have been assessed in detail in Section 7.3 and found to be highly manageable.

A number of other solar farms are all proposed within the Dubbo Regional LGA and surrounding LGAs (refer to Table 8-24). If all the development applications are submitted and successful, the close proximity of the proposed solar farms has the potential to result in cumulative impacts affecting land use change and local agriculture. The combined Development footprint of the Forest Glen SF and these proposals equates to approximately 2710 ha.

The proposal site is located within the Central West and Orana region in which Agriculture occupies 306,900 square kilometres. Grazing native vegetation is the most common land use within the region. Agricultural production within the region contributes 10% of the total gross value of agricultural production in NSW.

The proposal site is approximately 790ha and is comprised mostly of grazed agricultural pastures with patches of remnant woodland, some of which retains moderate native diversity in the groundcover. The land on which the Development footprint is located is predominantly grazed by sheep and intermittent cropping for feed. During operation sheep grazing would still occur over approximately 100ha of the 790ha site.

Solar farm infrastructure is typically low in height and results in minimal physical impact to the land surface. In relation to the Forest Glen SF, approximately 177ha of the proposal would remain vegetated and approximately 35ha would be compacted gravel surfaces. These surfaces would include internal access tracks, compounds, inverter and batter storage, hardstands and the substation. As a result of the low scale of development of the solar farms, the agricultural capability of the land would not be affected by the proposals. As previously mentioned, grazing could continue to be managed across the sites to maintain the height of groundcover during the operational period.

The land can be returned to agricultural use following decommissioning of the proposals. There are many benefits of resting the land for a period of time including:

- Increased groundcover and diversity of groundcover with biosecurity management.
    - Perennial grasses can be encouraged to increase soil stability of the grassland around the panels.
- Increase in soil moisture and nutrients.
- Increases in soil organic matter means less evaporation, less impact of raindrops, less impact of runoff and less erosion.
- Reduce stocking rates will reduce soil compaction.

- An associated return of soil organisms for decomposition of organic matter, nutrient cycling and improving soil structure.

Potential loss of 444ha of agricultural land within the region should be measured against wider government strategic goals and environmental benefits, which include:

- Strategic goals of the Commonwealth and NSW Governments for renewable energy development going forward.
- The environmental benefits of solar energy production, in particular the reduction of greenhouse gas emissions.
- The economic benefits of using an area with reliable solar resources and access to existing electricity infrastructure.
- The benefits of alternative and increased energy supply for grid stability and reliability.

Currently, there are a small number of part - time staff employed in agriculture at the proposal site. The figure is likely to be higher for the proposed Forest Glen SF. During construction there would be approximately 350 full time equivalent staff on average and 7 - 10 full time equivalent staff during operation.

The potential cumulative impact of the reduction in agricultural employment would be balanced by the additional employment during construction and on-going employment of staff during operation. Additional local services could be maintained during operation. For example, to maintain the solar farm area mowing/slashing services would be required. Local agricultural services could be maintained if sheep grazing is maintained within the solar farm.

As such, no cumulative impacts to agricultural enterprise or local agricultural land use are expected.

### 8.11.3. Safeguards and mitigation measures

*C: Construction; O: Operation; D: Decommissioning*

| ID | Safeguards and mitigation measures | C | O | D |
|---|---|---|---|---|
| C1 | The proponent would liaise with representatives of Maryvale, Dunedoo, Wollar, Mumbill, Suntop and Gilgandra, Burrendong and Uungula wind/ solar farm developments to manage impacts on local services, accommodation and businesses. | C | | |
| C2 | Accommodation and Employment Strategy for the development in consultation with Council. This strategy must:<br>• Propose measures to ensure there is sufficient accommodation for the workforce associated with the development;<br>• Consider the cumulative impacts associated with other State significant development projects in the area, including nearby mines;<br>• Investigate options for prioritising the employment of local workers for the construction and operation of the development, where feasible; and<br>• Include a program to monitor and review the effectiveness of the strategy over the life of the development, including regular monitoring and review during construction. | C | | |

# 9. Environmental management

## 9.1. Environmental management framework

The environmental risks associated with the proposed Forest Glen SF would be managed by implementing a proposal-specific suite of mitigation measures detailed in Sections 7 and 8 and summarised below in Section 9.2.

All commitments and mitigation measures would be managed through the implementation of a Project Environmental Management Strategy (EMS). The EMS would comprise a Construction Environmental Management Plan (CEMP), an Operation Environmental Management Plan (OEMP) and a Decommissioning Environmental Management Plan (DEMP). These plans would be prepared sequentially, prior to each stage of works by the contractor (CEMP, DEMP) and proponent (OEMP).

The EMS would include performance indicators, timeframes, implementation and reporting responsibilities, communications protocols, a monitoring program, auditing and review arrangements, emergency responses, induction and training and complaint/dispute resolution procedures. The monitoring and auditing program would clearly identify any residual impacts after mitigation. Adaptive management would be used to ensure that improvements are consolidated in updated EMPs.

## 9.2. Consolidated mitigation measures

The mitigation measures contained in this report comprise proposal-specific safeguards, recommendations from specialist assessment reports and reference to a range of best practice guidelines and regulatory requirements. The measures are to be incorporated in proposal plans and designs, contract specifications and the Construction Environmental Management Plan, Operation Environmental Management Plan and Decommissioning Environmental Management Plan as appropriate. The mitigation measures are consolidated below. Where measures are relevant to more than one environmental aspect, they are cited only once under the most relevant aspect, to avoid duplication.

| ID | Safeguards and mitigation measures | C | O | D |
|---|---|---|---|---|
| **Visual amenity and landscape character** | | | | |
| V1 | The materials and colour of onsite infrastructure would, where practical, be non-reflective and in keeping with the materials and colouring of existing infrastructure or of a colour that will blend with the landscape. Where practical:<br>• Proposed new buildings will be non-reflective and in eucalypt green, beige or muted brown.<br>• Pole mounts will be non-reflective.<br>• Security fencing posts and wire would be non-reflective. | | Desig n | |
| V2 | Ongoing consultation to be undertaken with R4 and the Dubbo Model Aero Club | C | O | D |
| V3 | Existing vegetation should be retained and protected, where possible, during the works to maintain the existing level of screening. | C | | |
| V4 | Night lighting would be minimised to the maximum extent possible (i.e. manually operated safety lighting at main component locations). | | O | |
| **Noise and vibration** | | | | |
| NV1 | A Noise Management Plan would be developed as part of the CEMP (refer to Appendix H). The plan would include, but not be limited to:<br>• Use less noisy plant and equipment where feasible and reasonable.<br>• Plant and equipment to be properly maintained. | C | | |

| ID | Safeguards and mitigation measures | C | O | D |
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| | • Provide special attention to the use and maintenance of 'noise control' or 'silencing' kits fitted to machines to ensure they perform as intended.<br>• Strategically position plant on site to reduce the emission of noise to the surrounding neighbourhood and to site personnel.<br>• Avoid any unnecessary noise when carrying out manual operations and when operating plant.<br>• Any equipment not in use for extended periods during construction work should be switched off.<br>• Complaints procedure deal with noise complaints that may arise from construction activities. Each complaint would need to be investigated and appropriate noise amelioration measures put in place to mitigate future occurrences, where the noise in question is in excess of allowable limits.<br>• Establish good relations with people living in the vicinity of the site at the beginning of proposal and maintain. Keep people informed, deal with complaints seriously and expeditiously. The community liaison member of staff should be adequately experienced. | | | |
| **Compatibility with existing land uses** | | | | |
| LU1 | Undertake a baseline soil survey prior to construction to inform construction and operational management measures to resist erosion and weed ingress. | PC | | |
| LU2 | Consultation would be undertaken with Essential Energy regarding connection to the substation and design of electricity transmission infrastructure. | C | O | D |
| LU3 | Consultation with proposal site exploration licence holders regarding the proposal and potential impacts. | C | O | D |
| LU4 | Consultation with DPIE-Crown Lands would be ongoing, and the following would be undertaken:<br>Prior to construction, a permit will be applied for to allow construction to commence within Delroy Road Crown road. | PC | | |
| LU5 | A pest and weed management plan would be prepared to manage the occurrence of priority weeds and pest species across the site during construction and operation. The plans must be prepared in accordance with Dubbo Regional Council and NSW DPI requirements. | C | O | |
| LU6 | A Rehabilitation Plan would be prepared to ensure the array site is returned to at least or better than pre-solar farmland and | C | | D |

| ID | Safeguards and mitigation measures | C | O | D |
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| | soil capability during the decommissioning stage. The plan would be developed with reference to the base line soil testing (completed prior to construction) and with input from an agronomist to ensure the site is left stabilised, under a cover crop or other suitable ground cover. The soil survey would be based on:<br>• *Australian Soil and Land Survey Handbook* (CSIRO, 2009)<br>• *Guidelines for Surveying Soil and Land Resources* (CSIRO, 2008).<br>*The land and soil capability assessment scheme: second approximation (OEH, 2012).* | | | |
| **Social and economic impacts** | | | | |
| SE1 | • Liaison with local industry representatives to maximise the use of local contractors, manufacturing facilities, materials. | C | | |
| SE2 | Liaison with local representatives regarding accommodation options for staff, to minimise adverse impacts on local services. | C | | D |
| SE3 | • Liaison with local tourism industry representatives to manage potential timing conflicts with local events. | C | | D |
| SE4 | The Community Consultation Plan would be implemented to manage impacts to community stakeholders, including but not limited to:<br>• Protocols to keep the community updated about the progress of the proposal and proposal benefits.<br>• Protocols to inform relevant stakeholders of potential impacts (haulage, noise, air quality etc.).<br>• Protocols to respond to any complaints received. | C | | D |
| SE5 | • The Proponent will consult with local employment agencies and training organisations and where practicable, will consider supporting training and apprenticeships. | C | O | D |
| **Biodiversity (Flora and fauna)** | | | | |
| B1 | Timing works to avoid critical life cycle events such as breeding or nursing:<br>• Hollow bearing tree removal should be timed to avoid August-November - breeding season for the highest number of species. | C | | |

| ID | Safeguards and mitigation measures | C | O | D |
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| B2 | Instigating clearing protocols including pre-clearing surveys, daily surveys and staged clearing, the presence of a trained ecological or licensed trained spotter catcher during clearing events:<br>• Staged clearing, supervised by Ecologist or trained spotter catcher to allow for resident fauna to relocate or be relocated where required | C | | |
| B3 | Relocation of habitat features (fallen timber, hollow logs and embedded rock) from within the Development Site:<br>• All embedded rock, fallen timber and hollow logs should be relocated outside of the construction area under the supervision of an Ecologist or spotter catcher. | C | | |
| B4 | Induct all staff prior to construction to identify vegetation to be retained, prevent inadvertent damage and reduce soil disturbance:<br>Approved clearing limits to be clearly delineated with temporary fencing or similar prior to construction commencing.<br>No stockpiling or storage within dripline of any mature trees.<br>No stockpiling or storage within riparian buffers. | PC<br>C | | |
| B5 | Clearing protocols that identify vegetation to be retained, prevent inadvertent damage and reduce soil disturbance; for example, removal of native vegetation by chainsaw, rather than heavy machinery, is preferable in situations where partial clearing is proposed:<br>Documented clearance protocols to mark and protect vegetation to be retained.<br>Use handheld machinery where possible and have elevated work platform check hollows prior to tree felling | PC | | |
| B6 | Install temporary fencing to protect significant environmental features such as riparian zones:<br>• Prior to construction commencing, exclusion fences and signage would be installed around identified exclusion zones. | C | | |
| B7 | Hygiene protocols to prevent the spread of weeds or pathogens between infected areas and uninfected areas:<br>• Ensure machinery and equipment as clean and free from pathogens and weeds prior to entering site. | C | | |
| B8 | Preparation of a Biodiversity Management Plan (BMP) for the site to include:<br>• How to remove and dispose of vegetation and topsoil containing weeds declared under the Biosecurity Act 2015 | C | O | |

| ID | Safeguards and mitigation measures | C | O | D |
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| | during and after construction.<br>• Reporting any occurrences of pathogens such as Myrtle Rust and Phytophthora<br>• Identification and protection of biodiversity exclusion zones during construction and operation. | | | |
| B9 | Sediment barriers and spill management procedures to control the quality of water runoff released from the site into the receiving environment:<br>• An erosion and sediment control plan would be prepared and implemented.<br>• Spill management procedures would be implemented.<br>• Stormwater management plan prepared and implemented. | C | | |
| **Traffic, transport and safety** | | | | |
| T1 | A Construction Traffic Management Plan (CTMP) will be prepared prior to construction commencing by the appointed contractor. The CTMP will provide additional information regarding the traffic volumes and distribution of construction vehicles that is not available at this time, including:<br>• Road transport volumes, distribution and vehicle types broken down into:<br>o Hours and days of construction.<br>o Schedule for phasing/staging of the project.<br>• The origin, destination and routes for:<br>o Employee and contractor light traffic.<br>o Heavy vehicle traffic.<br>o Oversize and over mass traffic.<br>The following provides recommended measures that should be adopted within the CTMP to minimise the impact of construction traffic along the road network:<br>• Neighbours of the solar farm be consulted and notified regarding the timing of major deliveries which may require additional traffic control and disrupt access.<br>• Dwellings are located adjacent to Delroy Road along the access route. It is recommended that dust suppression measures be implemented within the vicinity of the dwelling to limit the impact to residents | PC | | |

