ADDENDUM TO STATEMENT OF ENVIRONMENTAL EFFECTS

Project No. 1219
Client: IT Power (Australia) Pty Ltd
Project: Burrundulla Mini Sustainable Energy Park - Lot 6 DP 1069441, Burrundulla

REVIEW OF DEVELOPMENT APPLICATION DA0288/2019 – PPSWES-2

This document is an Addendum to the Statement of Environmental Effects that was prepared to evaluate the proposed Burrundulla Mini Sustainable Energy Park at Lot 6 DP 1069441, No 3B Sydney Road, Burrundulla dated 13 June 2019. The development application for the proposed development was refused by the Western Regional Planning Panel on 21 December 2020 for the following reasons:

1. *The proposed development is considered contrary to the relevant aims of the MWRLEP 2012 in that it is unlikely to conserve the significant visual elements that contribute to Mudgee's setting through the rural character existing along this section of the Castlereagh Highway, the main entry corridor into Mudgee. (s4.15(1)(a)(i));*
2. *The proposed development is considered contrary to the objectives of the RU4 Primary Production Small Lots zone applying to the subject land under MWRLEP 2012, in particular as it does not ensure the availability of land for intensive plant agriculture (s4.15(1)(a)(i));*
3. *The likely visual impact of the proposed development including the mitigation measures proposed is considered unacceptable having regard to the subject land's rural setting and its location on the main entry corridor to Mudgee (s4.15(1)(b));*
4. *As a result of the subject land's rural setting, its high visibility and flat topography and location on the main entry corridor into Mudgee, the site is considered unsuitable for the proposed development (s4.15(1)(c));*

The purpose of this Addendum is to expand upon certain aspects of the proposed development to support an application to review the determination under section 8.3 of the *Environmental Planning and Assessment Act 1979* (EPA Act).

This addendum addresses compliance with the objectives of zone RU4 Primary Production Small Lots, issues raised by Mid-Western Regional Council in the assessment report to the Western Regional Planning Panel, including construction noise impacts and the proposed decommissioning process at the end of life of the solar farm.

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Mid-Western Regional Local Environmental Plan 2012

The property is zoned RU4 Primary Production Small Lots under *Mid-Western Regional LEP 2012* (MWRLEP 2012). The objectives of zone RU4 are:

- *To enable sustainable primary industry and other compatible land uses.*
- *To encourage and promote diversity and employment opportunities in relation to primary industry enterprises, particularly those that require smaller lots or that are more intensive in nature.*
- *To minimise conflict between land uses within this zone and land uses within adjoining zones.*
- *To ensure that land is available for intensive plant agriculture.*
- *To encourage diversity and promote employment opportunities related to primary industry enterprises, particularly those that require smaller holdings or are more intensive in nature.*

The development is defined as ***electricity generating works*** which means a building or place used for the purpose of making or generating electricity. This use is permitted with consent in zone RU4 under *MWRLEP 2012* and by way of Part 3 Division 4 of *State Environmental planning Policy (Infrastructure) 2007*.

The proposal is satisfactory having regard to the statutory framework including the objects of the *EPA Act*, the aims of *MWRLEP 2012* and zone RU4 objectives for the following reasons:

- A rural site close to the township is necessary to allow connection to existing infrastructure to enable power to be directed to Mudgee. As demonstrated by investigations into amenity impacts carried out for the proposed development such as the effects of noise, traffic and the like, and subject to implementation of the recommendations of those studies to mitigate impacts, the development is not expected to impact on the setting of Mudgee and constitutes orderly and economic development.

- The site is located on the Castlereagh Highway on approach to Mudgee, however, the existence of commercial development and a range of land uses including bulky goods, light industry and Council infrastructure means that the proposal would be compatible with the existing landscape and land uses.

- Electricity generating works are an appropriate use in the zone otherwise they would be prohibited. The facility when operational does not emit noise, dust or odours and therefore cannot be in conflict with other primary production activities in the surrounding rural zone. The applicant will provide additional information to demonstrate that impacts on the occupants of dwellings in proximity to the proposal have been addressed such as noise emissions, visual impacts and the effects of glare and glint.

- It is considered that the solar farm can co-exist with existing and future rural residential development. The owners of rural land have a reasonable expectation to be able to develop permissible uses and inhabitants of residential or rural residential zones purchase and build with the knowledge that rural uses exist and will continue to be developed on nearby rural land. The operational lifespan of the development is 35 years. Following decommissioning the land could be made available if necessary for urban expansion.

- The proposal will not prevent future agricultural use of the land upon decommissioning. Farming of the site will continue and the land owner is committed to grazing sheep and lambs beneath and amongst photovoltaic panels - a use that is defined as extensive agriculture and permitted without consent in zone RU4. Elsewhere on the land, intensive agriculture may continue to be carried out.

- Zoning of the land as RU4 is in recognition of Council's preferred use of the land to utilise natural resources, in this case solar energy. The solar farm is appropriate development in a rural area due to the size of the parcel of land that is needed for such projects and the ability to co-locate with ongoing agricultural activities. The solar farm helps to diversify rural activities and farm income and will not conflict with adjoining land uses. This is in addition to the creation of employment for 50 workers for 6 months during the construction phase. Restaurants, cafes, bakeries, supermarkets, pubs, newsagents and accommodation providers would all benefit from the additional custom this will bring.

- The generation of electricity using solar photovoltaic panels is essentially a primary production use that that requires a rural location. The photovoltaic panels harvest sunlight (solar radiation) and convert that resource to electricity in the same way that farming harvests sunlight and water to grow crops. There is no secondary industry or manufacturing involved in the generation of electricity by sunlight. This fact has been accepted by the Western Regional Planning Panel as evidenced by granting consent to the subdivision of land to be occupied by a solar farm to a lot size less than permitted by the relevant environmental planning instrument at Hay and Hillston.

Planning Proposal General Amendment 2019 was exhibited between 24 May and 7 June 2019 prior to lodgement of the development application on 14 June 2019. In accordance with section 4.15 of the EPA Act, the planning proposal was considered in the original SEE submitted with the application. The planning proposal was a review of visually sensitive land and caused an amendment to clause *6.10 Visually sensitive land near Mudgee* of *Mid-Western Regional LEP 2012*. The effect was to map the development site and surrounding land at Burrundulla as visually sensitive. The considerations of clause 6.10 read:

Development consent must not be granted to development on land to which this clause applies unless the consent authority is satisfied that the development:

a) will complement the visual setting forming the backdrop to Mudgee, and

(b) will be designed, set back and sited to respond sympathetically to the landform of the site on which the development is proposed to be carried out and will minimise visual intrusion.

A revised visual impact assessment and amended plans are to be submitted with the application to review the proposal. This visual assessment includes landscaping with native endemic shrubs that will grow to a height of 3 metres setback between security and/or stock fencing and development area boundaries. Additional planting is proposed on all sides of the proposed array to ensure screening from the Castlereagh Highway and any other public places and to better screen the proposal from nearby receptors within the visual catchment of the development site. The proposed screening will ensure that the development is compatible with the visual setting of the entry to Mudgee.

The parts of the site to be used to install rows of PV modules are flat. The drainage line and small farm dam in the centre of the development site is to remain and a setback of 30 metres from modules to the edge of the drainage line is to be incorporated. The array will be setback approximately 200 metres from the Castlereagh Highway and approximately 100 metres from the eastern and southern boundaries to further minimise visual intrusion.

The PV arrays are mounted on a single axis tracking system whereby the panels rotate to remain perpendicular to the sun. The panels will have a horizontal height of 1.64 metres with the peak of the modules reaching an approximate maximum height of 2.75 metres when the array is fully tilted to 60 degrees from horizontal, i.e. in the early morning and late evening. The modules will have a uniform height above natural ground level similar to neighbouring plantings of grapes for wine production.

Solar photovoltaic (PV) panels are constructed of dark, light-absorbing material and covered with anti-reflective coating. In order to maximise the efficiency, the panels are designed to limit reflection and to absorb around 98% of sunlight received. The glare generated from solar panels is significantly lower than many other surfaces, including water. However, the metal frames surrounding panels have the potential to reflect sunlight. In this case and due to the sensitivity of the landscape to visual change, the frames are to be anodized black to minimise potential for reflectivity. The solar farm incorporates non-reflective materials as reflectivity is lost energy and indicative of inefficiency in a solar system. An updated assessment of the potential effects of glare and glint from the panels has been prepared and will also submitted with the application to review the proposal.

Mid-Western Regional Council DCP 2013

Mid-Western Regional Council DCP 2013 applies to all land in Mid-Western LGA. There are no specific development controls for solar farms. Council has suggested using boundary setbacks that apply to rural development generally, however, proposed setbacks would be assessed on merit having regard to the potential visual impact.

Amendment No 4 to the DCP commenced on 21 June 2019 following submission of the development application to Council on 14 June 2019. The purpose of the amendment is to impose restrictions on the development and location of solar farms. A draft DCP is not a statutory consideration for assessment of a development application under section 4.15 of the *EPA Act*. The application for Burrundulla Mini Sustainable Energy Park was lodged prior to the DCP taking effect. Savings provisions meant that the application was to be assessed under *Mid-Western Regional Council DCP 2013* that was in force at the time of lodgement. Further, the applicant (IT Power (Australia) Pty Ltd) nominated that the proposal be assessed against the earlier Amendment 3 to the DCP, therefore, Amendment 4 does not apply to assessment of the proposal to review the development application.

In relation to Amendment No 3 of *Mid-Western Regional DCP 2013*, the proposal does not include any signage. Any existing signage on the property does not relate to the solar farm and is not relevant to the proposal.

Electricity generating works are a type of primary industry and are not industrial development, as no secondary industry or manufacturing is taking place. DCP provisions that apply to industrial development do not apply to the proposed solar farm.

Construction noise impacts

A *Noise Assessment* of the impacts of noise emissions has been carried out by Muller Acoustic Consulting. The findings of the assessment are that construction noise levels have the potential to exceed relevant construction noise management levels at thirteen of thirty receptor locations when works are nearest to those locations. Of these, four receivers are located on the development site and in the same ownership. These four receivers are considered 'project-associated'.

The remaining affected receivers are located at:

- 446 Rocky Waterhole Road,
- 354 Burrundulla Road,
- 328 Burrundulla Road,
- 322 Burrundulla Road,
- 327 Burrundulla Road
- 371 Burrundulla Road,
- 312 Castlereagh Highway,
- 243 Castlereagh Highway, and
- 297 Burrundulla Road.

The assessment finds that the exceedances would be temporary, and of short duration due primarily to piling and trenching activities. However, it is likely that the effect of construction noise at certain receivers would be reduced or made inaudible due to the masking noise from traffic using the Castlereagh Highway.

In order to address these potential noise impacts we are instructed that the applicant would be amenable to prepare a noise management plan and submit that plan to Mid-Western Regional Council prior to the commencement of construction works.

Decommissioning

The expected operating life of the Burrundulla Mini Sustainable Energy Park (excluding the construction and decommissioning phases) is now projected to be 35 years due to technological improvements made in the production of photovoltaic panels.

Upon decommissioning all infrastructure, including cabling and panels and mounting frames including footings and inverters would be disassembled and removed from the site.

The bulk of materials that are used in solar panel manufacturing include glass (75%), aluminium (8%), silicon (5%) and copper (1%). There are also small amounts of silver, tin and lead. These materials are recoverable.

Decommissioning will involve:

- Notification of stakeholders (e.g. Essential Energy, Mid-Western Regional Council) of proposed de-energisation,
- De-energisation of the solar farm and disconnection of assets,
- Removal of PV modules and associated infrastructure,
- Removal of electrical wiring,
- Remediation of land.

Relevant equipment will be brought on to site to facilitate decommissioning, including amenities for site crew for the duration of the works. This equipment may include mobile cranes, excavators, skid steers, loaders, rollers/compactors, pile drivers, telehandlers, skip bins, water carts, temporary shipping containers for storage, site office and site ablution blocks.

Full details of the process are provided in the *Decommissioning Assessment* prepared by IT Power (Australia) Pty Ltd.

Allen Grimwood
Director
Zenith Town Planning Pty Ltd

17 December 2021

STATEMENT OF ENVIRONMENTAL EFFECTS

Lot 6 DP 1069441, No 3B Sydney Road, Burrundulla, NSW

Burrundulla Mini Sustainable Energy Park

Zenith
TOWN PLANNING

sustainable thinking

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Document Details & History

Project number	1219
Project title	Burrundulla Mini Sustainable Energy Park
Document title	Statement of Environmental Effects
Client	IT Power (Australia) Pty Ltd
Author	Allen Grimwood
ABN	11 624 467 349
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1. INTRODUCTION

1.1 Overview

The purpose of this Statement of Environmental Effects is to support an application to Mid-Western Regional Council to develop a solar farm at Lot 6 DP 1069441, No 3B Sydney Road, Burrundulla, referred to as the Burrundulla Mini Sustainable Energy Park. The application is for regionally significant development that needs consent and is to be determined by the Western Regional Planning Panel.

The proposal is for integrated development due to the need to construct a new entry to the site off the Castlereagh Highway. Under section 138 of the *Roads Act 1993* works in, on or over a public road cannot be carried out without the consent of the appropriate roads authority and, in the case of a classified road, without the concurrence of RMS. There are no other separate approvals required to be obtained under section 4.46 of the *Environmental Planning and Assessment Act 1979*.

This Statement has been prepared having regard to pre-lodgement advice provided by Mid-Western Regional Council during discussions held during April and May 2019. Information has also been sourced from the Council's website, the NSW legislation website, SIX Maps, the website of the Office of Environment and Heritage, and the Department of Planning & Environment's Planning Portal. All information referenced in this Statement has been sourced from publicly available documents or websites and from expert reports produced to support the application.

1.2 Scope of the report

The scope of this report is to describe the location and physical characteristics of the site on which the development is proposed, identify relevant provisions of plans and policies applying to the land, and to discuss any potential environmental impacts of the development and proposed servicing arrangements. The purpose of this report is to assist Council's assessment of the proposal against the matters for consideration listed in section 4.15 of the *Environmental Planning and Assessment Act 1979*.

1.3 The proponent

The proponent for the proposed Burrundulla Mini Sustainable Energy Park is IT Power (Australia) Pty Ltd. IT Power (Australia) is a private sector organization based in Canberra and Sydney, which was established in 2003. It is part of the IT Power Group which was formed in 1981 in the UK to bring together specialists in renewable energy, energy efficiency and carbon markets. IT Power offers expertise in renewable energy and energy efficiency, including research, development and implementation, managing and reviewing

government incentive programs, high level policy analysis (including carbon markets), engineering design and project management.

1.4 Justification

Solar energy is energy created by the heat and light of the sun. Solar power is produced when this energy is converted into electricity or used to heat air, water, or other substances. Australia has the highest average solar radiation per square metre of any continent in the world. Despite uncertainty regarding energy policy, the Commonwealth and NSW Governments have recognized the need to supplement energy derived from fossil fuels with energy generated from renewable sources. Alternative energy supply may be sourced from solar photovoltaic, geo-thermal, solar thermal, wave and tidal action, and wind.

The development of solar photovoltaic power is well underway in NSW and across Australia. This growth in the local solar PV sector continues to provide a significant boost for Australia's regional economy with renewable infrastructure development estimated to create upwards of 2,300 direct jobs plus indirect employment. According to the Australian Renewable Energy Agency (ARENA), the deployment of household solar PV that generates about 5 kW is expected to continue and at the same time an increase in rooftop solar PV installations on commercial premises generating around (10-100 kW) is expected. Large scale solar PV is also rapidly expanding in Australia with several solar farms being constructed that will have the capacity to generate over 50MW. The proposed Burrundulla Mini Sustainable Energy Park aims to fill the gap in the mid-sized plants. It will generate 10MW of AC power and contribute to renewable energy supply to supplement electricity generation from coal, oil and gas and assist to reduce reliance on these unsustainable means of supply.

Four alternative sites were considered for development by IT Power (Australia) however, the proposed development site is preferred primarily due to proximity to existing electricity infrastructure and favourable lease arrangements. Other sites considered are described as:

- 27 Bruce Road, Spring Flat (Lot 48 DP 756894),
- 3B Sydney Road, Burrundulla (Lot 4 DP 1069441) – part of same property holding as the preferred development site and in the same ownership,
- Lot 12 DP 445944
- Lot 11 DP 1051504

The proposed development is in accordance with relevant objects of the *Environmental Planning and Assessment Act 1979* in that it will assist to generate power to be distributed to the residents of NSW thereby promoting the social and economic welfare of the community in a manner that manages and conserves natural resources. The Burrundulla Mini Sustainable Energy Park will further the goals of sustainability, and the orderly and economic use of land.

2. SITE DESCRIPTION AND CONTEXT

2.1 Description

The site of the proposed development is described as Lot 6 DP 1069441, No 3B Sydney Road, Burrundulla, NSW. It is located approximately 5 kilometres south-west of the town centre of Mudgee and is an irregular shape with an area of approximately 63.8 hectares.

The north-eastern boundary fronts the Castlereagh Highway. Existing access to the site is located at the north-western corner fronting the Castlereagh Highway. Business signage has been erected along the highway frontage. A 22kV power line runs along the highway boundary within a 20 metre wide easement within the development site. This line connects to the Essential Energy Mudgee Zone substation.

The location of the site is shown in Figure 1 below. The site is shaded yellow.

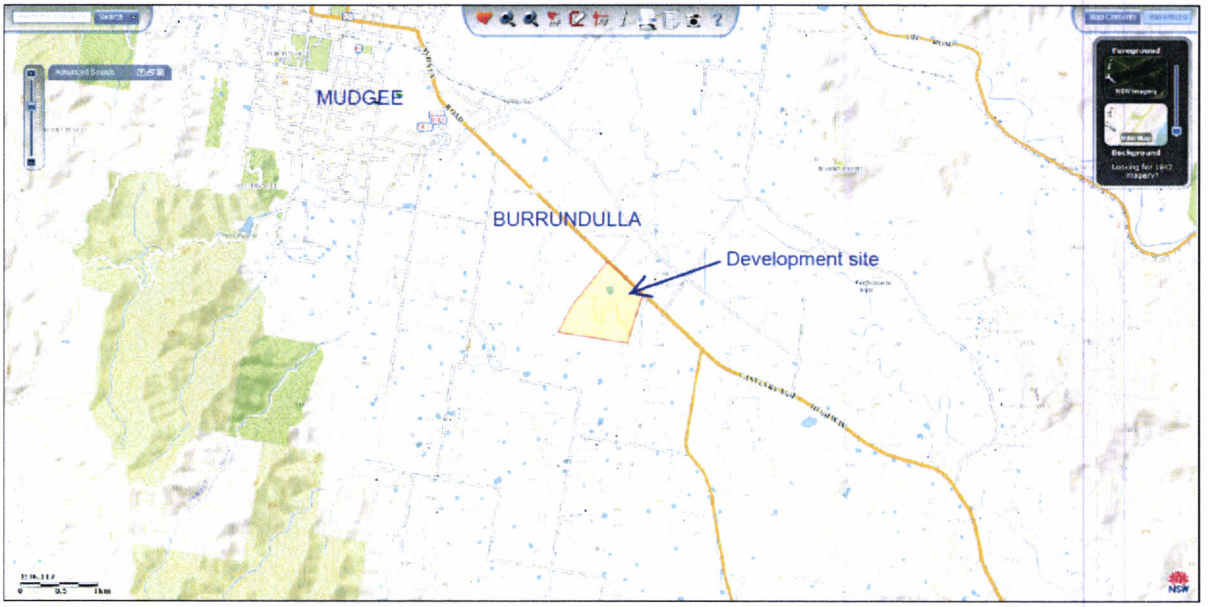

Figure 1: Locality map. Source: SIX Maps, 2019

The site has been fully cleared in the past for grazing other than seven paddock trees scattered across the lot. A farm dam is located towards the northern corner. The topography is flat and there are no structures on the site other than the dam.

2.2 Context

The site and surrounding countryside is generally flat with gentle undulations to the south-east. Steep ranges are to the north-east and south-west of the site.

The site is not mapped as being bushfire prone land.

Land surrounding the development site is predominantly farmland used for cropping, grazing and viticulture. Rural dwellings are located on properties to the west and south and to the north of the Castlereagh Highway. The nearest dwelling is located approximately 97 metres to the south of the development site boundary at the closest point.

Burrundulla Wines cellar door and vineyards occupy the property to the west. A plant nursery is located on property directly opposite the development site to the north of the highway (recently closed).

An aerial image of the site and surrounding land is shown in Figure 2 below. The site is shaded yellow.

Figure 2: Aerial image dated November 2011. Source: SIX Maps, 2019

Below are photographs of the property that show land uses and existing development on the site and adjoining land. All photographs were taken in May 2019 by Zenith Town Planning Pty Ltd.

Plate 1: Looking towards the development site from the existing entry

Plate 2: Looking across the development site towards Burrundulla Wines cellar door

Below is an extract from the topographic map for land in the vicinity of Mudgee. This map shows the location of the settlement, services including transport infrastructure, dams, cadastre and waterways. The development site is 6.8 kilometres south of Mudgee Airport.

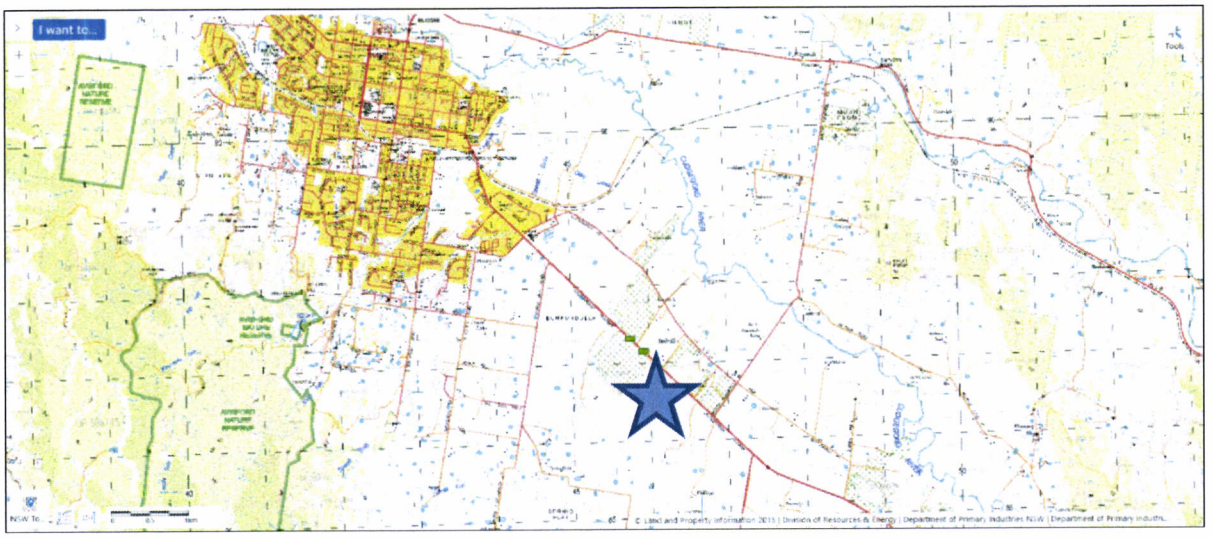

Figure 3: Extract from the topographic map. Source: Land & Property Information 2015

2.3 Climate

Global solar exposure is described on the Bureau of Meteorology website as being the total amount of solar energy falling on a horizontal surface. The daily global solar exposure is the total solar energy for a day. Typical values for daily global solar exposure range from 1 to 35 MJ/m^2 (megajoules per square metre). The values are usually highest in clear sunny conditions during the summer, and lowest during winter or very cloudy days.