| ID | Safeguards and mitigation measures | C | O | D |
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| | • Loading and unloading is proposed to occur within the work area. No street or roads will be used for material storage at any time.<br>• Delivery of larger plant to occur outside of school bus service times and peak traffic times to prevent larger vehicles interacting with the school bus and congestion issues.<br>• All vehicles will enter and exit the site in a forward direction.<br>• Management of vehicular access to and from the site is essential in order to maintain the safety of the general public as well as the labour force. The following code is to be implemented as a measure to maintain safety within the site:<br>    ○ Utilisation of only the designated transport routes.<br>    ○ Construction vehicle movements are to abide by finalised schedules as agreed by the relevant authorities.<br>• All permits for working within the road reserve must be received from the relevant authority prior to works commencing.<br>• A map of the primary haulage routes highlighting critical locations.<br>• An induction process for vehicle operators and regular toolbox meetings.<br>• A complaint resolution and disciplinary procedure.<br>Local climatic conditions that may impact road safety of employees throughout all project phases (e.g. fog, wet and significant dry, dusty weather) | | | |
| T2 | The intersection of Minore Road and Delroy Road is to be upgraded to formalise the intersection to ensure vehicle movements are undertaken in a safe manner and to accommodate the increase in traffic generated by the solar farm. The proposed upgrades are shown within Appendix C and includes:<br>• Provide a minimum carriageway width of 6.5 metres for Delroy Road;<br>• Seal the first part of Delroy Road to allow vehicles to safely exit Minore Road;<br>• Providing Give Way signage and line marking for vehicles exiting Delroy Road. | PC, C | | |
| T3 | A Haulage Plan would be developed and implemented during construction and decommissioning, including but not limited to:<br>• Direction of traffic flow (both heavy and light).<br>• Loads, weights and length of haulage and construction related vehicles and the number of movements of such | C | O | D |

| ID | Safeguards and mitigation measures | C | O | D |
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| | vehicles.<br>• Scheduling of deliveries of major components to minimise safety risks (on other local traffic).<br>• Traffic controls (signage and site speed limit restrictions etc.).<br>• All heavy vehicle movements to/from the access point are to be managed to ensure that only one inbound or outbound vehicle is travelling along the access route in the vicinity of the site at a time.<br>Heavy vehicle movements into and out of the proposal Site will be controlled via traffic management means, including a traffic controller, temporary lowered speed limit and additional road signage alerting vehicles of truck movements in the area. | | | |
| T4 | The proponent would engage an appropriately qualified person to prepare a Road Dilapidation Report for all road routes to be used during the construction (and decommissioning) activities, in consultation with the relevant road authority. This report is to address all road related infrastructure. Reports must be prepared prior to commencement and after completion of construction (and decommissioning). Any damage resulting from the construction (or decommissioning) traffic, except that resulting from normal wear and tear, must be repaired at the Proponent's cost. Such work shall be undertaken at a time agreed upon between the Proponent and relevant road authorities. | PC | | D |
| T5 | The proponent would repair any damage resulting from project traffic (except that resulting from normal wear and tear) as required at the proponent's cost. | C | | D |
| T6 | Obtain a Section 138 Consent from the relevant council/agency to carry out works within the road reserve. | C | | D |
| **Soils** | | | | |
| S1 | As part of the CEMP, a Soil and Water Management Plan (SWMP) (with erosion and sediment control plans) would be prepared, implemented and monitored during the proposal, in accordance with Landcom (2004), to minimise soil (and water) impacts. These plans would include provisions to:<br>• Install, monitor and maintain erosion controls.<br>• Ensure that machinery leaves the site in a clean condition to avoid tracking of sediment onto public roads which may cause risks to other road users through reduced road stability.<br>• Manage topsoil in all excavation activities, separate subsoils and topsoils and ensure that they are replaced in their natural configuration to assist revegetation. Stockpile topsoil appropriately so as to minimise weed infestation, maintain | C | | |

| ID | Safeguards and mitigation measures | C | O | D |
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| | soil organic matter, maintain soil structure and microbial activity.<br>• Minimise the area of disturbance from excavation and compaction; rationalise vehicle movements and restrict the location of activities that compact and erode the soils as much as practical. Any compaction caused during construction would be treated such that revegetation would not be impaired.<br>• Manage works in consideration of heavy rainfall events; if a heavy rainfall event is predicted, the site should be stabilised, and work ceased until the wet period had passed.<br>Areas of soil disturbed by the proposal would be rehabilitated progressively or immediately post-construction, reducing views of bare soil. | | | |
| S2 | A Groundcover Management Plan would be developed in consultation with an agronomist and to ensure final land use includes perennial grass cover establishment across the site as soon as practicable after construction and maintained throughout the operation phase. The plan would cover:<br>• Soil handling, restoration and preparation requirements.<br>• Plant Species election.<br>• Soil preparation.<br>• Establishment techniques.<br>• Maintenance and monitoring requirements.<br>• Perennial groundcover targets, indicators, condition monitoring, reporting and evaluation arrangements – i.e. A target of 70% live grass cover would apply to protect soils, landscape function and water quality. Additional measures would be implemented where practical when live grass cover falls below 70%. Grass cover would be monitored on a fortnightly basis using an accepted methodology.<br>• Contingency measures to respond to declining soil or groundcover condition. I.e. any grazing stock would be removed from the site when cover falls below the target of 70% live ground cover.<br>• Identification of baseline conditions for rehabilitation following decommissioning.<br>Preserve the native composition as much as possible | C | O | D |
| S3 | The array would be designed to allow sufficient space between panels to establish and promote groundcover beneath the panels and allow for implementation of weed controls. | Design | | |

| ID | Safeguards and mitigation measures | C | O | D |
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| S4 | A Spill and Contamination Response Plan would be developed as part of the overall Emergency Response Plan to prevent contaminants affecting adjacent surrounding environments. The plan would include measures to:<br>• Respond to the discovery of existing contaminants at the site (e.g. pesticide containers or asbestos), including stop work protocols and remediation and disposal requirements.<br>• Requirement to notify the EPA for incidents that cause material harm to the environment (refer s147-153 of the POEO Act).<br>• Manage the storage of any potential contaminants onsite.<br>• Mitigate the effects of soil contamination by fuels or other chemicals (including emergency response and the EPA notification procedures and remediation.<br>• Ensure that machinery arrives on site in a clean, washed condition, free of fluid leaks.<br>• Prevent contaminants affecting adjacent pastures, dams, water courses and native vegetation.<br>• Monitor and maintain spill equipment.<br>Induct and train all site staff. | C | O | D |
| S5 | The transformers will be filled with oil, and waterproof bunds built around them to manage oil spills. | Design | | |
| S6 | A protocol would be developed in relation to discovering buried contaminants within the proposal site (e.g. pesticide containers). It would include stop work, remediation and disposal requirements. | C | O | D |
| **Watercourses and hydrology** | | | | |
| W1<br>The design of buildings, equipment foundations and footings for electrical componentry and panel mounts would be designed to avoid the 1% AEP flood level to minimise impacts from potential flooding including:<br>• The solar array mounting piers would be designed to withstand the forces of floodwater (including any potential debris loading) up to the 1% AEP flood event plus 500mm freeboard, giving regard to the depth and velocity of floodwaters.<br>• The tracking axis for solar tracking modules would be located above 1% AEP flood event plus 500mm freeboard. | | Design | | |

| ID | Safeguards and mitigation measures | C | O | D |
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| | • The mounting height of the solar module frames would be designed such that the lower edge of the module is clear of the predicted 1% AEP flood level.<br>• All electrical infrastructure, including inverters, would be located above the 1% AEP flood level plus 500mm freeboard.<br>• Where electrical cabling is required to be constructed below the 1% AEP flood level it would be capable of continuous submergence in water.<br>• The proposed perimeter security fencing would be constructed in a manner which does not adversely affect the flow of floodwater and should be designed to withstand the forces of floodwater, or collapse in a controlled manner to prevent impediment to floodwater.<br>• Fencing across the primary watercourse traversing the proposal site would be avoided (two separate fenced compounds on either side of the watercourse would be undertaken where required).<br>• The finished floor level of all buildings should be a minimum of 500mm above the 1% AEP flood level.<br>• Waterway exclusion zones would be marked as no go zones and included in the CEMP. | | | |
| W2<br>All buildings and structures (including solar arrays) associated with the proposal should be located outside high hazard areas (H5 and above) where they may be vulnerable to structural damage and have significant impact on flood behaviour. | | Design | | |
| W3 | As the proposal site is flood affected it is recommended that:<br>Flood warning signs and flood level indicators should be placed on each approach to any proposed watercourse crossings that is subject to inundation.<br>A Business Floodsafe Plan be prepared for the development to ensure the safety of employees during flood events in general accordance with the NSW SES “Business Floodsafe Toolkit and Plan”. | C | O | D |
| W4<br>Any road crossings on watercourses within the proposal site would be of the type defined in Table 2 of the Hydrological and Hydraulic Analysis Report was prepared by Footprint NSW Pty Ltd in Appendix F.<br>Any proposed crossings (vehicular or service) of existing watercourses on the subject site should be designed in accordance with the following guidelines, and in the case of vehicle crossing should preferably consist of bed level crossings constructed flush with the bed of the watercourse on first and second order watercourses to minimise any hydraulic impact: | | Design | | |

| ID | Safeguards and mitigation measures | C | O | D |
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| | • Guidelines for Watercourse Crossings on Waterfront Land (DPI, 2012)<br>• Guidelines for Laying pipes and Cables in Watercourses on Waterfront Land (Office of Water, 2010)<br>• *Why do fish need to cross the road? Fish Passage Requirements for Waterway Crossings* (Fairfull and Witheridge, 2003).<br>• *Policy and Guidelines for Fish Friendly Waterway Crossings* (NSW DPI, 2003). | | | |
| W5 | Within the floodplain access roads should be constructed as close to natural ground levels as possible so as not to form an obstruction to floodwaters.<br>The surface treatment of roads should be designed giving regard to the velocity of floodwaters to minimise potential for scouring during flood events. | C | | |
| W6 | An Emergency Response Plan incorporating a Flood Response Plan would be prepared in consultation with RFS and SES prior to construction covering all phases of the proposal. The plan would:<br>• Detail who would be responsible for monitoring the flood threat and how this is to be done.<br>• Detail specific response measures to ensure site safety and environmental protection.<br>• Outline a process for removing any necessary equipment and materials offsite and out of flood risk areas (i.e. rotate array modules to provide maximum clearance of the predicted flood level).<br>• Consider site access in the event that some tracks become flooded.<br>• Consider appropriate vehicles used to transport staff to and from site, with 4WDs being the preferred vehicle.<br>• Establish an evacuation point.<br>• Define communication protocols with emergency services agencies.<br>• The condition of the private track exiting to Lagoon Creek Road will be monitored in collaboration with the landowner throughout the life of the solar farm and be available to the project needs in the case of emergency. | C | O | D |
| **Water use and water quality** | | | | |
| WQ1 | All fuels, chemicals, and liquids would be stored at least 40m from any waterways or drainage lines, not on sloping land and would be stored in an impervious bunded area. | C | O | D |

| ID | Safeguards and mitigation measures | C | O | D |
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| WQ2 | The refuelling of plant and maintenance would be undertaken in impervious bunded areas on hardstand areas only. | C | O | D |
| WQ3 | Machinery would be checked daily to ensure there is no oil, fuel or other liquids leaking from the machinery. All staff would be appropriately trained through toolbox talks for the minimisation and management of accidental spills. | C | O | D |
| WQ4 | All potential pollutants stored on-site would be stored in accordance with HAZMAT requirements and bunded. | C | O | D |
| WQ5 | An incident management procedure to address any spills and pollution incidents will be developed and implemented. The procedure would be incorporated into the Construction and Operation Environmental Management Plans and include a requirement to notify EPA for incidents that cause material harm to the environment (refer s147-153 Protection of the Environment Operations Act). | C | O | D |
| WQ6 | Ensure appropriate drainage controls are incorporated into the design to minimise the area of disturbance, runoff and pollutant generation. | Design | | |
| WQ7 | If groundwater is to be intercepted at any stage of the development the proponent must obtain the relevant entitlement and approval where required prior to any extraction. | C | O | D |
| WQ8 | Re-use of collected stormwater (from dams or sediment basins) should be considered wherever possible. | | O | |
| WQ9 | Inspect stormwater control measures before and after rainfall of more than 10mm in 24 hours and at least quarterly. | C | O | D |
| WQ10 | Water supply agreements would be secured in consultation with Dubbo Regional Council and/or local water suppliers prior to construction to ensure adequate water supply is secured for construction and operation. | C | O | |
| **Bush fire** | | | | |
| BF1 | • Dangerous or hazardous materials would be stored and handled in accordance with AS1940-2004: *The storage and handling of flammable and combustible liquids*. | C | O | D |
| BF2 | Develop a BFEMOP to include but not be limited to:<br>• detailed measures to prevent or mitigate fires igniting; | C | O | D |

| ID | Safeguards and mitigation measures | C | O | D |
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| | • work that should not be carried out during total fire bans;<br>• availability of fire-suppression equipment, access and water;<br>• storage and maintenance of fuels and other flammable materials;<br>• notification of the local NSW RFS Fire Control Centre for any works that have the potential to ignite surrounding vegetation, proposed to be carried out during a bush-fire fire danger period to ensure weather conditions are appropriate;<br>• and appropriate bush fire emergency management planning.<br>In developing the BFEMOP, NSW RFS and FRNSW would be consulted on the volume of water supplies, fire-fighting equipment maintained on-site, fire truck connectivity requirements, proposed APZ and access arrangements, communications, vegetation fuel levels and hazard reduction measures. | | | |
| BF3 | An APZ of minimum 10m would be maintained between remnant or planted woody vegetation and solar farm infrastructure. The APZ around the perimeter of the site would incorporate a 4m wide gravel access track.<br>Average grass height within the APZ would be maintained at or below 5 centimetres on average throughout the August - March fire season. Average grass height outside the APZ, including beneath the solar array, would be maintained at or below 10 centimetres throughout the fire season. | C | O | |
| BF4 | The overhead powerlines at the site would be managed by maintaining appropriate vegetation clearance limits to minimise potential ignition risks, in accordance with the *ISSC 3 Guideline for Managing Vegetation Near Power Lines*. | | O | |
| BF5 | A non-combustible (steel or concrete) water storage tank should be installed adjoining the main internal access road, or nearby the BS, for fire-fighting and other non-potable water uses, with a 65mm Storz outlet, a metal valve and a minimum of 20,000 litres reserved for fire-fighting purposes, in accordance with PBP. | C | | |
| BF6 | Appropriate fire-fighting equipment would be held on site to respond to any fires that may occur at the site during construction. This equipment would include fire extinguishers, a 1000 litre water cart (fitted with suitable hosing, fittings and diesel firefighting pump) retained on site on a precautionary basis, particularly during any blasting and welding operations. Equipment lists would be detailed in Work Method Statements. | C | | |
| BF7 | The NSW RFS and Fire and Rescue NSW would be provided with a contact point for the solar farm, during construction and | C | O | |

| ID | Safeguards and mitigation measures | C | O | D |
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| | operation. | | | |
| BF8 | Following commissioning of the solar farm, the local NSW RFS and Fire and Rescue brigades would be invited to an information and orientation day covering access, infrastructure, firefighting resources on-site, fire control strategies and risks/hazards at the site | | O | |
| BF9 | The perimeter access track would comply with the requirements of property access roads in accordance with Table 5.3b of the PBP. All access and egress tracks on the site would be maintained and kept free of parked vehicles to enable rapid response for firefighting crews and to avoid entrapment of staff in the case of bush fire emergencies. Access tracks would be constructed as through roads as far as practicable. Dead end tracks would be signposted and include provision for turning firefighting vehicles. | C | O | D |
| BF10 | A Hot Works Permit system would be applied to ensure that adequate safety measures are in place. Fire extinguishers would be present during all hot works. Where practicable hot works would be carried out in specific safe areas (such as the Construction Compound temporary workshop areas). | C | O | D |
| BF11 | Machinery capable of causing an ignition would not be used during bushfire danger weather, including Total Fire Ban days. | C | O | D |
| BF12 | Prior to operation of the solar farm, an Emergency Response Plan (ERP) would be prepared in consultation with the RFS and Fire and Rescue NSW. This plan must include but not be limited to:<br>• Specifically addresses foreseeable on site and off site fire events and other emergency incidents.<br>• Risk control measures would include the level of personal protective clothing required to be worn, the minimum level of respiratory protection required, decontamination procedures, minimum evacuation zone distances and a safe method of shutting down and isolating the PV system (either in its entirety or partially, as determined by risk assessment).<br>• Outline other risk control measures that may need to be implemented in a fire emergency due to any unique hazards specific to the site.<br>• Two copies of the ERP are stored in a prominent 'Emergency Information Cabinet' which is located in a position directly adjacent to the site's main entry point/s.<br>Once constructed and prior to operation, the operator of the facility would contact the relevant local emergency management committee (LEMC). | PC,C | O | |

| ID | Safeguards and mitigation measures | C | O | D |
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| BF13 | Fire risks associated with the lithium-ion energy storage facility would include:<br>• Locating the Energy Storage Facility as far as practicable from any sensitive receptors or large stands of vegetation.<br>• Installing reliable automated monitoring (voltage and temperature), alarm and shutdown response systems.<br>• Installing reliable integrated fire detection and fire suppression systems (inert gas).<br>• Ensuring the battery containers are not vulnerable to external heat effects in the event of a bushfire.<br>• Designing appropriate separation and isolation between battery containers and between batteries and other infrastructure, including gravel surfacing around the facility for a minimum 10m in accordance with APZ.<br>• Compliance with all relevant guidelines and standards.<br>• Preparation of a specific Battery Fire Response Plan, under the general BFEMOP, in consultation with fire authorities, fire suppression experts and in reference to relevant standards and guidelines.<br>Facilitation of first responder training in the management of Lithium-ion battery fires at the site for local brigades. | | Desig<br>n | |
| **Aboriginal Heritage** | | | | |
| AH1 | Further archaeological assessment would be required if the proposal activity extends beyond the area assessed in this report. This would include consultation with the registered Aboriginal parties and may involve further field survey. | C | O | D |
| AH2 | No ground disturbing activities or removal of remnant vegetation is to occur outside the survey area as outlined in Figure 8-26. | C | O | D |
| AH3 | During construction and ongoing use of the Forest Glen Solar Farm, the unexpected finds procedure outlined in Appendix B of the ACHA report must be followed. | C | O | D |
| AH4 | In the unlikely event that human remains are discovered during the construction of the Forest Glen Solar Farm, all work must cease in the immediate vicinity. Heritage NSW and the local police should be notified. Further assessment would be undertaken to determine if the remains are Aboriginal or non-Aboriginal. If the remains are deemed to be Aboriginal in origin the Registered Aboriginal Parties should be advised of the find as directed by Heritage NSW. | C | O | D |
| **Historic Heritage** | | | | |

| ID | Safeguards and mitigation measures | C | O | D |
|---|---|---|---|---|
| HH1 | Should an item of historic heritage be identified, Heritage NSW (NSW Department of Premier and Cabinet) must be contacted prior to further work being carried out in the vicinity. | C | O | D |
| **Resource use and waste generation** | | | | |
| WR1 | A Waste Management Plan (WMP) would be developed to minimise wastes. It would include but not be limited to:<br>• Identification of opportunities to avoid, reuse and recycle, in accordance with the waste hierarchy.<br>• Quantification and classification of all waste streams.<br>• Provision for recycling management onsite.<br>• Provision of toilet facilities for onsite workers and identify that sullage would be disposed of (i.e., pump out to local sewage treatment plant).<br>• Tracking of all waste leaving the site.<br>• Disposal of waste at facilities permitted to accept the waste.<br>Requirements for hauling waste (such as covered loads). | C | O | D |
| WR2 | Septic system is installed and operated according to the Dubbo Regional Council regulations. | C | O | |
| **Electric and Magnetic Fields (EMFs)** | | | | |
| E1 | All electrical equipment would be designed in accordance with relevant codes and industry best practice standards in Australia. | Design | | |
| E2 | All design and engineering would be undertaken by qualified and competent person/s with the support of specialists as required. | Design | | |
| E3 | Design of electrical infrastructure would minimise EMFs. | Design | | |
| **Hazardous materials and development** | | | | |
| H1 | Dangerous or hazardous materials would be stored and handled in accordance with AS1940-2004: *The storage and handling of flammable and combustible liquids* and the ADG code where relevant. | C | O | D |

| ID | Safeguards and mitigation measures | C | O | D |
|---|---|---|---|---|
| H2 | Protocols would be developed for lithium-ion battery storage, maintenance, and incident response to mitigate Li-ion fire risks. | C | O | D |
| H3 | The transportation of new and waste lithium-ion batteries would comply with the requirements of the Dangerous Goods Code, including specific 'special provisions' and 'packing instructions' applying to the transportation of Li-ion batteries. | C | O | D |
| **Air quality and climate** | | | | |
| A1 | Track width of internal tracks would be minimised during detailed design. | Design | | |
| A2 | The Community Consultation Plan will be implemented to promote information sharing for air quality and include a complaints process:<br>• Notification of relevant stakeholders defined.<br>An accessible complaints process with a timely response protocol. | C | O | D |
| A3 | Dust control measures, including on site access roads and ground cover management will be specified in the CEMP and Decommissioning Environmental Management Plan (DEMP) and may include water applications or other means as required. | C | O | D |
| A4 | Dust generation by vehicles accessing the site and earthworks at the site would be suppressed using water applications or other means as required. | C | | D |
| A5 | Vehicle loads of material which may create dust would be covered while using the public road system. | C | | D |
| A6 | All vehicles and machinery used at the site would be in good condition, fitted with appropriate emission controls and comply with the requirements of the POEO Act, relevant Australian standards and manufacturer's operating recommendations. Plant would be operated efficiently and turned off when not in use. | C | O | D |
| A7 | Fires and material burning is prohibited on the proposal site. | C | O | D |
| **Cumulative impacts** | | | | |
| C1 | The proponent would liaise with representatives of Maryvale, Dunedoo, Wollar, Mumbill, Suntop and Gilgandra, Burrendong | C | | |

| ID | Safeguards and mitigation measures | C | O | D |
|---|---|---|---|---|
| | and Uungula wind/ solar farm developments to manage impacts on local services, accommodation and businesses. | | | |
| C2 | Accommodation and Employment Strategy for the development in consultation with Council. This strategy must:<br>• Propose measures to ensure there is sufficient accommodation for the workforce associated with the development;<br>• Consider the cumulative impacts associated with other State significant development projects in the area, including nearby mines;<br>• Investigate options for prioritising the employment of local workers for the construction and operation of the development, where feasible; and<br>Include a program to monitor and review the effectiveness of the strategy over the life of the development, including regular monitoring and review during construction. | C | | |

# 10. Conclusion

## 10.1. Proposal overview

The Forest Glen Solar Farm proposal is located along Minore Road, approximately 16km west of Dubbo in the central west of NSW. One existing Essential Energy 132kV transmission lines run through the northern section of the proposal site; the connection to the grid would be within the proposal site.

The proposed Forest Glen Solar Farm involves the construction, operation and decommissioning of a ground-mounted PV solar array. Approximately 110MW (DC) (90MW AC equivalent) of renewable energy would be generated and supplied directly to the national electricity grid. The Forest Glen SF would provide enough clean, renewable energy for about 40,000 average NSW homes while displacing approximately 164,000 metric tons of carbon dioxide annually. It would also assist the NSW and Commonwealth Governments to meet Australia's renewable energy targets. The proposal is considered compatible with existing land uses and highly reversible upon decommissioning, returning the site to its current land capability, for agricultural or other alternative land uses.

## 10.2. Benefits of and need for the proposal

The Forest Glen Solar Farm has been designed with the following objectives:

- Select a site that is suitable for solar PV generation, connection to the grid network and environmental constraints
- Assist to mitigate the effects of climate change through the transition to renewable energy.
- Meet and exceed all relevant environmental and regulatory requirements for the proposal, in collaboration with key stakeholders.
- Provide local and regional employment opportunities and other social benefits during the construction and operation of the facility.
- Include on site energy storage to support the high voltage transmission network.

The development of the renewable energy source on the Forest Glen SF proposal site would:

- Assist the NSW and Commonwealth Governments to meet Australia's renewable energy targets.
- Provide a clean and renewable energy source to assist in reducing greenhouse gas emissions.
- Generate electricity that have a minimal negative impact on cultural and environmental impacts.
- Generation of enough clean, renewable energy for about 40,000 average NSW homes per annum.
- Displace approximately 164,000 metric tonnes of carbon dioxide, currently generated by non-renewable sources per annum.
- the area where the Forest Glen solar farm is proposed, has been identified by the AEMO as a Renewable Energy Zone (REZ), and if approved, the proposal would provide electricity close to an identified consumption centre, thus, providing local and regional employment opportunities and other social benefits during all stages of the project.

## 10.3. Environmental impacts and management

The key environmental risks of the proposal have been investigated through specialist investigations, and include:

1. Visual amenity
2. Noise and vibration
3. Social and economic considerations
4. Land use compatibility
5. Biodiversity
6. Traffic, transport and safety.