Figure 4 below shows average daily solar exposure for the 12 month period 1 May 2018 to 30 April 2019. Mid-Western LGA has received an average of between 16 and 20 MJ/m^2 each day, placing it within the second highest area receiving solar radiation in Australia.

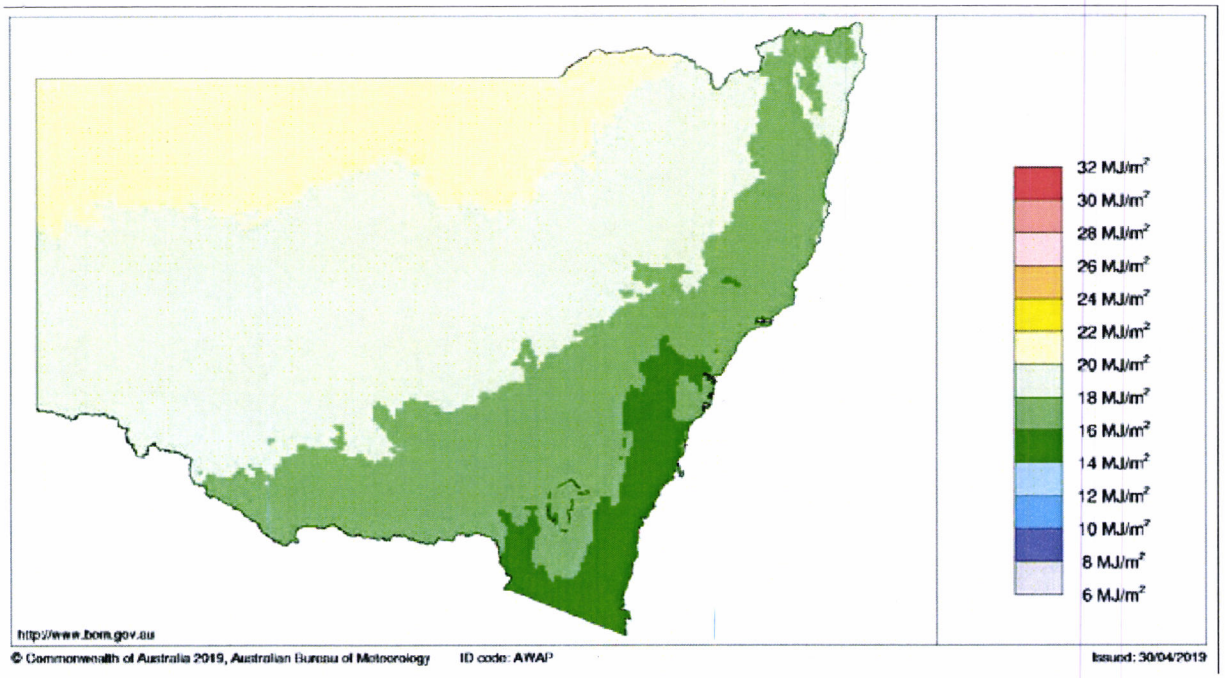

Figure 4: Average daily solar exposure. Source: Australian Bureau of Meteorology

The mean monthly global solar exposure measured at Mudgee Airport, the closest measuring station to the Burrundulla Mini Sustainable Energy Park site, is given in Table 1 below. The annual average for 2018 was 18.2MJ/m^2.

Table 1: Mean monthly global solar exposure at Mudgee Airport, 2018

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Monthly mean	25.5	22.0	20.0	16.4	12.0	10.0	11.5	13.6	17.8	20.9	22.3	27.0

The map below (Figure 5) shows the average daily hours of sunshine across Australia. Mid-Western LGA receives and average of 7 to 8 hours of sunshine each day.

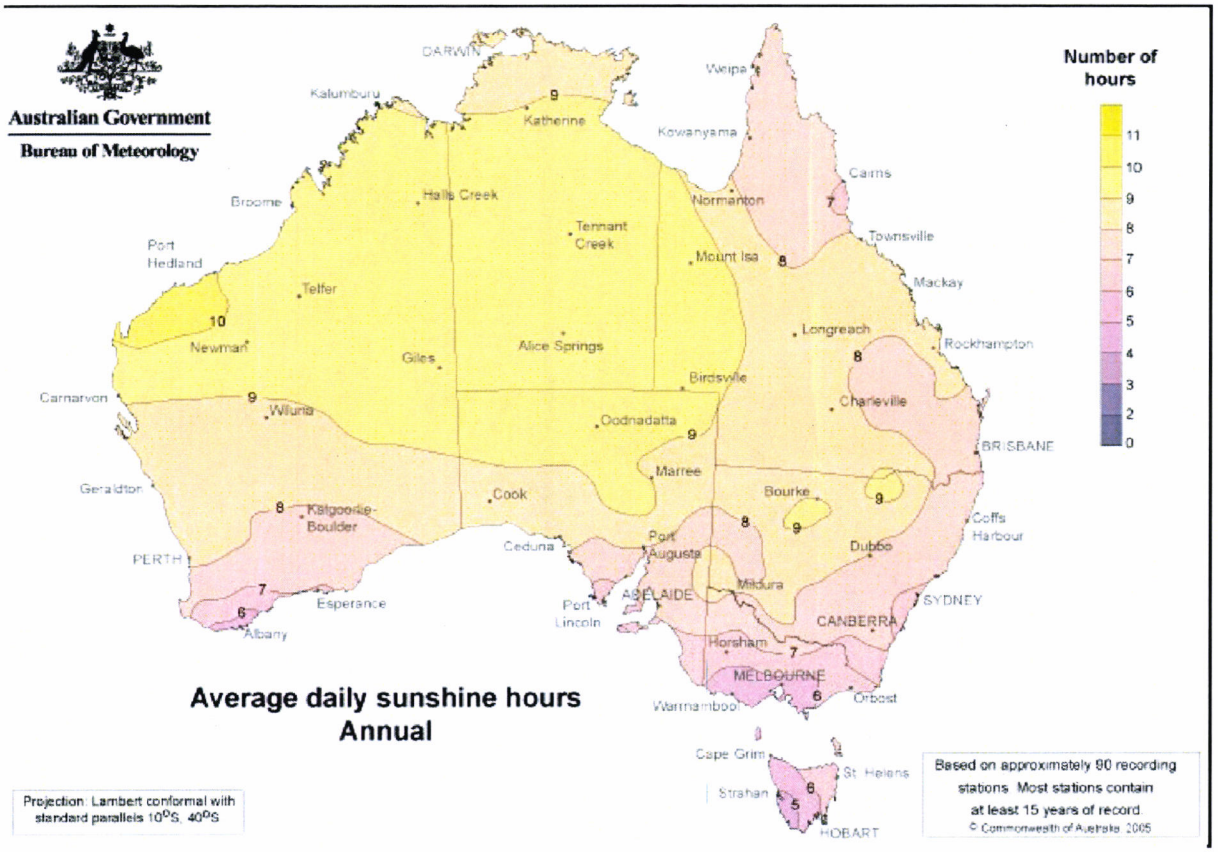

Figure 5: Average daily sunshine hours. Source: Australian Bureau of Meteorology

The global solar exposure coincides with seasons – the longer the daylight hours the greater the solar radiation due to the tilt of the earth during summer months. Rainfall is spread relatively evenly across the year and so does not appear to impact on the level of solar radiation.

Solar exposure estimates are important for a wide range of applications, including for agriculture, power generation and solar heating system design and use. This climatic information sourced from the Australian Bureau of Meteorology indicates that the global solar exposure, or solar radiation, is sufficient to support power generation in the proposed location which benefits from existing grid infrastructure such as the 22kV power line running through the site which connects to Mudgee Zone substation.

3. DETAILS OF THE PROPOSED DEVELOPMENT

3.1 Overview

The proposed Burrundulla Mini Sustainable Energy Park is to be located at 3B Sydney Road in the locality of Burrundulla which is south-east of the town of Mudgee. The site is approximately 63.8 hectares that is currently used for grazing. A lease agreement is being negotiated with the land owner with the intention of constructing a solar farm with a DC array capacity of 12.1MW and an AC output of 10MW. It would be capable of generating 25.96GWh annually.

The array is proposed to be placed within a 27 hectare section of the development site as two separate systems each with an AC output of 5MW. System A is to occupy an area of 12.7 hectares at the west of the development area and System B will occupy 14.2 hectares at the east of the development area. Each system will be setback 40 metres either side of a drainage line that runs south to north through the centre of the property. Paddock trees that are scattered across the property will need to be removed to enable placement of the arrays. The solar farm is to connect to the 22kV which feeds into the Mudgee substation. Any power not consumed by the town would flow into the grid.

Details of the layout and specifics of the development are show on the General Arrangement plan submitted with the development application (Drawing No MUD3C-G-210).

3.2 Photovoltaic panels

There are proposed to be approximately 31,000 solar modules installed on 374 mounting structures running north to south, Each row of solar photovoltaic modules will be 88.6 metres long and 2 metres wide and oriented north to south. There is approximately 6 metres spacing between each row.

The arrays are to be setback variable distances to a security fence surrounding the arrays. Minimum setbacks are 6.9 metres at the eastern boundary for System B, 11.8 metres to the southern security fence and 6.9 metres to the western fence of System A, and 10 metres to the northern security fence for both systems. The security fence and elsewhere a stock fence is to be setback 15.6 metres from the Castlereagh Highway road reserve and 6 metres from the development area perimeter on other sides. The arrays are proposed to be a total of 109.4 metres from the highway road reserve allowing for the 6 metres of landscaping, separation of 99.4 metres between stock fencing and security fencing, and a 10 metre setback from the arrays to the security fence.

Each row of PV modules will rotate to track the sun across the sky from east to west each day. The hub height of each tracker is 2 metres with the peak of the modules reaching an approximate height of 2.6 metres when the array is fully tilted to 60 degrees from horizontal, i.e. in the early morning and late evening.

3.3 Inverters and battery storage

Two 5MW AC inverter stations will be installed at the solar farm. These inverters are to be located within the arrays and are each mounted on a 6 metre long skid. Each of these inverter stations incorporates high and medium voltage switchgear and transformers. Each will connect by way of underground cables to connect to the 22kV power line at the north-eastern end of the development site which then connects to the Mudgee Zone substation. Dial-before-you-dig investigations have been carried out.

3.4 Services

Reticulated water and sewer services are not required to be provided to the solar farm as there are no permanent offices or amenities proposed on site. Maintenance workers would not be required to remain on site. Cleaning of the PV panels would be carried out on an annual basis to maximise the performance of the system. This is done using water brought into the site and a sponge mop.

Vehicle access to the site would be by way of an existing gate located at the north-western corner of the site off the Castlereagh Highway. This will be upgraded to a driveway entrance able to accommodate both heavy and light commercial vehicles. During the construction stage there is estimated to be eight semi-articulated trucks per day accessing the site to deliver PV panels, mounting frame equipment and inverters plus construction machinery to grade the accessways and erect the mounting system. Internal site access roads are proposed within the arrays.

In addition, car parking will be needed to cater for construction workers. Temporary car parking areas are to be sited at the northern edge of the array of panels for System A and along the western edge of panel arrays for System B. Materials laydown areas are located at the south-western and south-eastern corners of the development areas that will be accessed by 6 metre wide roads.

3.5 Construction

The mounting system for the PV panels is constructed on piles that are driven into the ground using a vibrating pile driver. The piles will be driven approximately 1.2 to 3.5 metres into the ground, the depth to be confirmed by a geotechnical/structural engineer.

During construction there is expected to be 50 personnel on site working from 7.00 am – 4.00 pm Monday to Friday. The construction is expected to take six months. Should it be necessary to carry out work outside these hours then activities would be limited to those generating low noise emissions.