X-Elio's site selection and careful consideration infrastructure layout through iterative design ensure the overall impact of the Forest Glen Solar Farm is low, by avoiding construction on land exhibiting high environmental constraints. Of note the site is situated in a well screened position on a flat landscape with relatively few sensitive residential receivers. Biodiversity has been given substantial consideration, with high value plant communities and paddock trees avoided through stringent planning of indicative infrastructure layouts.

Finally, upon finalisation of Aboriginal cultural heritage and Historic heritage assessments the site has been considered to be absent of significant places, artefacts and landscape features that could indicate archaeological sensitivity. Given the sites location within the Central West Orana REZ in addition to the notably low impact nature of the site as indicated above, the Forest Glen Solar Farm proposal site is highly suitable for solar development.

X-Elio has undertaken comprehensive consultation with affected landowners, the local community and other relevant stakeholders in developing the proposal. X-Elio has informed and engaged with relevant local, State and Commonwealth Government authorities, infrastructure and service providers, community groups and affected landowners on the proposal.

Of the 444ha Development footprint considered for construction of the solar farm. X-Elio has made provisions for the exclusion of approximately 36.9ha of high constraint land including riparian corridors and areas of high biodiversity value.

The impacts and risks that have been identified are considered manageable with the effective implementation of the measures stipulated in this EIS. Specific impact avoidance and minimisation measures have been incorporated into the design of the proposal and form commitments of the project, pending approval. They are largely standard and highly certain strategies to manage the impacts of solar farm development, which has grown significantly as an industry sector in regional Australia over the last 10 years. These measures are considered practical and achievable by the proponent.

## 10.4. Ability to be approved

This EIS indicates that the proposal can be approved, subject to the identified mitigation measures.
In summary, this is because:

- The proposal meets relevant planning requirements, as set out in Section 5.
- The environmental risks associated with the proposal are well understood and manageable, as set out in Section 7 and Section 8. Specifically:
  - The proposal has demonstrated consideration of avoidance and minimisation of key environmental features as part of the layout and mitigation strategy development.
  - The impacts are largely reversible, and offsetting would be undertaken to ensure an overall 'not net biodiversity loss' outcome for the proposal.

   - The principles of ecologically sustainable development have been incorporated in the design, construction and ongoing operations of the development.

Consideration has been given to the compatibility of the proposal with the existing electricity network and the compatibility of the site for the generation of solar energy. This ensures construction and operating costs are reduced, maximising the viability of the proposal and its contribution to meeting energy needs into the future. Considerations during initial site investigations included:

- Proximity to and capacity of the electrical transmission network
- Availability of an abundant solar resource
- Availability of suitable land (i.e. topography, aspect, presence of native vegetation)
- Suitability in terms of the interests of other stakeholders and the environment.

The consequences of not proceeding with the proposed Forest Glen Solar Farm would result in:

- Loss of opportunity to reduce GHG emissions and move towards cleaner renewable electricity generation
- Loss of a renewable energy supply that would assist in reaching the NSW renewable energy targets
- Loss of additional electricity generation and supply into the National grid
- Loss of social and economic benefits created through the provision of direct and indirect employment opportunities during the construction and operation of the solar farm.

The Forest Glen Solar Farm would result in numerous benefits, local and regional, and has been developed to ensure the benefits are spread into the longer term, reflecting community expectations specific to this proposal. It provides a balance between technological, energy and environmental aspects, while retaining the flexibility required in the final design stage of the proposal. Furthermore, the proposal is consistent with the principles of ESD and forms an important part of Australia's transition to renewable energy generation. It is considered justifiable and acceptable.

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# Appendix A Secretary’s Environmental Assessment Requirements

# Appendix B Proposal Plans

# Appendix C Community Consultation Plan

# Appendix D Biodiversity Development Assessment Report (BDAR)

# Appendix E Visual Impact Assessment

## E.1 Visual impact per receiver

The photos taken for each receiver were taken from the closest public viewpoint.

| Receiver ID | Orientation of dwelling[20] | Distance (m) and direction from proposal site | Distance (m) from closest piece of permanent infrastructure | Elevation (AHD) | Existing mitigation (screening, topography, existing structures) | Potential impacts | Mitigation Measures and effectiveness | Visual impact rating |
|---|---|---|---|---|---|---|---|---|
| **Non-associated receivers** | | | | | | | | |
| R2 | South | 153m west of proposal boundary | 237m | 297m | Existing screening is present on R2, along Minore Road and the railway corridor, as well on the on proposal site between the residence and any proposed infrastructure.<br><br>Topography is flat, the residence is lower in the landscape than most of the proposal site and only 2m higher than the lowest point of the site. | **Solar farm and ancillary infrastructure**<br><br>Existing topography and vegetation mean this receiver would not have a view of solar farm infrastructure.<br><br>**Glint and glare**<br><br>Existing topography and vegetation would screen this receiver from any potential glint or glare. | Receiver would have no views of the proposal site. No mitigation measures are proposed. Existing screening is secure with the vegetation being located on four pieces of separate land.<br><br>**No mitigation required.** | Nil |

[20] Orientation is based on aerial imagery and assumes the house entry or any visible viewpoints out to the landscape.

| Receiver ID | Orientation of dwelling[20] | Distance (m) and direction from proposal site | Distance (m) from closest piece of permanent infrastructure | Elevation (AHD) | Existing mitigation (screening, topography, existing structures) | Potential impacts | Mitigation Measures and effectiveness | Visual impact rating |
|---|---|---|---|---|---|---|---|---|
| R3 | South -east | 160m north of proposal boundary | 242m | 296m | Existing screening is present on R3, along Minore Road and the railway corridor, as well on the on proposal site between the residence and any proposed infrastructure.<br><br>Topography is flat, the residence is lower in the landscape than most of the proposal site and only 1m higher than the lowest point of the site. | **Solar farm infrastructure**<br><br>Existing topography and vegetation mean this receiver would not have a view of solar farm infrastructure.<br><br>**Glint and glare**<br><br>Existing topography and vegetation would screen this receiver from any potential glint or glare. | Receiver would have no views of the proposal site. No mitigation measures are proposed. Existing screening is secure with the vegetation being located on four pieces of separate land.<br><br>**No mitigation required.** | Nil |
| R4 | South | 163m north of the proposal boundary | 248m | 298m | Existing screening is present along Minore Road, railway corridor and Delroy Road. However the screening is thin and existing tracks across the railway line creates view corridors towards the solar farm.<br><br>Topography is flat, the residence is lower in the landscape than most of the site and only 3m higher than | **Solar farm infrastructure**<br><br>Existing topography and vegetation mean this receiver would have broken up views of the solar farm and site access. The receiver is likely to have views of traffic along Delroy Road entering the site.<br><br>**Glint and glare**<br><br>Existing topography and vegetation would break up any | Receiver would have broken up views of the proposal site entry and potentially of solar arrays in the north east corner of the site. The screening is secure with it being occupied on four separate pieces of land.<br><br>Consultation has been undertaken with this | Low. |

| Receiver ID | Orientation of dwelling[20] | Distance (m) and direction from proposal site | Distance (m) from closest piece of permanent infrastructure | Elevation (AHD) | Existing mitigation (screening, topography, existing structures) | Potential impacts | Mitigation Measures and effectiveness | Visual impact rating |
|---|---|---|---|---|---|---|---|---|
| | | | | | the lowest point of the site. | potential for this receiver from glint or glare. | landowner (refer to Section 6.4 of the EIS). They have no concerns with the proposed project. Consultation is recommend to continue during the life of the project to address any potential concerns that may occur due to their proximity to the site.<br>**Mitigation recommended** | |
| R5 | South and north | 165m north of the proposal site | 712m | 289m | Existing screening is present on along Minore Road and the railway corridor, as well on the on proposal site between the residence and any proposed infrastructure.<br>Topography is flat, the residence is lower in the landscape than the proposal site. This makes the existing screening effective. | **Solar farm infrastructure**<br>Existing topography and vegetation mean this receiver would not have a view of solar farm infrastructure.<br>**Glint and glare**<br>Existing topography and vegetation would screen this receiver from any potential glint or glare. | Receiver would have no views of the proposal site. No mitigation measures are proposed. Existing screening is secure with the vegetation being located on four pieces of separate land.<br>**No mitigation required.** | Nil |

| Receiver ID | Orientation of dwelling[20] | Distance (m) and direction from proposal site | Distance (m) from closest piece of permanent infrastructure | Elevation (AHD) | Existing mitigation (screening, topography, existing structures) | Potential impacts | Mitigation Measures and effectiveness | Visual impact rating |
|---|---|---|---|---|---|---|---|---|
| R6 | South | 180m west of the proposal site | 306m | 287m | Existing screening is present at R6 between the dwelling and proposal site. Additionally, sheds and other farm structures are between the dwelling and proposal site.<br><br>Topography is flat, the residence is lower in the landscape than the proposal site. This makes the existing screening effective. | **Solar farm infrastructure**<br><br>Existing topography and vegetation mean this receiver would not have a view of solar farm infrastructure from their dwelling or sheds.<br><br>It is noted, the landowner would have views of the solar array and substation at their dam in the centre of their property. This due to the proximity of the infrastructure to the property, and limited screening along the properties shared fence line. Due to the topography the views would be limited to this north west portion of the proposal site. There is no buildings or structure around the dam that could be used as accommodation or regularly for recreation.<br><br>**Glint and glare** | Receiver would have no views of the proposal site. No mitigation measures are proposed.<br><br>**No mitigation required.** | Low |

| Receiver ID | Orientation of dwelling[20] | Distance (m) and direction from proposal site | Distance (m) from closest piece of permanent infrastructure | Elevation (AHD) | Existing mitigation (screening, topography, existing structures) | Potential impacts | Mitigation Measures and effectiveness | Visual impact rating |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Existing topography and vegetation would screen this receiver from glint or glare. | | |
| R7 | South and north | 260m north of the proposal site | 341m | 295m | Existing screening is present on along Minore Road and the railway corridor, as well on the on proposal site between the residence and any proposed infrastructure. From the aerial imagery the receiver has screening also planted around the dwelling.<br><br>Topography is flat, the residence is the same elevation as the lowest point in the proposal site. This makes the existing screening effective. | **Solar farm infrastructure**<br><br>Existing topography and vegetation mean this receiver would not have a view of solar farm infrastructure.<br><br>**Glint and glare**<br><br>Existing topography and vegetation would screen this receiver from any potential glint or glare. | Receiver would have no views of the proposal site. No mitigation measures are proposed. Existing screening is secure with the vegetation being located on four pieces of separate land.<br><br>**No mitigation required.** | Nil |
| R8 | South | 261m north of the proposal site | 395m | 302m | Existing screening is present at R8, along Minore Road and the railway corridor, as well on the on proposal site between the residence and any | **Solar farm infrastructure**<br><br>Existing topography and vegetation mean this receiver would not have a view of solar farm infrastructure. | Receiver would have no views of the proposal site. No mitigation measures are proposed. Existing screening is secure with | Nil |

| Receiver ID | Orientation of dwelling[20] | Distance (m) and direction from proposal site | Distance (m) from closest piece of permanent infrastructure | Elevation (AHD) | Existing mitigation (screening, topography, existing structures) | Potential impacts | Mitigation Measures and effectiveness | Visual impact rating |
|---|---|---|---|---|---|---|---|---|
| | | | | | proposed infrastructure.<br>Topography is flat, the residence is a similar elevation to the proposal site. This makes the existing screening effective. | **Glint and glare**<br>Existing topography and vegetation would screen this receiver from any potential glint or glare. | the vegetation being located on four pieces of separate land.<br>**No mitigation required.** | |
| R9 | West | 381m north of the proposal site | 448m | 303m | Existing screening is present at R9, along Minore Road and the railway corridor, as well on the on proposal site between the residence and any proposed infrastructure.<br>Topography is flat, the residence is a similar elevation to the proposal site. This makes the existing screening effective. | **Solar farm infrastructure**<br>Existing topography and vegetation mean this receiver would not have a view of solar farm infrastructure.<br>**Glint and glare**<br>Existing topography and vegetation would screen this receiver from any potential glint or glare. | Receiver would have no views of the proposal site. No mitigation measures are proposed. Existing screening is secure with the vegetation being located on four pieces of separate land.<br>**No mitigation required.** | Nil |
| R10 | South | 390m north of the proposal site | 577m | 289m | Existing screening is present at R9, along Minore Road and the railway corridor, as well on the on proposal site between the residence and any proposed infrastructure. | **Solar farm infrastructure**<br>Existing topography and vegetation mean this receiver would not have a view of solar farm infrastructure. | Receiver would have no views of the proposal site. No mitigation measures are proposed. Existing screening is secure with | Nil |

| Receiver ID | Orientation of dwelling[20] | Distance (m) and direction from proposal site | Distance (m) from closest piece of permanent infrastructure | Elevation (AHD) | Existing mitigation (screening, topography, existing structures) | Potential impacts | Mitigation Measures and effectiveness | Visual impact rating |
|---|---|---|---|---|---|---|---|---|
| | | | | | Topography is flat, the residence is lower in the landscape than the proposal site. | **Glint and glare**<br>Existing topography and vegetation would screen this receiver from any potential glint or glare. | the vegetation being located on four pieces of separate land.<br>**No mitigation required.** | |
| R11 | North west | 499m west of the proposal site | 552m | 301m | Existing screening is present at R9, and adjacent property blocking views of the proposal site<br>Topography is flat, the residence is a similar elevation to the proposal site. This makes the existing screening effective. | **Solar farm infrastructure**<br>Existing topography and vegetation mean this receiver would not have a view of solar farm infrastructure.<br>**Glint and glare**<br>Existing topography and vegetation would screen this receiver from any potential glint or glare. | Receiver would have no views of the proposal site. No mitigation measures are proposed.<br>**No mitigation required.** | Nil |
| R12 | South | 677m north west of the proposal site | 1,026m | 285m | Existing screening is present along Minore Road and the railway corridor, as well on the on proposal site between the residence and any proposed infrastructure. Additionally the silos located within Minore | **Solar farm infrastructure**<br>Existing topography, vegetation and structures mean this receiver would not have a view of solar farm infrastructure. | Receiver would have no views of the proposal site. No mitigation measures are proposed. Existing screening is secure with the vegetation being | Nil |

| Receiver ID | Orientation of dwelling[20] | Distance (m) and direction from proposal site | Distance (m) from closest piece of permanent infrastructure | Elevation (AHD) | Existing mitigation (screening, topography, existing structures) | Potential impacts | Mitigation Measures and effectiveness | Visual impact rating |
|---|---|---|---|---|---|---|---|---|
| | | | | | would block any views of the proposal site.<br><br>Topography is flat, the residence is lower in the landscape than the proposal site. | **Glint and glare**<br><br>Existing topography and vegetation would screen this receiver from any potential glint or glare. | located on four pieces of separate land as well as the existing structures of silos.<br><br>**No mitigation required.** | |
| R13 | West and east | 737m north west of the proposal site | 1,367m | 297m | Existing screening is present at R13, along Minore Road and the railway corridor, as well as on the proposal site between the residence and any proposed infrastructure.<br><br>Topography is flat, the residence is a similar elevation to the proposal site. This makes the existing screening effective. | **Solar farm infrastructure**<br><br>Existing topography, vegetation and structures mean this receiver would not have a view of solar farm infrastructure.<br><br>**Glint and glare**<br><br>Existing topography and vegetation would screen this receiver from any potential glint or glare. | Receiver would have no views of the proposal site. No mitigation measures are proposed. Existing screening is secure with the vegetation being located on multiple properties.<br><br>**No mitigation required.** | Nil |
| R15 | North | 783m west of the proposal site | 962m | 293m | Existing screening is present at R15 and on the proposal site between the residence and any proposed infrastructure. | **Solar farm infrastructure**<br><br>Existing topography, vegetation and structures mean this receiver would not have a view of solar farm | Receiver would have no views of the proposal site. No mitigation measures are proposed. | Nil |

| Receiver ID | Orientation of dwelling[20] | Distance (m) and direction from proposal site | Distance (m) from closest piece of permanent infrastructure | Elevation (AHD) | Existing mitigation (screening, topography, existing structures) | Potential impacts | Mitigation Measures and effectiveness | Visual impact rating |
|---|---|---|---|---|---|---|---|---|
| | | | | | Topography is flat, the residence is a similar elevation to the proposal site. This makes the existing screening effective. | infrastructure.<br>**Glint and glare**<br>Existing topography and vegetation would screen this receiver from any potential glint or glare. | **No mitigation required.** | |
| R16 | North and south | 784m north east of the proposal site | 868m | 294m | Existing screening is present at R16, along Minore Road and the railway corridor, as well on the on proposal site between the residence and any proposed infrastructure.<br>Topography is flat, the residence is a similar elevation to the proposal site. This makes the existing screening effective. | **Solar farm infrastructure**<br>Existing topography and vegetation mean this receiver would not have a view of solar farm infrastructure.<br>**Glint and glare**<br>Existing topography and vegetation would screen this receiver from any potential glint or glare. | Receiver would have no views of the proposal site. No mitigation measures are proposed. Existing screening is secure with the vegetation being located on multiple properties.<br>**No mitigation required.** | Nil |
| R17 | North and south | 892m north west of the proposal site | 1,159m | 288m | Existing screening is present along Minore Road and the railway corridor, as well on the on proposal site between the residence and any proposed infrastructure. Additionally the | **Solar farm infrastructure**<br>Existing topography, vegetation and structures mean this receiver would not have a view of solar farm | Receiver would have no views of the proposal site. No mitigation measures are proposed. Existing screening is secure with | Nil |

| Receiver ID | Orientation of dwelling[20] | Distance (m) and direction from proposal site | Distance (m) from closest piece of permanent infrastructure | Elevation (AHD) | Existing mitigation (screening, topography, existing structures) | Potential impacts | Mitigation Measures and effectiveness | Visual impact rating |
|---|---|---|---|---|---|---|---|---|
| | | | | | silos located within Minore would block any views of the proposal site.<br>Topography is flat, the residence is lower in the landscape than the proposal site. | infrastructure.<br>**Glint and glare**<br>Existing topography and vegetation would screen this receiver from any potential glint or glare. | the vegetation being located on multiple properties.as well as the existing structures of silos.<br>**No mitigation required.** | |
| R18 | North | 983m west of the proposal site | 1,086m | 289m | Existing screening is present at R8 and adjacent properties as well on the on proposal site between the residence and any proposed infrastructure.<br>Topography is flat, the residence is a similar elevation to the proposal site. This makes the existing screening effective. | **Solar farm infrastructure**<br>Existing topography and vegetation mean this receiver would not have a view of solar farm infrastructure.<br>**Glint and glare**<br>Existing topography and vegetation would screen this receiver from any potential glint or glare. | Receiver would have no views of the proposal site. No mitigation measures are proposed. Existing screening is secure with the vegetation being located on multiple properties.<br>**No mitigation required.** | Nil |
| R19 | North | 970m north east of the proposal site | 1,084m | 287m | Existing screening is present at R19, along Minore Road and the railway corridor, as well on the on proposal site between the residence and | **Solar farm infrastructure**<br>Existing topography and vegetation mean this receiver would not have a view of solar | Receiver would have no views of the proposal site. No mitigation measures are proposed. Existing | Nil |

| Receiver ID | Orientation of dwelling[20] | Distance (m) and direction from proposal site | Distance (m) from closest piece of permanent infrastructure | Elevation (AHD) | Existing mitigation (screening, topography, existing structures) | Potential impacts | Mitigation Measures and effectiveness | Visual impact rating |
|---|---|---|---|---|---|---|---|---|
| | | | | | any proposed infrastructure.<br>Topography is flat, the residence is a similar elevation to the proposal site. This makes the existing screening effective. | farm infrastructure.<br>**Glint and glare**<br>Existing topography and vegetation would screen this receiver from any potential glint or glare. | screening is secure with the vegetation being located on multiple properties.<br>**No mitigation required.** | |
| R20 | North | 1,004m east of the proposal site | 1,052m | 295m | Existing screening is present at R20 and adjacent properties.<br>Topography is flat, the residence is a similar elevation to the proposal site. This makes the existing screening effective. | **Solar farm infrastructure**<br>Existing topography and vegetation mean this receiver would not have a view of solar farm infrastructure.<br>This receiver is accessed off Delroy Road. They have no views of the access track from the dwelling due to existing screening.<br>**Glint and glare**<br>Existing topography and vegetation would screen this receiver from any potential glint or glare. | Receiver would have no views of the proposal site. No mitigation measures are proposed. Existing screening is secure with the vegetation being located on multiple properties.<br>**No mitigation required.** | Nil |

| Receiver ID | Orientation of dwelling[20] | Distance (m) and direction from proposal site | Distance (m) from closest piece of permanent infrastructure | Elevation (AHD) | Existing mitigation (screening, topography, existing structures) | Potential impacts | Mitigation Measures and effectiveness | Visual impact rating |
|---|---|---|---|---|---|---|---|---|
| R21 | South west | 1,014m west of the proposal site | 1,324m | 301m | Existing screening is present at R21, on adjacent properties and on the proposal site.<br><br>Topography is flat, the residence is a similar elevation to the proposal site. This makes the existing screening effective. | **Solar farm infrastructure**<br><br>Existing topography and vegetation mean this receiver would not have a view of solar farm infrastructure.<br><br>**Glint and glare**<br><br>Existing topography and vegetation would screen this receiver from any potential glint or glare. | Receiver would have no views of the proposal site. No mitigation measures are proposed. Existing screening is secure with the vegetation being located on multiple properties.<br><br>**No mitigation required.** | Nil |
| R22 | South west | 1,083m north of the proposal site | 1,215m | 311m | Existing screening is present at R22, along Minore Road and the railway corridor, as well on the on proposal site between the residence and any proposed infrastructure. Another residence is also within the viewline of dwelling and proposal site.<br><br>Topography is flat, the residence is a similar elevation to the proposal site. This makes the existing | **Solar farm infrastructure**<br><br>Existing topography and vegetation mean this receiver would not have a view of solar farm infrastructure.<br><br>**Glint and glare**<br><br>Existing topography and vegetation would screen this receiver from any potential glint or glare. | Receiver would have no views of the proposal site. No mitigation measures are proposed. Existing screening is secure with the vegetation being located on four pieces of separate land.<br><br>**No mitigation required.** | Nil |

| Receiver ID | Orientation of dwelling[20] | Distance (m) and direction from proposal site | Distance (m) from closest piece of permanent infrastructure | Elevation (AHD) | Existing mitigation (screening, topography, existing structures) | Potential impacts | Mitigation Measures and effectiveness | Visual impact rating |
|---|---|---|---|---|---|---|---|---|
| | | | | | screening effective. | | | |
| R23 | West | 1,092m west of the proposal site | 1,214m | 291m | Existing screening is present at R23, on adjacent properties and on the proposal site. Additionally, another two residences are within the view line of dwelling and proposal site.<br><br>Topography is flat, the residence is a similar elevation to the proposal site. This makes the existing screening effective. | **Solar farm infrastructure**<br><br>Existing topography and vegetation mean this receiver would not have a view of solar farm infrastructure.<br><br>**Glint and glare**<br><br>Existing topography and vegetation would screen this receiver from any potential glint or glare. | Receiver would have no views of the proposal site. No mitigation measures are proposed. Existing screening is secure with the vegetation being located on multiple properties.<br><br>**No mitigation required.** | Nil |
| R24 | West | 1,098m west of the proposal site | 1197m | 287m | Existing screening is present at R24, on adjacent properties and on the proposal site. Additionally, another two residences are within the view line of dwelling and proposal site.<br><br>Topography is flat, the residence is a similar elevation to the proposal site. | **Solar farm infrastructure**<br><br>Existing topography and vegetation mean this receiver would not have a view of solar farm infrastructure.<br><br>**Glint and glare**<br><br>Existing topography and vegetation would screen this receiver from any potential | Receiver would have no views of the proposal site. No mitigation measures are proposed. Existing screening is secure with the vegetation being located on multiple properties.<br><br>**No mitigation** | Nil |

| Receiver ID | Orientation of dwelling[20] | Distance (m) and direction from proposal site | Distance (m) from closest piece of permanent infrastructure | Elevation (AHD) | Existing mitigation (screening, topography, existing structures) | Potential impacts | Mitigation Measures and effectiveness | Visual impact rating |
|---|---|---|---|---|---|---|---|---|
| | | | | | This makes the existing screening effective. | glint or glare. | **required.** | |
| R25 | West | 1,171 west of the proposal site | 1,344m | 300m | Existing screening is present at R25, on adjacent properties and on the proposal site.<br>Topography is flat, the residence is a similar elevation to the proposal site. This makes the existing screening effective. | **Solar farm infrastructure**<br>Existing topography and vegetation mean this receiver would not have a view of solar farm infrastructure.<br>**Glint and glare**<br>Existing topography and vegetation would screen this receiver from any potential glint or glare. | Receiver would have no views of the proposal site. No mitigation measures are proposed. Existing screening is secure with the vegetation being located on multiple properties.<br>**No mitigation required.** | Nil |
| R26 | East | 1,174m east of the proposal site | 1,250m | 309m | Existing screening is present at R26 and adjacent properties.<br>Topography is flat, the residence is a similar elevation to the proposal site. This makes the existing screening effective. | **Solar farm infrastructure**<br>Existing topography and vegetation mean this receiver would not have a view of solar farm infrastructure.<br>This receiver is accessed off Delroy Road. They have no views of the access track from the dwelling due to existing | Receiver would have no views of the proposal site. No mitigation measures are proposed. Existing screening is secure with the vegetation being located on multiple properties.<br>**No mitigation** | Nil |