Once operational the site will be unmanned. Maintenance is expected to be carried out quarterly by a crew of two to three people.

3.6 Landscaping

Landscaping is proposed around the perimeter of the site after installation of the panel arrays to provide a visual screen for the occupants of nearby rural dwellings as well as motorists travelling along the Castlereagh Highway. Screening is not required where there is an existing row of trees along the western boundary.

It is proposed to plant native shrubs endemic to the Mudgee locality that will grow to a maximum height of 2 to 2.5 metres and to provide 5 metres separation between each plant. Proposed plants include acacia and grevillea that are well suited to the local acid soils, and white and yellow box eucalypts where these will not cause shading of PV panels. Plants will be staggered to create an effective screen within a six metre setback between the security or stock fencing and the development area boundary. Plantings will be maintained and watered by maintenance crew on a regular basis. A separate stock fence will be placed along the boundary to prevent sheep and cattle from destroying the screen plantings. If considered necessary by Council shade cloth can be placed on the security fence until such time as the shrubs are mature.

Land that is disturbed during construction of the solar farm and not to be used for access or other maintenance purposes will be sown with native grasses following completion of construction. Planting will also assist to minimise site disturbance and contribute to the rural landscape and character of the area.

3.7 Security

Arrays within the Burrundulla Mini Sustainable Energy Park is to be enclosed within 1.8 metre high security fencing set within the boundaries and surrounding the array. The proposed fence is to be green coated chain mesh steel topped with three rows of barbed wire giving a total height of 2.1 metres similar to that shown in Plate 3 below. Elsewhere a stock fence is to enclose the development area. As mentioned above, a six metre wide row of trees is to be planted on external side of the fencing. Consideration has been given to placing shade cloth on the fence to provide additional screening. Council may wish to impose a condition of consent requiring the shade cloth.

3.8 Decommissioning

The Burrundulla Mini Sustainable Energy Park is intended to remain in operation indefinitely in order to contribute to sustainable electricity power supply to the state of NSW. If, however, circumstances change and it is necessary to decommission the farm in around 20 to 25 years then all infrastructure, panels, cables, mounting frames including footings and inverters would be disassembled and removed from the site. All gravel surfacing of accessways would be removed unless required for a future use. The site may then return to an agricultural use. If necessary, Council may impose a condition of consent that requires a decommissioning plan to be prepared and approved prior to the event.

Plate 3: Example of security fencing

4. STATUTORY FRAMEWORK

4.1 Environmental Planning and Assessment Act 1979

The *Environmental Planning and Assessment (EPA) Act 1979* is the principal piece of legislation governing the use and development of land in NSW. The objects of the Act are:

(a) *to promote the social and economic welfare of the community and a better environment by the proper management, development and conservation of the State's natural and other resources,*
(b) *to facilitate ecologically sustainable development by integrating relevant economic, environmental and social considerations in decision-making about environmental planning and assessment,*
(c) *to promote the orderly and economic use and development of land,*
(d) *to promote the delivery and maintenance of affordable housing,*
(e) *to protect the environment, including the conservation of threatened and other species of native animals and plants, ecological communities and their habitats,*
(f) *to promote the sustainable management of built and cultural heritage (including Aboriginal cultural heritage),*
(g) *to promote good design and amenity of the built environment,*
(h) *to promote the proper construction and maintenance of buildings, including the protection of the health and safety of their occupants,*
(i) *to promote the sharing of the responsibility for environmental planning and assessment between the different levels of government in the State,*
(j) *to provide increased opportunity for community participation in environmental planning and assessment.*

The objects of the EPA Act are intended to guide land planning and management. Section 4.15 of the Act lists matters for consideration when assessing and determining an application for development.

4.2 State Environmental Planning Policies

4.2.1 State Environmental Planning Policy No 55 – Remediation of Land

SEPP 55 requires Council to consider whether land is contaminated and to determine whether the proposed use is suitable with or without contamination. Council can require an applicant for development to conduct a preliminary investigation and a subsequent more detailed investigation if warranted. Where contamination exists and remediation is necessary, Council must be satisfied that the remediation will take place before the land is used for the proposed purpose. It is noted that should the preliminary investigation identify contamination on the site then the NSW *Contaminated Land Planning Guidelines* apply to subsequent investigations.

The property has been cleared and farmed for many years and is not known to be listed on a Council register of potentially contaminated land. There has been no known historical usage that would cause the land to be contaminated. The use of farm chemicals such as pesticides and fertilisers is not considered to contaminate soils to the extent that mediation is required. It is considered that a preliminary investigation is not required for the development of a solar farm.

4.2.2 State Environmental Planning Policy (Infrastructure) 2007

The aims of *SEPP (Infrastructure) 2007* are to ensure a consistent and flexible planning system to facilitate the delivery of services. The policy identifies environmental assessment categories for types of infrastructure, matters to consider when assessing development adjacent to infrastructure and provides for consultation with relevant public authorities. The policy applies to the whole of NSW. *SEPP (Infrastructure)* contains provisions relating to approval processes and assessment requirements for infrastructure proposals according to the type or sector of infrastructure. It outlines land use zones where types of infrastructure are permissible with or without consent and identifies certain works as exempt and complying development.

Part 3 Division 4 of the policy relates to electricity generating works or solar energy systems. Section 34 enables Development for the purpose of electricity generating works to be carried out by any person with consent on any land in a prescribed rural, industrial or special use zone. Zone RU4 Primary Production Small Lots is a prescribed rural zone. Similarly, development for the purpose of a solar energy system may be carried out by any person with consent on any land, although this is limited to no more than 100kW in a prescribed residential zone. The proposed development is located in zone RU4 Primary Production Small Lots and is therefore permitted with consent by *SEPP (Infrastructure) 2007*.

4.2.3 State Environmental Planning Policy (Rural Lands) 2008

SEPP (Rural Lands) 2008 applies to all rural LGAs including Mid-Western Regional Council area. This policy sets out *Rural Planning Principles* and *Rural Subdivision Principles* to implement measures that are intended to reduce land use conflicts and to identify State significant agricultural land.

The development site is not listed in a schedule to the policy as being state significant agricultural land.

4.2.4 State Environmental Planning Policy (State and Regional Development) 2011

Development that is state and regionally significant is identified in *SEPP (State and Regional Development) 2011*. Electricity generating works including solar farms which have a capital investment value of more than $30 million, or a capital investment value of more than $10 million and are located in an environmentally sensitive area of State significance, are declared state significant development. Private infrastructure, including electricity generating stations, that have a capital investment value of over $5 million are declared regionally significant. In this case the proposed development has a CIV of over $5

million and is regionally significant. The application will be determined by the Western Regional Planning Panel.

4.3 Local Environmental Plans

4.3.1 Mid-Western Local Environmental Plan 2012

The property is zoned RU4 primary Production Small Lots under *Mid-Western LEP 2012*. The objectives of zone RU4 are:

- *To enable sustainable primary industry and other compatible land uses.*
- *To encourage and promote diversity and employment opportunities in relation to primary industry enterprises, particularly those that require smaller lots or that are more intensive in nature.*
- *To minimise conflict between land uses within this zone and land uses within adjoining zones.*
- *To ensure that land is available for intensive plant agriculture.*
- *To encourage diversity and promote employment opportunities related to primary industry enterprises, particularly those that require smaller holdings or are more intensive in nature.*

The development is defined as ***electricity generating works*** which means a building or place used for the purpose of making or generating electricity. This use is permitted with consent in zone RU4.

The site is not mapped as being environmentally sensitive in the *Sensitivity Biodiversity Map* that accompanies *Mid-Western LEP 2012* and is not affected by land reservation acquisition provisions of the LEP. It is not mapped as being sensitive on the *Flood Planning Map* or the *Visually Sensitive Land Map*. It is mapped as being groundwater vulnerable on the *Groundwater Vulnerability Map*.

It is not a listed heritage item or within a heritage conservation area and is not adjoining or adjacent a property that is listed as a heritage item in *Schedule 5 Environmental heritage* of *Mid-Western LEP 2012*.

A development standard of 5 hectares applies for a minimum lot size for subdivision for a dwelling, or 2 hectares if the land is serviced with reticulated water.

The following clauses of *Mid-Western LEP 2012* apply to the proposed development:

Clause 6.1 Salinity

The objective of this clause is to provide for the appropriate management of land that is subject to salinity and the minimisation and mitigation of adverse impacts from development that contributes to salinity. Where a development is proposed that may affect the process of salinization or is proposed to be carried out on land affected by groundwater salinity, Council is required to consider any potential impacts on processes,

whether salinity will impact on the development and proposed measures to avoid, mitigate or minimize impacts.

The issue of salinity is addressed in the groundwater assessment and findings are summarized in section 5.3 Water Resources. The primary area of salinity on the development site occurs within the drainage line that runs south to north and around the existing dam. No development is proposed within a 40 metre buffer either side of the drainage line.

Clause 6.3 Earthworks

The objective of this clause is to ensure that earthworks for which development consent is required will not have a detrimental impact on environmental functions and processes, neighbouring uses, cultural or heritage items or features of the surrounding land.

Development consent is required for earthworks unless the earthworks are ancillary to development for which development consent has been given. In deciding whether to grant development consent for development involving ancillary earthworks, the consent authority must consider:

(a) *the likely disruption of, or any detrimental effect on, drainage patterns and soil stability in the locality of the development,*
(b) *the effect of the development on the likely future use or redevelopment of the land,*
(c) *the quality of the fill or the soil to be excavated, or both,*
(d) *the effect of the development on the existing and likely amenity of adjoining properties,*
(e) *the source of any fill material and the destination of any excavated material,*
(f) *the likelihood of disturbing relics,*
(g) *the proximity to, and potential for adverse impacts on, any waterway, drinking water catchment or environmentally sensitive area,*
(h) *any appropriate measures proposed to avoid, minimise or mitigate the impacts of the development.*

Earthworks associated with the development comprise minor excavation to 150mm to install road base for accessways, 750mm footings for the inverters and security fence strainer posts, 1,000mm footings for the access gate and 1,500mm footings for the panel mounting frames. Cable trenching of 600mm for low voltage cables and 1,200mm deep trenching is also to be carried out. All of these earthworks are ancillary to the development of a solar farm and are not expected to impact adversely on drainage, future use of the land if the facility is decommissioned, relics, the natural environment or adjoining developments.

Clause 6.4 Groundwater vulnerability

The objectives of this clause are to maintain the hydrological functions of key groundwater systems, and to protect vulnerable groundwater resources from depletion and contamination as a result of development.

Council is required to consider the potential for groundwater contamination due to the proposed development, adverse impacts on groundwater dependent ecosystems, cumulative impacts and proposed measures to avoid, mitigate or minimize impacts.

The development site is mapped as being groundwater vulnerable. This issue is addressed in the groundwater assessment and findings are summarized in section 5.3 Water Resources.

Clause 6.9 Essential services

This clause requires a consent authority to be satisfied that any of the following services that are essential for the development are available or that adequate arrangements have been made to make them available when required:

(a) the supply of water,
(b) the supply of electricity,
(c) the disposal and management of sewage,
(d) stormwater drainage or on-site conservation,
(e) suitable vehicular access.

The supply of water and sewerage services is not required for the proposed development. Electrical services are available to the site. Stormwater management is proposed to be addressed by controls recommended in this Statement with full details to be provided with the application for a construction certificate. Adequate vehicular access is proposed by way of an existing entrance to the site off the Castlereagh Highway.

6.10 Visually sensitive land near Mudgee

The objective of this clause is to protect the visually and environmentally significant upper slopes on the urban fringe south of the town of Mudgee. It applies to land shown as "Visually Sensitive Land" on the *Visually Sensitive Land Map*. To grant development consent, the consent authority must be satisfied that the development will complement the visual setting forming the backdrop to Mudgee, will be located to avoid visibility above ridgelines and any visual intrusion will be minimised. The development site is not currently mapped as being visually sensitive.