| Receiver ID | Orientation of dwelling[20] | Distance (m) and direction from proposal site | Distance (m) from closest piece of permanent infrastructure | Elevation (AHD) | Existing mitigation (screening, topography, existing structures) | Potential impacts | Mitigation Measures and effectiveness | Visual impact rating |
|---|---|---|---|---|---|---|---|---|
| | | | | | | screening.<br>**Glint and glare**<br>Existing topography and vegetation would screen this receiver from any potential glint or glare. | **required.** | |
| R27 | South | 1,209m north east of the proposal site | 1,298m | 284m | Existing screening is present at R27, along Minore Road and the railway corridor, as well on the on proposal site between the residence and any proposed infrastructure.<br>Topography is flat, the residence is a similar elevation to the proposal site. This makes the existing screening effective. | **Solar farm infrastructure**<br>Existing topography and vegetation mean this receiver would not have a view of solar farm infrastructure.<br>**Glint and glare**<br>Existing topography and vegetation would screen this receiver from any potential glint or glare. | Receiver would have no views of the proposal site. No mitigation measures are proposed. Existing screening is secure with the vegetation being located on multiple properties.<br>**No mitigation required.** | Nil |
| R28 | South | 1,244m west north west of the proposal site | 1,651m | 282m | Existing screening is present along North Minore Road and the railway corridor, on adjacent properties and on the on proposal site between the residence and any proposed | **Solar farm infrastructure**<br>Existing topography, vegetation and structures mean this receiver would not have a view of solar farm | Receiver would have no views of the proposal site. No mitigation measures are proposed. Existing screening is secure with | Nil |

| Receiver ID | Orientation of dwelling[20] | Distance (m) and direction from proposal site | Distance (m) from closest piece of permanent infrastructure | Elevation (AHD) | Existing mitigation (screening, topography, existing structures) | Potential impacts | Mitigation Measures and effectiveness | Visual impact rating |
|---|---|---|---|---|---|---|---|---|
| | | | | | infrastructure. Additionally, the silos located within Minore would block any views of the proposal site.<br><br>Topography is flat, the residence is a similar elevation to the proposal site. This makes the existing screening effective. | infrastructure.<br><br>**Glint and glare**<br><br>Existing topography and vegetation would screen this receiver from any potential glint or glare. | the vegetation being located on multiple properties.as well as the existing structures of silos.<br><br>**No mitigation required.** | |
| R29 | South | 1,335m west north west of the proposal site | 1,644m | 282m | Existing screening is present along Minore Road and the railway corridor, on adjacent properties and on the proposal site between the residence and any proposed infrastructure. Additionally, the silos located within Minore would block any views of the proposal site.<br><br>Topography is flat, the residence is a similar elevation to the proposal site. This makes the existing screening effective. | **Solar farm infrastructure**<br><br>Existing topography, vegetation and structures mean this receiver would not have a view of solar farm infrastructure.<br><br>**Glint and glare**<br><br>Existing topography and vegetation would screen this receiver from any potential glint or glare. | Receiver would have no views of the proposal site. No mitigation measures are proposed. Existing screening is secure with the vegetation being located on multiple properties.as well as the existing structures of silos.<br><br>**No mitigation required.** | Nil |

| Receiver ID | Orientation of dwelling[20] | Distance (m) and direction from proposal site | Distance (m) from closest piece of permanent infrastructure | Elevation (AHD) | Existing mitigation (screening, topography, existing structures) | Potential impacts | Mitigation Measures and effectiveness | Visual impact rating |
|---|---|---|---|---|---|---|---|---|
| R30 | West | 1,388m west of the proposal site | 1,436m | 289m | Existing screening is present at R30, on adjacent properties and on the proposal site.<br>Topography is flat, the residence is a similar elevation to the proposal site. This makes the existing screening effective. | **Solar farm infrastructure**<br>Existing topography and vegetation mean this receiver would not have a view of solar farm infrastructure.<br>**Glint and glare**<br>Existing topography and vegetation would screen this receiver from any potential glint or glare. | Receiver would have no views of the proposal site. No mitigation measures are proposed. Existing screening is secure with the vegetation being located on multiple properties.<br>**No mitigation required.** | Nil |
| R31 | South | 1,400m west of the proposal site | 1,410m | 289m | Existing screening is present at R31, on adjacent properties and on the proposal site.<br>Topography is flat, the residence is a similar elevation to the proposal site. This makes the existing screening effective. | **Solar farm infrastructure**<br>Existing topography and vegetation mean this receiver would not have a view of solar farm infrastructure.<br>**Glint and glare**<br>Existing topography and vegetation would screen this receiver from any potential glint or glare. | Receiver would have no views of the proposal site. No mitigation measures are proposed. Existing screening is secure with the vegetation being located on multiple properties.<br>**No mitigation required.** | Nil |

| Receiver ID | Orientation of dwelling[20] | Distance (m) and direction from proposal site | Distance (m) from closest piece of permanent infrastructure | Elevation (AHD) | Existing mitigation (screening, topography, existing structures) | Potential impacts | Mitigation Measures and effectiveness | Visual impact rating |
|---|---|---|---|---|---|---|---|---|
| R32 | South | 1,415m south west of the proposal site | 1,459m | 326m | Existing screening is present at R32 and on adjacent properties.<br>Topography is flat, the residence is a similar elevation to the proposal site. This makes the existing screening effective. | **Solar farm infrastructure**<br>Existing topography and vegetation mean this receiver would not have a view of solar farm infrastructure.<br>**Glint and glare**<br>Existing topography and vegetation would screen this receiver from any potential glint or glare. | Receiver would have no views of the proposal site. No mitigation measures are proposed. Existing screening is secure with the vegetation being located on multiple properties.<br>**No mitigation required.** | Nil |
| R33 | South | 1,429m east of the proposal site | 1,490m | 294m | Existing screening is present at R33 and adjacent properties.<br>Topography is flat, the residence is a similar elevation to the proposal site. This makes the existing screening effective. | **Solar farm infrastructure**<br>Existing topography and vegetation mean this receiver would not have a view of solar farm infrastructure.<br>This receiver is accessed off Delroy Road. They have no views of the access track from the dwelling due to existing screening.<br>**Glint and glare**<br>Existing topography and | Receiver would have no views of the proposal site. No mitigation measures are proposed. Existing screening is secure with the vegetation being located on multiple properties.<br>**No mitigation required.** | Nil |

| Receiver ID | Orientation of dwelling[20] | Distance (m) and direction from proposal site | Distance (m) from closest piece of permanent infrastructure | Elevation (AHD) | Existing mitigation (screening, topography, existing structures) | Potential impacts | Mitigation Measures and effectiveness | Visual impact rating |
|---|---|---|---|---|---|---|---|---|
| | | | | | | vegetation would screen this receiver from any potential glint or glare. | | |
| R34 | East | 1,495m west of the proposal site | 1,553m | 290m | Existing screening is present at R34 and adjacent properties.<br>Topography is flat, the residence is a similar elevation to the proposal site. This makes the existing screening effective. | **Solar farm infrastructure**<br>Existing topography and vegetation mean this receiver would not have a view of solar farm infrastructure.<br>**Glint and glare**<br>Existing topography and vegetation would screen this receiver from any potential glint or glare. | Receiver would have no views of the proposal site. No mitigation measures are proposed. Existing screening is secure with the vegetation being located on multiple properties.<br>**No mitigation required.** | Nil |
| R35 | South | 1,504m north east of the proposal site | 1,593m | 289m | Existing screening is present along Minore Road and the railway corridor.<br>Topography is flat, the residence is a similar elevation to the proposal site. This makes the existing screening effective. | **Solar farm infrastructure**<br>Existing topography and vegetation mean this receiver would not have a view of solar farm infrastructure.<br>**Glint and glare**<br>Existing topography and vegetation would screen this | Receiver would have no views of the proposal site. No mitigation measures are proposed. Existing screening is secure with the vegetation being located on multiple properties. | Nil |

| Receiver ID | Orientation of dwelling[20] | Distance (m) and direction from proposal site | Distance (m) from closest piece of permanent infrastructure | Elevation (AHD) | Existing mitigation (screening, topography, existing structures) | Potential impacts | Mitigation Measures and effectiveness | Visual impact rating |
|---|---|---|---|---|---|---|---|---|
| | | | | | | receiver from any potential glint or glare. | **No mitigation required.** | |
| R36 | West | 1,522m west of the proposal site | 1,578m | 288m | Existing screening is present at R36, on adjacent properties and on the proposal site.<br>Topography is flat, the residence is a similar elevation to the proposal site. This makes the existing screening effective. | **Solar farm infrastructure**<br>Existing topography and vegetation mean this receiver would not have a view of solar farm infrastructure.<br>**Glint and glare**<br>Existing topography and vegetation would screen this receiver from any potential glint or glare. | Receiver would have no views of the proposal site. No mitigation measures are proposed. Existing screening is secure with the vegetation being located on multiple properties.<br>**No mitigation required.** | Nil |
| R37 | North | 1,587m west south west of the proposal site | 1,614m | 311m | Existing screening is present at R37, on adjacent properties and on the proposal site.<br>Topography is flat, the residence is a similar elevation to the proposal site. This makes the existing screening effective. | **Solar farm infrastructure**<br>Existing topography and vegetation mean this receiver would not have a view of solar farm infrastructure.<br>**Glint and glare**<br>Existing topography and vegetation would screen this receiver from any potential | Receiver would have no views of the proposal site. No mitigation measures are proposed. Existing screening is secure with the vegetation being located on multiple properties.<br>**No mitigation** | Nil |

| Receiver ID | Orientation of dwelling[20] | Distance (m) and direction from proposal site | Distance (m) from closest piece of permanent infrastructure | Elevation (AHD) | Existing mitigation (screening, topography, existing structures) | Potential impacts | Mitigation Measures and effectiveness | Visual impact rating |
|---|---|---|---|---|---|---|---|---|
| | | | | | | glint or glare. | **required.** | |
| R38 | East | 1,637m west of the proposal site | 1,682m | 285m | Existing screening is present at R38, on adjacent properties and on the proposal site.<br>Topography is flat, the residence is a similar elevation to the proposal site. This makes the existing screening effective. | **Solar farm infrastructure**<br>Existing topography and vegetation mean this receiver would not have a view of solar farm infrastructure.<br>**Glint and glare**<br>Existing topography and vegetation would screen this receiver from any potential glint or glare. | Receiver would have no views of the proposal site. No mitigation measures are proposed. Existing screening is secure with the vegetation being located on multiple properties.<br>**No mitigation required.** | Nil |
| R39 | East | 1640m west of the proposal site | 1,689m | 285m | Existing screening is present at R39, on adjacent properties and on the proposal site.<br>Topography is flat, the residence is a similar elevation to the proposal site. This makes the existing screening effective. | **Solar farm infrastructure**<br>Existing topography and vegetation mean this receiver would not have a view of solar farm infrastructure.<br>**Glint and glare**<br>Existing topography and vegetation would screen this receiver from any potential glint or glare. | Receiver would have no views of the proposal site. No mitigation measures are proposed. Existing screening is secure with the vegetation being located on multiple properties.<br>**No mitigation required.** | Nil |

| Receiver ID | Orientation of dwelling[20] | Distance (m) and direction from proposal site | Distance (m) from closest piece of permanent infrastructure | Elevation (AHD) | Existing mitigation (screening, topography, existing structures) | Potential impacts | Mitigation Measures and effectiveness | Visual impact rating |
|---|---|---|---|---|---|---|---|---|
| R40 | East/north east | 1,663m south west of the proposal site | 1,731m | 305m | Existing screening is present on adjacent properties.<br>Topography is flat, the residence is a similar elevation to the proposal site. This makes the existing screening effective. | **Solar farm infrastructure**<br>Existing topography and vegetation mean this receiver would not have a view of solar farm infrastructure.<br>**Glint and glare**<br>Existing topography and vegetation would screen this receiver from any potential glint or glare. | Receiver would have no views of the proposal site. No mitigation measures are proposed.<br>**No mitigation required.** | Nil |
| R41 | West | 1,675m west of the proposal site | 2,059m | 289m | Existing screening is present at R41, on adjacent properties and on the proposal site.<br>Topography is flat, the residence is a similar elevation to the proposal site. This makes the existing screening effective. | **Solar farm infrastructure**<br>Existing topography and vegetation mean this receiver would not have a view of solar farm infrastructure.<br>**Glint and glare**<br>Existing topography and vegetation would screen this receiver from any potential glint or glare. | Receiver would have no views of the proposal site. No mitigation measures are proposed. Existing screening is secure with the vegetation being located on multiple properties.<br>**No mitigation required.** | Nil |
| R42 | South | 1,686m | 2,083m | 281m | Existing screening is present | **Solar farm infrastructure** | Receiver would have no | Nil |