4.3.2 Planning Proposal General Amendment 2019

Planning Proposal General Amendment 2019 is on exhibition between 24 May and 7 June 2019. It is a review of visually sensitive land and will cause an amendment to clause *6.10 Visually sensitive land near Mudgee* of *Mid-Western LEP 2012*. The effect will be to map the development site and surrounding land at Burrundulla as visually sensitive. It will also amend clause 6.10 to read:

Development consent must not be granted to development on land to which this clause applies unless the consent authority is satisfied that the development:

- *incorporates appropriate measures to minimise any adverse visual impact on the landscape;*
- *will be screened from view from the Castlereagh Highway and other public places by existing vegetation or by planting indigenous vegetation;*
- *the development will be designed and sited to respond sympathetically to the land form of which it will form a part;*
- *the development will use unobtrusive and non-reflective materials to blend structures into the natural environment; and*
- *the development will incorporate appropriate measures to minimise the reflection of sunlight from glazed surfaces.*

These considerations are addressed in section *5.4 Visual and scenic amenity* of this Statement.

4.4 Development Control Plans

Mid-Western Regional Council DCP 2013 applies to all land in Mid-Western LGA. There are no specific development controls for solar farms. Council has suggested using boundary setbacks that apply to rural development generally, however, proposed setbacks would be assessed on merit having regard to the potential visual impact.

A draft DCP has been exhibited by Mid-Western Regional Council that aims to impose restrictions on the development and location of solar farms. A draft DCP is not a statutory consideration for assessment of a development application under section 4.15 of the *EPA Act*. The application for the Burrundulla Mini Sustainable Energy Park has been lodged prior to the draft DCP taking effect. Savings provisions mean that the application is to be assessed under *Mid-Western Regional Council DCP 2013* that is in force at the time of lodgement.

4.5 Land use strategies

4.5.1 Mid-Western Regional Comprehensive Land Use Strategy

The *Mid-Western Comprehensive Land Use Strategy* was prepared by parsons Brinckerhoff Australia Pty Ltd in August 2010. The purpose of the strategy was primarily to inform the *Mid-Western LEP 2012*, and also to provide direction for *Mid-Western Regional Council DCP 2013* and identify sites that should be subject to further investigation to determine optimum land uses.

The strategy contains mapping of opportunities and constraints for rural land surrounding Mudgee. A '*5 kilometre offset area*' around the township is identified as having potential for rural lifestyle development.

The development site is located within this offset area but is not within an area nominated for short, medium, or long term rural lifestyle development. Neighbouring and surrounding land remains zoned rural.

4.5.2 Central West and Orana Regional Plan

The *Central West and Orana Regional Plan 2036* was released in June 2017. It establishes a framework for growth over the next 20 years for the Central West and Orana Region. The Mid-Western Regional Council area is located within the Orana district being the upper part of the region. Economic opportunities identified in the plan include renewable energy generation to promote local jobs in small communities and development opportunities for associated industries. It is stated on page 15 of the plan that *the large open plains of Orana provide the best access for solar energy generation*.

A series of goals, directions and actions are to guide land use planning priorities and decision-making. The plan aims to develop the region as *the most diverse regional economy in NSW*. Direction 9 is to increase renewable energy generation. Action 9.1 is to ident*ify locations with renewable energy generation potential and access to the electricity network*. In the case of the proposed Burrundulla Mini Sustainable Energy Park, IT Power have identified the development site as being suitable in terms of existing power infrastructure to enable connection and proximity to the township of Mudgee in order to directly generate power for use by the local community. Action 9.2 is to *facilitate small-scale renewable energy projects using ... solar ... through local environmental plans*.

5. ENVIRONMENTAL EFFECTS

5.1 Biodiversity

5.1.1 Methodology

A desktop biodiversity assessment has been carried out to determine the impact on threatened species and endangered ecological communities. This is supported by a site survey carried out on 24 May 2019. The following sources of information and data have been used to determine whether any threatened species or endangered ecological communities occur on or near the site:

- SIX Maps aerial imagery dated November 2011,
- Sensitive Biodiversity mapping of *Mid-Western LEP 2012*,
- BioNet Atlas of Living Australia,
- Mapping by the NSW Office of Environment and Heritage (Central West Lachlan vegetation mapping, Native Vegetation Regulatory Map, Biodiversity Values Map)
- Schedules to the *Biodiversity Conservation Act 2016,* and
- Protected Matters Report of the *Environment Protection and Biodiversity Act 1999*.

5.1.2 Mid-Western LEP 2012

Lot 6 DP 1069441 is not shown as being affected by biodiversity on the *Sensitive Biodiversity Map* of *Mid-Western LEP 2012* as shown in Figure 6 below.

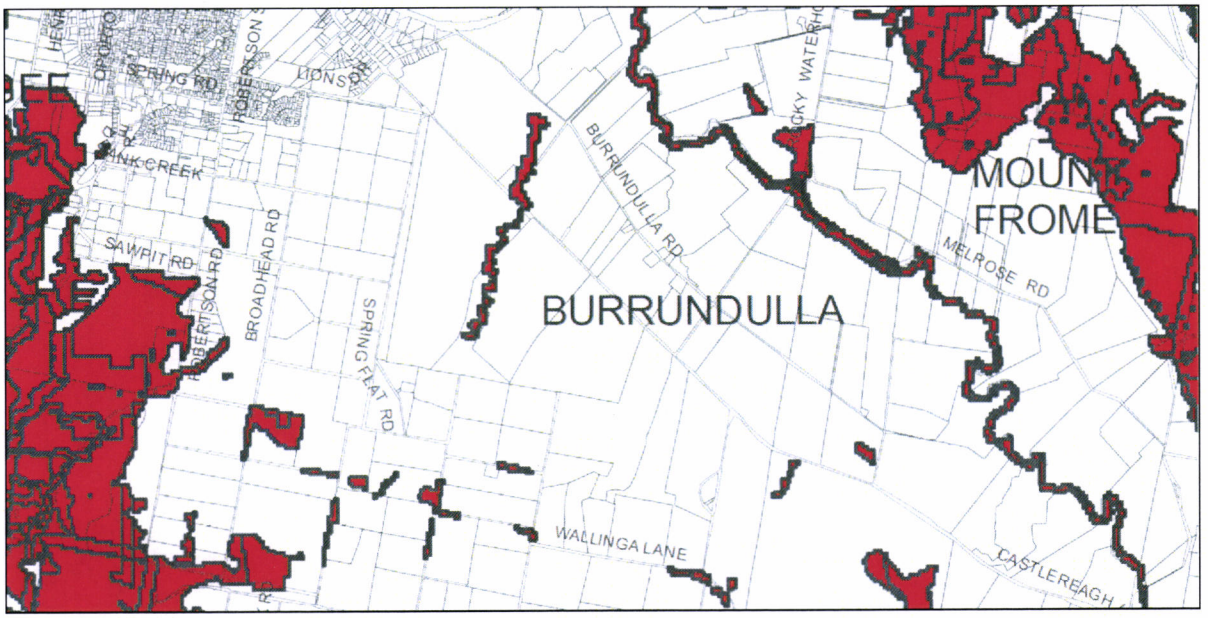

Figure 6: Extract from Mid-Western LEP 2012 Sensitive Biodiversity Map Sheet BIO_006

5.1.3 Significant flora

Species

A search of the BioNet Atlas within a 10 km radius surrounding the site revealed records for six threatened flora species with the nearest record about 2 kilometres from the development site. An *EPBC Act* Protected Matters Search Report showed nine *EPBC Act* listed threatened flora species as being predicted for the locality (report appended as Attachment B). The likelihood of occurrence of these species, within and adjacent to the subject land, is assessed under section 5.1.5 below.

Native vegetation /ecological communities

On site

A search of datasets maintained by OEH was carried out to produce a map of vegetation communities on the development site and surrounding land. These are shown in Figure 7 below. Ground-truthing of this mapping under the current assessment showed the land to be under cultivation and therefore it is classified as cleared land (non-native vegetation), rather than PCT 796 Derived Grassland of the NSW South West Slopes, as shown in the mapping of Figure 7.

A sparse cover of native grasses persists in limited areas, among exotic dominated pasture grasses and weeds. A total of seven native paddock trees persist throughout the subject land. None of these have sufficient native cover to enable them to be classified as native vegetation (under either the *Biodiversity Conservation Act 2016* or the *EPBC Act*).

A row of planted tress occurs within the subject land along part of the western boundary, which is not considered to represent native vegetation.

Off site

A search of the Bionet Atlas also found potentially five endangered ecological communities in the search area. These are:

- Coolac-Tumut Serpentinite Shrubby Woodland in the NSW South Western Slopes and South Eastern Highlands Bioregions
- Fuzzy Box Woodland on alluvial Soils of the South Western Slopes, Darling Riverine Plains and Brigalow Belt South Bioregions
- Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Peneplain, Nandewar and Brigalow Belt South Bioregions

- Tablelands Snow Gum, Black Sallee, Candlebark and Ribbon Gum Grassy Woodland in the South Eastern Highlands, Sydney Basin, South East Corner and NSW South Western Slopes Bioregions
- White Box Yellow Box Blakely's Red Gum Woodland ('Box Gum Woodland')

About 50 metres to the south-east of the subject land there is a small patch of native vegetation, comprising remnant trees with a modified/grazed understorey. It is likely to comprise Box Gum Woodland (an endangered ecological community under the *Biodiversity Conservation Act 2016* and a critically endangered ecological community under the *EPBC Act*), however, its distance from the site is considered too great to be potentially impacted.

The roadside vegetation adjacent to the subject land comprises exotic dominated pasture grasses and weeds, with only a handful of native remnant trees persisting along roadsides.

5.1.4 Significant fauna

The BioNet search showed records of 23 threatened or migratory fauna species within a 10 km radius of the site (complete list appended as Attachment A). Groups comprised:

- 13 threatened birds
- 5 migratory birds
- 5 threatened mammals.

An *EPBC Act* Protected Matters Search Report showed various other threatened and migratory species as predicted for the locality (report appended in Attachment B).

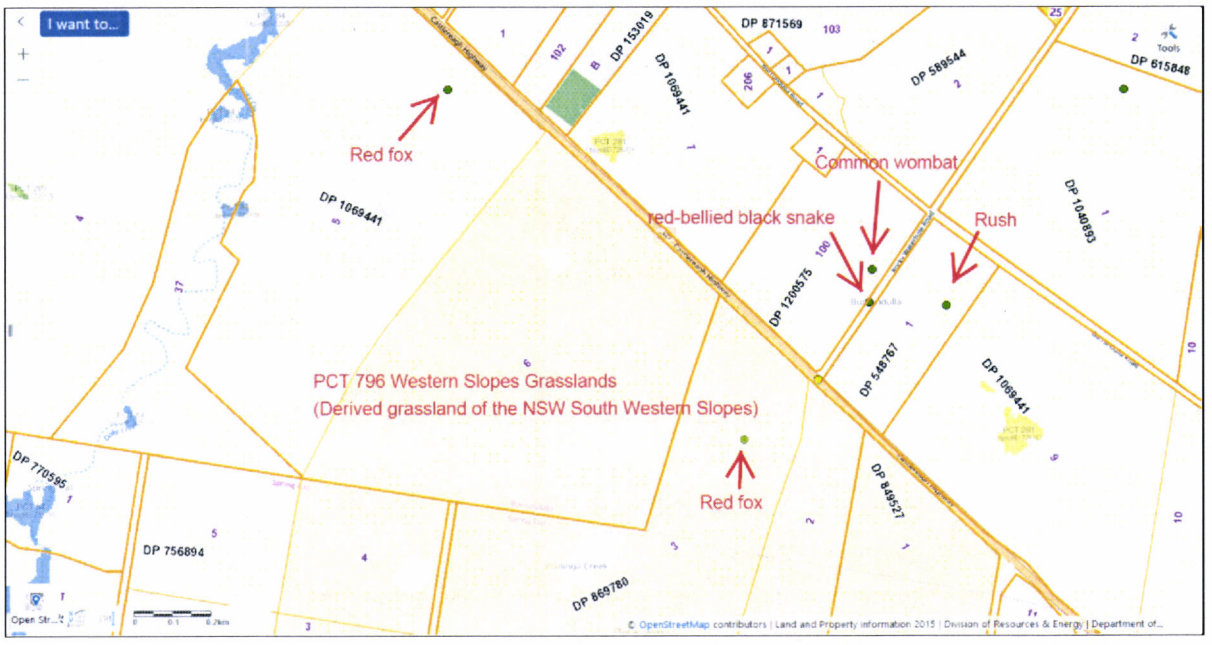

Figure 7: Recorded vegetation communities and species sightings. Source: OEH 2019

5.1.5 Likelihood of occurrence assessment

Potential direct impacts

Given that the part of the site to be developed as a solar farm has been fully cleared and used for the cultivation of crops for many years, it does not contain any habitat value for threatened or migratory fauna species. Seven remnant native paddock trees persist on site, three of which would be cleared under the proposal. As shown in Figure 7, no threatened or migratory species or ecological communities have been recorded on or directly adjacent to the development site. It is unlikely that any threatened flora species (including their seed banks) would be present within or directly adjacent to the development site due to historical and current land use.