| Receiver ID | Orientation of dwelling[20] | Distance (m) and direction from proposal site | Distance (m) from closest piece of permanent infrastructure | Elevation (AHD) | Existing mitigation (screening, topography, existing structures) | Potential impacts | Mitigation Measures and effectiveness | Visual impact rating |
|---|---|---|---|---|---|---|---|---|
| | | north west of the proposal site | | | along Minore Road and the railway corridor, on adjacent properties and on the on proposal site between the residence and any proposed infrastructure. Additionally, the silos located within Minore would block any views of the proposal site.<br><br>Topography is flat, the residence is a similar elevation to the proposal site. This makes the existing screening effective. | Existing topography, vegetation and structures mean this receiver would not have a view of solar farm infrastructure.<br><br>**Glint and glare**<br><br>Existing topography and vegetation would screen this receiver from any potential glint or glare. | views of the proposal site. No mitigation measures are proposed. Existing screening is secure with the vegetation being located on multiple properties.as well as the existing structures of silos.<br><br>**No mitigation required.** | |
| R43 | South | 1,705m west of the proposal site | 2,048m | 286m | Existing screening is present at R43, on adjacent properties and on the proposal site.<br><br>Topography is flat, the residence is a similar elevation to the proposal site. This makes the existing screening effective. | **Solar farm infrastructure**<br><br>Existing topography and vegetation mean this receiver would not have a view of solar farm infrastructure.<br><br>**Glint and glare**<br><br>Existing topography and vegetation would screen this receiver from any potential | Receiver would have no views of the proposal site. No mitigation measures are proposed. Existing screening is secure with the vegetation being located on multiple properties.<br><br>**No mitigation** | Nil |

| Receiver ID | Orientation of dwelling[20] | Distance (m) and direction from proposal site | Distance (m) from closest piece of permanent infrastructure | Elevation (AHD) | Existing mitigation (screening, topography, existing structures) | Potential impacts | Mitigation Measures and effectiveness | Visual impact rating |
|---|---|---|---|---|---|---|---|---|
| | | | | | | glint or glare. | **required.** | |
| R44 | East | 1,705m east of the proposal site | 1,810m | 279m | Existing screening is present at R44 and adjacent properties.<br>Topography is flat, the residence is a similar elevation to the proposal site. This makes the existing screening effective. | **Solar farm infrastructure**<br>Existing topography and vegetation mean this receiver would not have a view of solar farm infrastructure.<br>This receiver is accessed off Delroy Road. They have no views of the access track from the dwelling due to existing screening.<br>**Glint and glare**<br>Existing topography and vegetation would screen this receiver from any potential glint or glare. | Receiver would have no views of the proposal site. No mitigation measures are proposed. Existing screening is secure with the vegetation being located on multiple properties.<br>**No mitigation required.** | Nil |
| R45 | West | 1,709m west of the proposal site | 1,966m | 285m | Existing screening is present at R45, on adjacent properties and on the proposal site.<br>Topography is flat, the residence is a similar elevation to the proposal site. | **Solar farm infrastructure**<br>Existing topography and vegetation mean this receiver would not have a view of solar farm infrastructure. | Receiver would have no views of the proposal site. No mitigation measures are proposed. Existing screening is secure with | Nil |

| Receiver ID | Orientation of dwelling[20] | Distance (m) and direction from proposal site | Distance (m) from closest piece of permanent infrastructure | Elevation (AHD) | Existing mitigation (screening, topography, existing structures) | Potential impacts | Mitigation Measures and effectiveness | Visual impact rating |
|---|---|---|---|---|---|---|---|---|
| | | | | | This makes the existing screening effective. | **Glint and glare**<br>Existing topography and vegetation would screen this receiver from any potential glint or glare. | the vegetation being located on multiple properties.<br>**No mitigation required.** | |
| R46 | South | 1,737m west north west of the proposal site | 1,918m | 277m | Existing screening is present along Minore Road and the railway corridor, on adjacent properties and on the on proposal site between the residence and any proposed infrastructure. Additionally, the silos located within Minore would block any views of the proposal site.<br>Topography is flat, the residence is a similar elevation to the proposal site. This makes the existing screening effective. | **Solar farm infrastructure**<br>Existing topography, vegetation and structures mean this receiver would not have a view of solar farm infrastructure.<br>**Glint and glare**<br>Existing topography and vegetation would screen this receiver from any potential glint or glare. | Receiver would have no views of the proposal site. No mitigation measures are proposed. Existing screening is secure with the vegetation being located on multiple properties.as well as the existing structures of silos.<br>**No mitigation required.** | Nil |
| R47 | East | 1,750m south of the | 1,781m | 303m | Existing screening is present at R47 and on adjacent properties. | **Solar farm infrastructure**<br>Existing topography and vegetation mean this receiver | Receiver would have no views of the proposal site. No mitigation | Nil |

| Receiver ID | Orientation of dwelling[20] | Distance (m) and direction from proposal site | Distance (m) from closest piece of permanent infrastructure | Elevation (AHD) | Existing mitigation (screening, topography, existing structures) | Potential impacts | Mitigation Measures and effectiveness | Visual impact rating |
|---|---|---|---|---|---|---|---|---|
| | | proposal site | | | Topography is flat, the residence is a similar elevation to the proposal site. This makes the existing screening effective. | would not have a view of solar farm infrastructure.<br>**Glint and glare**<br>Existing topography and vegetation would screen this receiver from any potential glint or glare. | measures are proposed. Existing screening is secure with the vegetation being located on multiple properties.<br>**No mitigation required.** | |
| R48 | South | 1,756m north of the proposal site | 1,839m | 292m | Existing screening is present at R22, on adjacent properties, along Minore Road and the railway corridor.<br>Topography is flat, the residence is a similar elevation to the proposal site. This makes the existing screening effective. | **Solar farm infrastructure**<br>Existing topography and vegetation mean this receiver would not have a view of solar farm infrastructure.<br>**Glint and glare**<br>Existing topography and vegetation would screen this receiver from any potential glint or glare. | Receiver would have no views of the proposal site. No mitigation measures are proposed. Existing screening is secure with the vegetation being located on four pieces of separate land.<br>**No mitigation required.** | Nil |
| R49 | West | 1,757m south west of the proposal | 1,792m | 329m | Existing screening is present at R49 and on adjacent properties.<br>Topography is flat, the | **Solar farm infrastructure**<br>Existing topography and vegetation mean this receiver would not have a view of solar | Receiver would have no views of the proposal site. No mitigation measures are | Nil |

| Receiver ID | Orientation of dwelling[20] | Distance (m) and direction from proposal site | Distance (m) from closest piece of permanent infrastructure | Elevation (AHD) | Existing mitigation (screening, topography, existing structures) | Potential impacts | Mitigation Measures and effectiveness | Visual impact rating |
|---|---|---|---|---|---|---|---|---|
| | | site | | | residence is a similar elevation to the proposal site. This makes the existing screening effective. | farm infrastructure.<br>**Glint and glare**<br>Existing topography and vegetation would screen this receiver from any potential glint or glare. | proposed. Existing screening is secure with the vegetation being located on multiple properties.<br>**No mitigation required.** | |
| R50 | East | 1,793 north west of the proposal site | 2,244m | 279m | Existing screening is present along North Minore Road, Minore Road, the railway corridor and on adjacent properties.<br>Topography is flat, the residence is a similar elevation to the proposal site. This makes the existing screening effective. | **Solar farm infrastructure**<br>Existing topography, vegetation and structures mean this receiver would not have a view of solar farm infrastructure.<br>**Glint and glare**<br>Existing topography and vegetation would screen this receiver from any potential glint or glare. | Receiver would have no views of the proposal site. No mitigation measures are proposed. Existing screening is secure with the vegetation being located on multiple properties.as well as the existing structures of silos.<br>**No mitigation required.** | Nil |
| R51 | South | 1,795m north west of the | 1,915m | 283m | Existing screening is present at R51, along Minore Road and the railway corridor. | **Solar farm infrastructure**<br>Existing topography and vegetation mean this receiver | Receiver would have no views of the proposal site. No mitigation | Nil |

| Receiver ID | Orientation of dwelling[20] | Distance (m) and direction from proposal site | Distance (m) from closest piece of permanent infrastructure | Elevation (AHD) | Existing mitigation (screening, topography, existing structures) | Potential impacts | Mitigation Measures and effectiveness | Visual impact rating |
|---|---|---|---|---|---|---|---|---|
| | | proposal site | | | Topography is flat, the residence is a similar elevation to the proposal site. This makes the existing screening effective. | would not have a view of solar farm infrastructure.<br>**Glint and glare**<br>Existing topography and vegetation would screen this receiver from any potential glint or glare. | measures are proposed. Existing screening is secure with the vegetation being located on multiple properties.<br>**No mitigation required.** | |
| R52 | South | 1,800m north east of the proposal site | 1,914m | 289m | Existing screening is present along Minore Road, the railway corridor and adjacent properties.<br>Topography is flat, the residence is a similar elevation to the proposal site. This makes the existing screening effective. | **Solar farm infrastructure**<br>Existing topography and vegetation mean this receiver would not have a view of solar farm infrastructure.<br>**Glint and glare**<br>Existing topography and vegetation would screen this receiver from any potential glint or glare. | Receiver would have no views of the proposal site. No mitigation measures are proposed. Existing screening is secure with the vegetation being located on multiple properties.<br>**No mitigation required.** | Nil |
| R53 | East | 1,812m west of the proposal site | 2,129m | 295m | Existing screening is present at R53, on adjacent properties and on the proposal site.<br>Topography is flat, the | **Solar farm infrastructure**<br>Existing topography and vegetation mean this receiver would not have a view of solar | Receiver would have no views of the proposal site. No mitigation measures are | Nil |

| Receiver ID | Orientation of dwelling[20] | Distance (m) and direction from proposal site | Distance (m) from closest piece of permanent infrastructure | Elevation (AHD) | Existing mitigation (screening, topography, existing structures) | Potential impacts | Mitigation Measures and effectiveness | Visual impact rating |
|---|---|---|---|---|---|---|---|---|
| | | | | | residence is a similar elevation to the proposal site. This makes the existing screening effective. | farm infrastructure.<br>**Glint and glare**<br>Existing topography and vegetation would screen this receiver from any potential glint or glare. | proposed. Existing screening is secure with the vegetation being located on multiple properties.<br>**No mitigation required.** | |
| R54 | East | 1,885m north west of the proposal site | 2,406m | 277m | Existing screening is present along North Minore Road, Minore Road, the railway corridor and on adjacent properties.<br>Topography is flat, the residence is a similar elevation to the proposal site. This makes the existing screening effective. | **Solar farm infrastructure**<br>Existing topography, vegetation and structures mean this receiver would not have a view of solar farm infrastructure.<br>**Glint and glare**<br>Existing topography and vegetation would screen this receiver from any potential glint or glare. | Receiver would have no views of the proposal site. No mitigation measures are proposed. Existing screening is secure with the vegetation being located on multiple properties.as well as the existing structures of silos.<br>**No mitigation required.** | Nil |
| R55 | East | 1,913m south west of the | 1,954m | 326m | Existing screening is present at R55 and on adjacent properties. | **Solar farm infrastructure**<br>Existing topography and vegetation mean this receiver | Receiver would have no views of the proposal site. No mitigation | Nil |

| Receiver ID | Orientation of dwelling[20] | Distance (m) and direction from proposal site | Distance (m) from closest piece of permanent infrastructure | Elevation (AHD) | Existing mitigation (screening, topography, existing structures) | Potential impacts | Mitigation Measures and effectiveness | Visual impact rating |
|---|---|---|---|---|---|---|---|---|
| | | proposal site | | | Topography is flat, the residence is a similar elevation to the proposal site. This makes the existing screening effective. | would not have a view of solar farm infrastructure.<br>**Glint and glare**<br>Existing topography and vegetation would screen this receiver from any potential glint or glare. | measures are proposed. Existing screening is secure with the vegetation being located on multiple properties.<br>**No mitigation required.** | |
| R56 | North | 1,916m west of the proposal site | 1,973m | 288m | Existing screening is present at R56, on adjacent properties and on the proposal site.<br>Topography is flat, the residence is a similar elevation to the proposal site. This makes the existing screening effective. | **Solar farm infrastructure**<br>Existing topography and vegetation mean this receiver would not have a view of solar farm infrastructure.<br>**Glint and glare**<br>Existing topography and vegetation would screen this receiver from any potential glint or glare. | Receiver would have no views of the proposal site. No mitigation measures are proposed. Existing screening is secure with the vegetation being located on multiple properties.<br>**No mitigation required.** | Nil |
| R57 | South | 1,938m south west of the proposal | 1,971m | 328m | Existing screening is present at R57 and on adjacent properties.<br>Topography is flat, the | **Solar farm infrastructure**<br>Existing topography and vegetation mean this receiver would not have a view of solar | Receiver would have no views of the proposal site. No mitigation measures are | Nil |