Potential indirect impacts

As previously mentioned, a small patch of modified vegetation (remnant trees, grazed understorey), likely comprising Box Gum Woodland EEC/CEEC, is present about 50 metres away from the south-eastern corner of the site. This distance is considered a sufficient buffer from potential impacts associated with the proposal.

5.1.6 Biodiversity Values Map

The Biodiversity Values Map is given in Figure 8 below. This map identifies land with high biodiversity value as defined by clause 7.3(3) of the *Biodiversity Conservation Regulation 2017*. The Biodiversity Offsets Scheme applies to all clearing of native vegetation and other biodiversity impacts prescribed by the regulation on land identified on the map. The Biodiversity Offsets Scheme is used to determine whether the Biodiversity Assessment Method is to be used to assess the impacts of a development proposal and applies to local development.

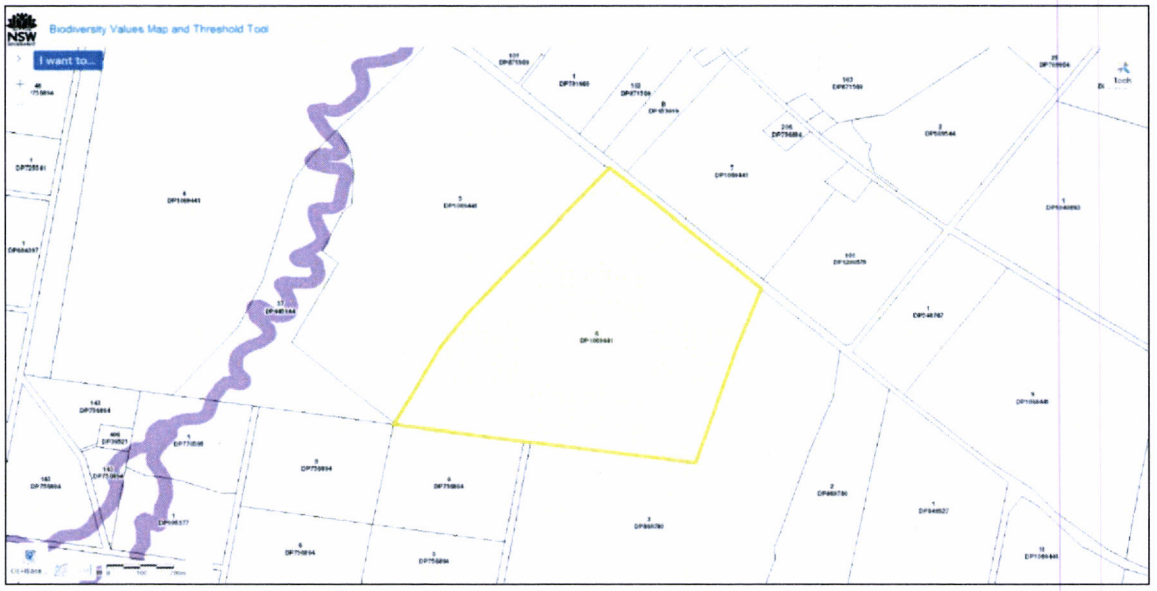

Figure 8: Biodiversity Values Map. Source: OEH, 2019

The scheme is triggered based on threshold levels of clearing comprising the land area to be cleared and whether the area is mapped on the Biodiversity Values Map. In this case Lot 6 is not mapped as being of high biodiversity value. In this case a minimum lot size of 5 hectares (or 2 hectares with reticulated water) applies to Lot 6. The threshold for clearing of native vegetation above which the Biodiversity Assessment Method applies is 0.5 hectares or more. It is proposed to remove paddock trees so that the panel arrays may be erected, therefore, it is not necessary to engage an accredited assessor to determine the offsets required to enable the project to proceed.

5.1.7 Biodiversity Conservation Act 2016 Test of Significance

A test of significance under section 7.3 of the *Biodiversity Conservation Act 2016* is required to be carried out for local development proposals that do not exceed the Biodiversity Offsets Scheme threshold. This test determines whether the potential impacts of development are likely to significant affect threatened species, ecological communities, and their habitats. Below are the results of the test of significance for the proposed solar farm.

(a) *in the case of a threatened species, whether the proposed development or activity is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction,*

The site has been cleared and farmed for many years and is not known to be inhabited by any threatened species. The Bionet Atlas does not contain any records of species on Lot 6. The development of Burrundulla Mini Sustainable Energy Park is not likely to adversely effect the lifecycle of any threatened species and pose a threat to the local population of any species.

(b) *in the case of an endangered ecological community or critically endangered ecological community, whether the proposed development or activity:*

- (i) *is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or*
- (ii) *is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction,*

Mapping of vegetation communities indicates that there are no endangered ecological communities located within the site. The area of land to be developed as a solar farm is cleared and was formerly farmed.

(c) *in relation to the habitat of a threatened species or ecological community:*

- (i) *the extent to which habitat is likely to be removed or modified as a result of the proposed development or activity, and*
- (ii) *whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed development or activity, and*

(iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species or ecological community in the locality,

It is considered that the site would not act as habitat for any threatened species or ecological community as it has been cleared and was continually farmed for many years. If any hollows are present in the remaining paddock trees, the removal of these trees would be unlikely to cause sufficient habitat loss to cause a significant impact on a threatened species population.

(d) whether the proposed development or activity is likely to have an adverse effect on any declared area of outstanding biodiversity value (either directly or indirectly),

The site is not mapped as being of high biodiversity value on the Biodiversity Values Map. The development of a solar farm is not likely to have any adverse effect on areas of outstanding value.

(e) whether the proposed development or activity is or is part of a key threatening process or is likely to increase the impact of a key threatening process.

The development of electricity generating works, including the installation of solar PV panels and ancillary facilities, is not listed as a key threatening process in Schedule 4 of the *Biodiversity Conservation Act 2016*.

As can be seen from Figure 9 below, other than a few paddock trees all native vegetation on Lot 6 DP 1069441 has been cleared including the area for the proposed arrays of panels. There are not likely to be any threatened species or endangered ecological communities present on the site.

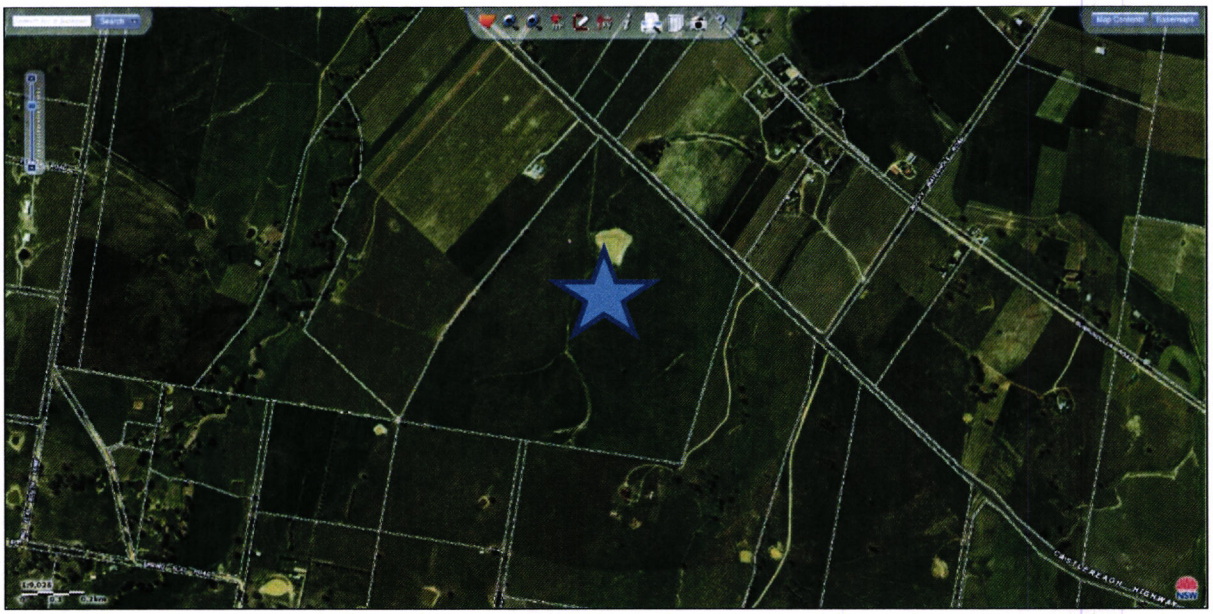

Figure 9: Aerial image of Lot 6. Source: SIX Maps

5.1.6 Native Vegetation Regulatory Map

The Native Vegetation Regulatory Map covers rural land in NSW and categorises land where management of native vegetation can occur without approval or where management of native vegetation may be carried out in accordance with Part 5A Land Management (native vegetation) of the Local Land Services Act 2013. The categories are Category 1 (unrestricted management where clearing is exempt from the LLS Act 2013), Category 2 is regulated land where the LLS Act applies to clearing as either code based, vulnerable or sensitive, and Excluded Land which is not regulated by the LLS Act 2013. The Native Vegetation Regulatory Map for Lot 6 is given as Figure 10 below. This land is not mapped as *sensitive regulated land* (shown in pink) or *vulnerable regulated land* (shown in yellow).

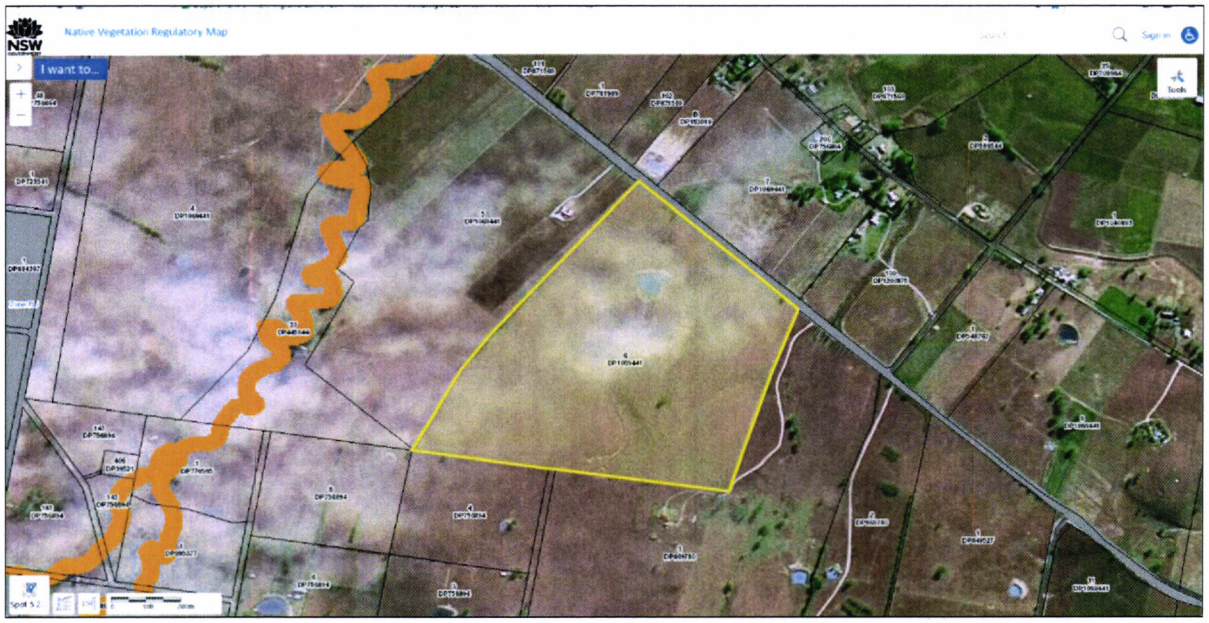

Figure 10: Native Vegetation Regulatory Map. Source: OEH, 2018

5.1.7 Environment Protection & Biodiversity Conservation Act

The *Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act)* affords protection for seven matters of national environmental significance. These matters are world heritage properties, national heritage places, wetlands of national importance, listed threatened species and ecological communities, migratory species, commonwealth marine areas and nuclear actions including uranium mines. Actions that have, or are likely to have, a significant impact on a matter of national environmental significance require the approval of the Australian Government Minister for the Environment and Energy.

Actions include but are not limited to construction, expansion, alteration or demolition of buildings, structures, infrastructure or facilities; storage or transport of hazardous materials; waste disposal; earthworks; impoundment, extraction and diversion of water; research activities; vegetation clearance; military exercises and use of military equipment; and sale or lease of land.

It is the responsibility of the Minister to decide whether assessment and approval is required under the *EPBC Act*. Currently there are potentially 4 wetlands of international importance, 3 listed threatened ecological communities, 30 listed threatened species of flora and fauna, and 11 listed migratory species of flora and fauna protected under the *EPBC Act* within the locality. The provisions of the *Environment Protection and Biodiversity Conservation Act 1999* may apply to the development of a solar farm, however, the search of the Bionet Atlas indicates that there are no recorded threatened or migratory species, or threatened ecological communities on the site. The EPBC Protect Matters Report is appended as Attachment B.

The site to be developed as a solar farm is cleared other than a few paddock trees and has been used for farming. There are no wetlands, threatened ecological communities or threatened species listed under the EPBC Act likely to occur on the site or on adjoining land. The development is not likely to have a significant impact on a matter of national environmental significance. Referral to the Commonwealth Government is not necessary.

5.1.8 Mitigation measures

To avoid interference with any vegetation communities located on adjoining land it is recommended that any vegetation planted to screen the development and any grasses planted to bind the soil following construction of the solar farm be native species endemic to the area. Access to the site is to be limited to that point shown on development plans and within the development area. Storage of materials is to be carried out wholly within the development area.

5.2 Natural hazards

5.2.1 Flooding

The site is not mapped as being flood prone in *Mid-Western LEP 2012*. Any necessary flood mitigation measures and stormwater management have been considered in section *4.3 Water resources* of this Statement.

5.2.2 Bushfire

Infrastructure comprising electricity generating works is not a habitable building and is not listed as a *special fire protection purpose* under section 100B of the *Rural Fires Act 1997*.

The site is not mapped as being bushfire prone. A bushfire assessment is not required to be prepared and submitted with the development application.

5.3 Water resources

A desktop assessment of potential impacts on groundwater and surface water flows has been carried out. The assessment examines:

- Local hydrology and catchment and water quality data,
- Surface and groundwater quality data,
- Flood-risk potential of the site,
- Impacts of the development against NSW policies and industry standards, and
- Management procedures and mitigation measures for construction and operation.

Mudgee is located near the Cudgegong River which is a tributary of the Macquarie River. Watercourses within the town flow in a northerly direction and discharge into the Cudgegong River. Eight creeks or drainage lines run through the town of Mudgee. The lower reaches of the creeks and drainage lines are subject to flooding from the Cudgegong River. The creeks respond quickly to intense bursts of rain and consequently rise to a peak flood level (flash flooding) within 20 mins after the commencement of heavy rainfalls (Lyall and Associates Consulting Water Engineers, 2008).

The topography of Mudgee is relatively flat, with slight hills rising in the south of the town. There are steep hillsides located south of the town to the south-east of the development site. The proposed development is located 500 metres east of Oaky Creek. A cleared drainage line flows through the centre pf the development site towards the Cudgegong River located 1.3 km to the north.

Mudgee is located within the water sharing plan for the *Macquarie Bogan Unregulated And Alluvial Water Sources 2012* area. The water source for the area is listed as being the Cudgegong alluvial. The water sharing plan recognises the connection between the Cudgegong alluvial groundwater source and the Cudgegong River.

There is also an additional water sharing plan specific for the Cudgegong River - the *Water Sharing Plan for the Macquarie and Cudgegong Regulated Rivers Water Source 2016*. This plan aims to ensure flows are protected. It contains provisions for the delivery of environmental water as well as stock and domestic replenishment flows to unregulated sources below the regulated river.

Water sharing plans relate to the protection of surface water and alluvial groundwater resources. The *Macquarie Bogan Unregulated and Alluvial Water Sources 2012* covers 30 unregulated surface water sources and four alluvial groundwater sources. The relevant groundwater sharing plan for development site is the *Water Sharing Plan for the NSW Murray Darling Basin Fractured Rock Groundwater Sources 2011*. The site is within the Lachlan Fold Belt (Mudgee) groundwater management area.

Both of these plans relate to licencing and use of water resources under the *Water Management Act 2000*. It is not proposed to extract water for the Burrundulla Mini Sustainable Energy Park, therefore, there is no requirement to obtain licences under the *Water Management Act 2000*.

The development site is shown as being groundwater vulnerable under clause 6.4 of *Mid-Western LEP 2012*. The site is located within the Macquarie-Bogan catchment area where groundwater sources include:

- minor alluvial systems in the highlands
- fractured rock aquifers of the Lachlan Fold Belt
- porous rock aquifers associated with the Gunnedah Basin

The fractured rock, known as the Lachlan Fold Belt, covers the width of the Murray Darling Basin (MDB) in NSW and therefore extends beyond the Macquarie-Bogan catchment. This formation underlies the Bell Alluvium, Cudgegong Alluvium, portions of the Upper Macquarie Alluvium, the Coolaburragundy–Talbragar Alluvium and the Lower Macquarie Alluvium. In this area, it is considered to exhibit low to moderate connection with surface water. Much of the upper Macquarie catchment is underlain by fractured rock which has a low yield.

The Bell, Upper Macquarie and Lower Macquarie alluvial deposits form a continuous sequence of unconsolidated sediments which generally allows for uninterrupted down valley flow as there is hydraulic connection across contiguous boundaries. A basement high exists between the Upper Macquarie Alluvium and the Lower Macquarie Alluvium which restricts down valley flows. Alluvial aquifers are the main groundwater sources for town water supply and irrigation water in the Macquarie-Bogan catchment. The site lies within the Lachlan Fold Belt fractured rock groundwater management area and is underlain by the fractured rock unit.

The Murray Darling Basin Authority tests water monitoring bores in the catchment which indicates a relatively long term and stable water level at the closest bore to the development site (16km north of Mudgee) which confirms that there is unlikely to be rising groundwater and salinisation associated with groundwater from the Lachlan Fold Belt geological unit. The owner of the development site has reported that a bore drilled to a depth of 70 metres did not reach groundwater.

The proposed development is therefore not expected to materially contribute to any salinity or regional groundwater issues particularly those associated with nearby irrigation districts. Potential adverse surface water-related impacts to the site are impediments to site accessibility and managing downstream sedimentation.

The development site is not mapped as subject to flooding in *Mid-Western LEP 2012* and is not mapped as being within the probable maximum flood area of the *Mudgee Floodplain Management Study and Plan 2002* prepared by Bewsher Consulting. Similarly, the development site is not mapped as being within the

probably maximum flood area of the Cudgegong River in the *Mudgee Local Creeks Floodplain Risk Management Study and Plan 2008* prepared by Lyall & Associated Consulting.

However, heavy rainfall during storm events may cause disruption during construction activities or for material suppliers. The drainage line that runs between the two separate solar systems located either side of the drainage line has the potential to cause overland flow during rainfall events. That water should be captured by the existing dam and with overflows directed towards the Cudgegong River. There is no development proposed within 40 metres either side of the drainage line that runs south to north through the development area.

The proposed development has the potential to alter existing water quality conditions within the site. The impervious area of solar facilities is typically only marginally increased owing to associated hardstand and building areas. However, the panels may impact the nature of pasture and grass coverage on the site, which has the potential to increase surface runoff and peak discharge. Increased flow concentration off the panels also has the potential to erode soil at the base of solar panels. There is the potential that site runoff may contain sediments and increase turbidity or other water quality parameters in downstream water ways. However, the existing dam would capture surface flows and reduce sedimentation downstream.

5.3.2 Mitigation measures

The following mitigation measures given in Table 2 are recommended to manage downstream sedimentation.

Table 2: Proposed mitigation measures to manage downstream sedimentation

Stage	Measure	Activities/approach
Design	Site drainage and water quality controls	Design Basis • Undertake hydrological assessment of the sites catchment in accordance with relevant methods outlined in Australian Rainfall and Runoff. • Determine sediment management targets and drainage control standards in accordance with Managing Urban Stormwater: Soils and Construction Vol 1 (Blue Book) (DECC, 2008). • Develop a site erosion and sediment control plan in accordance with the Blue Book. • Develop site drainage design incorporating

Stage	Measure	Activities/approach
		detention basins and sedimentation management structures where relevant. • Permanent site drainage should coincide with temporary arrangements where possible
Construction and/or Demolition	Site drainage and water quality controls	General site works: • Catch drains to be located downslope of any proposed road works. • Install location appropriate sediment fences or other applicable control measures depending on whether the feature is upstream or downstream of a disturbed part of the site or will need to be trafficable. • All stormwater collection points need to have appropriate sedimentation and erosion controls. • Undertake ongoing inspections of stormwater facilities and water control measures to assess their effectiveness. • Vibration grids or wash bays at all construction exits. • Level spreaders at locations where concentrated flow is discharged offsite to ensure sheet flow like conditions are maintained. • Flat land erosion control options include erosion control blankets, gravelling, mulching, soil binder, turfing and revegetation
Construction and/or Demolition	Stormwater point source control	In the event of concrete works: • Do not undertake works if chance of heavy rain. • Store rinsate water, if applicable, separately to other water on site and dispose of offsite as appropriate. • Block on site drains in the area of the works and remove any contaminated runoff. In the event that dewatering practices are required: • Pump hose intakes for withdrawing water from

Stage	Measure	Activities/approach
		excavations will be elevated to minimise sediment pumping and directed to a containment area for settling prior to discharge. • Limit direct discharge off site (consistent with the design requirements for sediment pond discharge). • Stormwater collected on site should be reused where possible. Controls should be inspected and maintained on a regular basis. All water released from sediment basins should be clear or disposed off site by vehicle. • Material and waste storage areas should be designed and operated to minimise interaction with surface waters. • Vehicle washdown areas should be located away from water courses

5.4 Visual and scenic amenity

5.4.1 Methodology

Impacts on the visual and scenic amenity of the proposed Burrundulla Mini Sustainable Energy Park have been assessed using the RMS guideline *Environmental Impact Assessment Practice Note – Guideline for Landscape Character and Visual Impact Assessment* (EIA-N04 Version 2-0 released on 28 March 2013). Details of methodology are given below.