| Receiver ID | Orientation of dwelling[20] | Distance (m) and direction from proposal site | Distance (m) from closest piece of permanent infrastructure | Elevation (AHD) | Existing mitigation (screening, topography, existing structures) | Potential impacts | Mitigation Measures and effectiveness | Visual impact rating |
|---|---|---|---|---|---|---|---|---|
| | | site | | | residence is a similar elevation to the proposal site. This makes the existing screening effective. | farm infrastructure.<br>**Glint and glare**<br>Existing topography and vegetation would screen this receiver from any potential glint or glare. | proposed. Existing screening is secure with the vegetation being located on multiple properties.<br>**No mitigation required.** | |
| R58 | West | 1,948m north east of the proposal site | 1,904m | 277m | Existing screening is present along Minore Road, the railway corridor and adjacent properties.<br>Topography is flat, the residence is a similar elevation to the proposal site. This makes the existing screening effective. | **Solar farm infrastructure**<br>Existing topography and vegetation mean this receiver would not have a view of solar farm infrastructure.<br>**Glint and glare**<br>Existing topography and vegetation would screen this receiver from any potential glint or glare. | Receiver would have no views of the proposal site. No mitigation measures are proposed. Existing screening is secure with the vegetation being located on multiple properties.<br>**No mitigation required.** | Nil |
| R59 | East | 1,979m west of the proposal site | 2,040m | 304m | Existing screening is present at 9R53, on adjacent properties and on the proposal site.<br>Topography is flat, the | **Solar farm infrastructure**<br>Existing topography and vegetation mean this receiver would not have a view of solar | Receiver would have no views of the proposal site. No mitigation measures are proposed. Existing | Nil |

| Receiver ID | Orientation of dwelling[20] | Distance (m) and direction from proposal site | Distance (m) from closest piece of permanent infrastructure | Elevation (AHD) | Existing mitigation (screening, topography, existing structures) | Potential impacts | Mitigation Measures and effectiveness | Visual impact rating |
|---|---|---|---|---|---|---|---|---|
| | | | | | residence is a similar elevation to the proposal site. This makes the existing screening effective. | farm infrastructure.<br>**Glint and glare**<br>Existing topography and vegetation would screen this receiver from any potential glint or glare. | screening is secure with the vegetation being located on multiple properties.<br>**No mitigation required.** | |
| R60 | East | 1979m north west of the proposal site | 2,510m | 276m | Existing screening is present along North Minore Road, Minore Road, the railway corridor and on adjacent properties.<br>Topography is flat, the residence is a similar elevation to the proposal site. This makes the existing screening effective. | **Solar farm infrastructure**<br>Existing topography, vegetation and structures mean this receiver would not have a view of solar farm infrastructure.<br>**Glint and glare**<br>Existing topography and vegetation would screen this receiver from any potential glint or glare. | Receiver would have no views of the proposal site. No mitigation measures are proposed. Existing screening is secure with the vegetation being located on multiple properties.as well as the existing structures of silos.<br>**No mitigation required.** | Nil |
| **Associated receivers** | | | | | | | | |
| R0 | North | Within Proposal | 428m | 307m | Existing screening is present | **Solar farm infrastructure** | **No mitigation** | Nil |

| Receiver ID | Orientation of dwelling[20] | Distance (m) and direction from proposal site | Distance (m) from closest piece of permanent infrastructure | Elevation (AHD) | Existing mitigation (screening, topography, existing structures) | Potential impacts | Mitigation Measures and effectiveness | Visual impact rating |
|---|---|---|---|---|---|---|---|---|
| | | site | | | dwelling.<br>Topography is flat, the residence is a similar elevation to the proposal site. This makes the existing screening effective. | Existing topography, vegetation and structures mean this receiver would have broken views of solar farm infrastructure.<br>**Glint and glare**<br>Existing topography and vegetation would screen this receiver from any potential glint or glare. | **required.** | |
| R1 | East | 95m west of the proposal site | 361m | 318m | Existing screening is present around dwelling and on proposal site.<br>Topography is flat, the residence is a similar elevation to the proposal site. This makes the existing screening effective. | **Solar farm infrastructure**<br>Existing topography, vegetation and structures mean this receiver would not have a view of solar farm infrastructure.<br>**Glint and glare**<br>Existing topography and vegetation would screen this receiver from any potential glint or glare. | **No mitigation required.** | Nil |

| Receiver ID | Orientation of dwelling[20] | Distance (m) and direction from proposal site | Distance (m) from closest piece of permanent infrastructure | Elevation (AHD) | Existing mitigation (screening, topography, existing structures) | Potential impacts | Mitigation Measures and effectiveness | Visual impact rating |
|---|---|---|---|---|---|---|---|---|
| R14 | East | 771m east of the proposal site | 849m | 289m | Existing screening is present around dwelling and on adjacent properties.<br><br>Topography is flat, the residence is a similar elevation to the proposal site. This makes the existing screening effective. | **Solar farm infrastructure**<br><br>Existing topography, vegetation and structures mean this receiver would not have a view of solar farm infrastructure.<br><br>**Glint and glare**<br><br>Existing topography and vegetation would screen this receiver from any potential glint or glare. | **No mitigation required.** | Nil |

## E.2 Photos taken from public viewpoints to represent each receiver

The table below shows the photos taken to represent the view from each receiver within 2km of the proposal site. The photos were taken from the closest public vantage points to each receiver due to private access restrictions and the photo was taken looking towards the proposal site. Where these photo points were taken is shown in Figure 11-1.

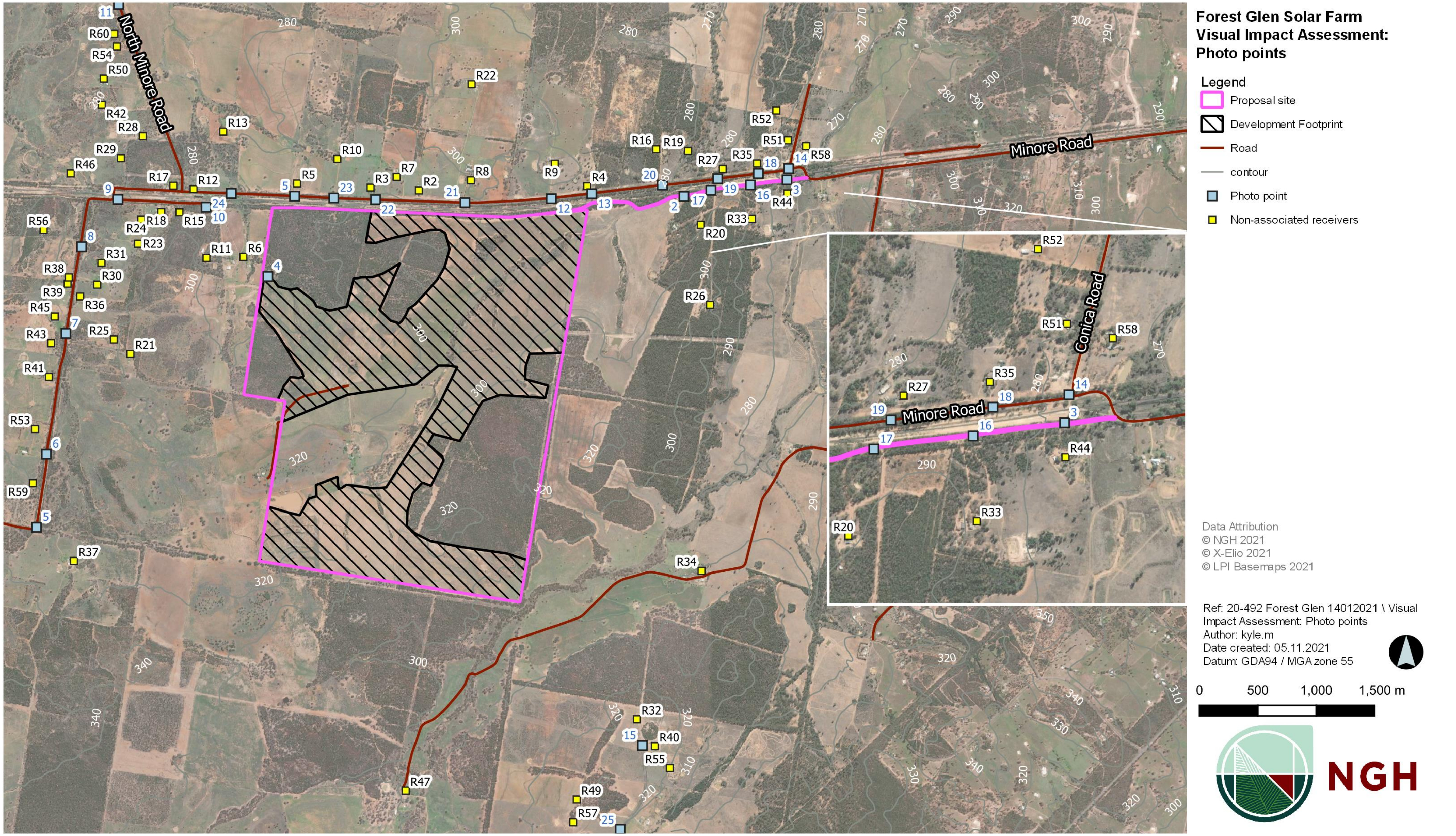


Figure 11-1 Photo point locations for each photo taken to represent a receiver as outlined in the table above

| Receiver ID | Map ID Refer to Figure 11-1 | Non-associated receivers (photos taken from closest public viewpoint) |
|---|---|---|
| R2 | 13 |  |
| R3 | 22 |  |
| R4 | 13 |  |

| Receiver ID | Map ID<br>Refer to Figure 11-1 | Non-associated receivers (photos taken from closest public viewpoint) |
|---|---|---|
| R5 | 5 |  |
| R6 (Photo taken from site looking back to dwelling) | 4 |  |
| R7 | | Refer to R3 |
| R8 | 21 |  |

| Receiver ID | Map ID<br>Refer to<br>Figure 11-1 | Non-associated receivers (photos taken from closest public viewpoint) |
|---|---|---|
| R9 | 12 |  |
| R10 | 23 |  |
| R11 | 10 |  |
| R12 | | Views of Minore silos. |

| Receiver ID | Map ID<br>Refer to Figure 11-1 | Non-associated receivers (photos taken from closest public viewpoint) |
|---|---|---|
| R13 | 24 |  |
| R15 | | Refer to R6 and R11 |
| R16 | 20 |  |
| R17 | | Refer to R6 and R11. Within Minore views of silo and railway corridor. |
| R18 | 9 |  |
| R19 | | Refer to R16 |

| Receiver ID | Map ID Refer to Figure 11-1 | Non-associated receivers (photos taken from closest public viewpoint) |
|---|---|---|
| R20 | 17 |  |
| R21 | 7 |  |
| R22 | | Refer to R8 |
| R23 | 8 |  |
| R24 | | Refer to R18 |
| R25 | | Refer to R21 |
| R26 | | Refer to R20 |

| Receiver ID | Map ID<br>Refer to<br>Figure 11-1 | Non-associated receivers (photos taken from closest public viewpoint) |
|---|---|---|
| R27 | 19 |  |
| R28 | | No photo taken. Refer to R6, R11 and R35. |
| R29 | | Refer to R18 |
| R30 | | Refer to R23 |
| R31 | | Refer to R23 |
| R32 | 15 |  |
| R33 | 16 |  |
| R34 | | Refer to R32 |

| Receiver ID | Map ID<br>Refer to Figure 11-1 | Non-associated receivers (photos taken from closest public viewpoint) |
|---|---|---|
| R35 | 18 |  |
| R36 | | Refer to R21 and R23 |
| R37 | 5 |  |
| R38 | | Refer to R23 |
| R39 | | Refer to R21 |
| R40 | | Refer to R32 |
| R41 | | Refer to R21 |
| R42 | | Refer to R18 |
| R43 | | Refer to R21 |
| R44 | 3 |  |
| R45 | | Refer to R21 |

| Receiver ID | Map ID<br>Refer to Figure 11-1 | Non-associated receivers (photos taken from closest public viewpoint) |
|---|---|---|
| R46 | | Refer to R18 |
| R47 | | Refer to R49 |
| R48 | | Refer to R4 |
| R49 | 25 |  |
| R50 | | Refer to R18 and R60 |
| R51 | | Refer to R35 |
| R52 | | Refer to R35 |
| R53 | 6 |  |
| R54 | | Refer to R18 and R60 |
| R55 | | Refer to R32 |
| R56 | | Refer to R23 |
| R57 | | Refer to R49 |
| R58 | | Refer to R35 |
| R59 | | Refer R37 |

| Receiver ID | Map ID<br>Refer to Figure 11-1 | Non-associated receivers (photos taken from closest public viewpoint) |
|---|---|---|
| R60 | 11 |  |

# Appendix F Hydrological and Hydraulic Analysis

# Appendix G Aboriginal Cultural Heritage Assessment (ACHA)

# Appendix H Noise Management Plan

# Appendix I Traffic Impact Assessment