A site inspection of the location of the proposed works and the surrounding area took place on Friday 24 May 2019. The visual catchment, the context of the site of the proposed works and viewpoints were identified at this time.

Land uses and characteristics of the environment such as topography, vegetation, architecture of neighbouring buildings and any heritage values of any significant sites in the vicinity of the proposed solar farm were noted and the capacity of the area to absorb physical change is assessed. Development plans for the solar farm have been reviewed and the likely impacts on landscape character identified. This is determined by the sensitivity of the landscape to physical change and the magnitude, or relative size and scale, of the works.

The visual significance of the site to viewpoints and receivers within the visual catchment is described in terms of proximity to the site, landscape character, the composition of views and the sensitivity to change that will affect scenic values. The visual impacts that will be experienced by each receiver are identified and evaluated in terms of the sensitivity of each receiver to change and the magnitude of that change in terms of the proposed works. The impacts are calculated and ranked according to negligible, low, moderate or high impact based on the following matrix (sourced from the RMS *Guideline for Landscape Character and Visual Impact Assessment).*

Table 3: Landscape character and visual impact grading matrix. Source: RMS Guideline for Landscape Character and Visual Impact Assessment, 2013

Landscape character and visual impact grading matrix					
	Magnitude				
Sensitivity		High	Moderate	Low	Negligible
	High	High impact	High-moderate	Moderate	Negligible
	Moderate	High-moderate	Moderate	Moderate-low	Negligible
	Low	Moderate	Moderate-low	Low	Negligible
	Negligible	Negligible	Negligible	Negligible	Negligible

The findings of the landscape character and visual impact assessments are summarised in the conclusion. Recommendations as to refinements of the development plans to avoid or mitigate significant landscape and visual impacts are made if necessary.

5.4.2 Description of the landscape

The character of the landscape at Burrundulla is predominantly an open modified agricultural landscape that has been shaped by farming. It is generally flat land with little remnant vegetation and some undulating slopes to the south-east. Rural land surrounding Mudgee, including Burrundulla, is characterized by a diverse range of uses – agriculture comprising grazing and cropping, extractive industries, viticulture, horticulture, rural living. Some of these uses, such as viticulture and cropping, result in a uniform landscape with large expanses of plants in rows and at similar heights.

The development site is rural and located east of the township of Mudgee. It is close to the industrialised entrance to the township and is relatively close to coal mining operations to the east. Development within the immediate vicinity of the site comprises viticulture, cropping, a plant nursery (recently closed), a sewer treatment plant, commercial development on the outskirts of town and farm dwellings. Notwithstanding, the rural landscape is attractive particularly due to its position between steep forested country.

Photographs taken during the site visit and provided below illustrate the site and surrounding area.

Plate 4: Vineyards along the Castlereagh Highway

Plate 5: The development site on approach from Mudgee

Plate 6: The northern side of the Castlereagh Highway opposite the development site

Plate 7: Looking towards the development site from Rocky Waterhole Creek

Plate 8: Looking towards the development site from Burrundulla Road (note solar panels in the paddock)

Plate 9: Commercial and industrial development on entering Mudgee urban area

5.4.3 Assessment of impacts on landscape character

The proposed Burrundulla Mini Sustainable Energy Park will comprise approximately 31,000 solar modules installed in 374 mounting structures. These are to be placed within a fenced area of 27 hectares within the larger property. Security fencing and stock fencing is to be setback 6 metres from the edge of the development area and panel arrays are setback 10 metres from the fence to the north fronting the Castlereagh Highway, a minimum of 6.9 metres to the east and west, and a minimum 121.5 metres to the south. Native shrubs comprising plants such as acacia and grevillea, and white and yellow box eucalypts where shading would not be caused, are to be planted between the security fence and development area boundaries.

The sensitivity of private property and public roads to landscape change would be moderate and decreasing over time given the mix of uses and spread of the urban area outwards along the Castlereagh Highway. The proximity of commercial/industrial uses to the west along the highway, signage, and the steep backdrop to the flat agriculture land capture motorists attention on approach to the township. The magnitude of the project and impact on landscape character is therefore considered to be moderate for private property and public roads.

5.4.4 The visual catchment

The visual catchment of the site of the proposed Burrundulla Mini Sustainable Energy Park is defined by an area within 500 metres of the development site from which the works may be visible as shown inside orange edging on the visual envelope map below. This area is less than has been considered in the glare and glint analysis as the greater the distance from the development site the less clear is the view of the solar farm. The ability to distinguish the type of land use and the actual composition of materials diminishes with distance.

The visual impact of solar farms depends on the scale and type of infrastructure, the prominence and topography of the site relative to the surrounding environment; and any proposed screening measures to reduce visibility of the site. Some potential viewpoints were therefore discounted because of significant existing features such as built structures. The site itself is cleared and there are no existing structures or vegetation in the Castlereagh Highway road reserve adjoining Lot 6 that would screen the site. Topography and vegetation have an influence on the visual catchment. As the land is generally flat it is unlikely that the site will be clearly visible from adjoining private properties and public roads beyond 500 metres.

There are several dwellings within the visual catchment. The distance from eight locations are shown in Figure 11 with the separation distance from each dwelling to the edge of the development site at the nearest point. It would be visible from public roads such as the Castlereagh Highway on approach from the south-east and from the north-west.

Figure 11: The 500 metre visual catchment with separation distances for dwellings. Source: SIX Maps

The sensitivity of neighbouring dwellings to landscape change varies from low (dwellings 1 to 5), to moderate (dwelling 7), to high (dwelling 6 and viewpoint 8) given the existing open landscape of the site though tempered by proximity to urban development. The sensitivity would decrease with distance so that visibility of the solar farm to dwellings and other structures beyond 500 metres and outside the visual catchment would be negligible.

Burrundulla is not currently mapped as being visually sensitive in the *Mid-Western LEP 2012*. Land to the south of Burrundulla shaded purple in Figure 12 is mapped as visually sensitive. However, *Planning Proposal General Amendment 2019* aims to show Burrundulla and the development site as visually sensitive on LEP maps.

The site is within a small lot primary production area which adjoins land zoned IN1 General Industrial and B5 Business Development. The edge of the commercial zone is 2.4 kilometres north-east along the Castlereagh Highway. A sewer treatment plant is located approximately 1.8 kilometres north-east of the development site on the northern side of the highway. The entrance to the township of Mudgee along the Castlereagh Highway is typical of many NSW country towns – industrial with little remaining vegetation, much hard stand, plenty of signage and scattered utilitarian structures.

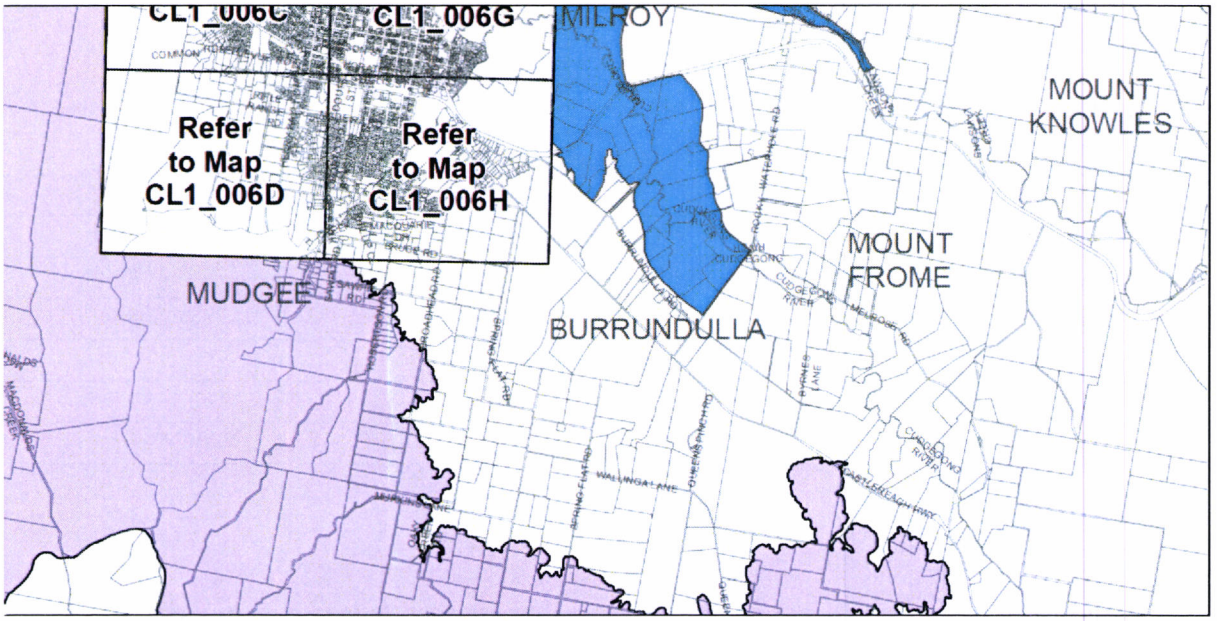

Figure 12: Extract from the Visual Sensitive Land Map, Mid-Western LEP 2012

5.4.5 Assessment of visual impacts

Vegetation within private property boundaries and the highway road reserve as well as agriculture such as vineyards on intervening land would serve to screen the solar farm from residences to the north and west. Some properties may have glimpses of the modules through gaps in vegetation. South-east of the site, undulating land reduces visibility of the site from residential properties located in that direction.

Land immediately adjoining to the east is not occupied by a dwelling and does not have a clear uninterrupted view of the site due to vegetation. The modules will be visible to motorists travelling along the Castlereagh Highway in either direction, however, the speed limit is 100 kilometres per hour along this section of the highway therefore the sensitivity to change is low.

Table 3 below indicates the magnitude of the proposed solar farm in terms of the visual change in the landscape and proximity to the viewpoint, and the degree of sensitivity based on the quality of the view, whether the site is clearly visible or obscured by landform or vegetation, the direction and composition of the view, and how sensitive the view is to changes in the landscape that will result from the proposed development.

A rating is then given based on magnitude and sensitivity using the landscape character and visual impact grading matrix. Note that Viewpoint 8 is a commercial building (a cellar door) and is discounted as this is in the same ownership as the development site. Commercial and industrial developments are not considered sensitive receivers in terms of visual impact.

Table 3: Viewpoint impacts

Viewpoint	Magnitude	Sensitivity	Rating
Castlereagh Highway	Moderate	Low	Low-moderate
Dwelling 1	Moderate	Low	Low-moderate
Dwelling 2	Moderate	Low	Low-moderate
Dwelling 3	Moderate	Low	Low-moderate
Dwelling 4	Moderate	Low	Low-moderate
Dwelling 5	Moderate	Low	Low-moderate
Dwelling 6	Moderate	High	High-moderate
Dwelling 7	Moderate	Moderate	Moderate

5.4.6 Summary of impacts

The landscape of Burrundulla is one that has been modified by human activity associated with the agricultural industry. It is characterised by a mix of agricultural and rural living uses and is attractive due to the forested backdrop of hills to the south-west and north-east and the open grazing/cropping lands. These uses impart a uniform character through removal of most native vegetation and large expanses of plantings in rows and of similar height.

The impact of the proposed Burrundulla Mini Sustainable Energy Park on landscape character has been assessed to be low-moderate ranging to high-moderate based on magnitude of works and the sensitivity to change of surrounding properties. Without screening, the works would be visible to motorists travelling along the Castlereagh Highway, however, given the character of the proximity to the urban area of Mudgee and the commercial and industrial uses visible on the approach to town it is expected that acceptance of and adaptation to change will occur within a relatively short space of time following completion of works.

Screening is proposed comprising the planting of native shrubs endemic to the locality that will grow to approximately 2 to 2.5 metres in height. The shrubs will be planted within a 6 metre setback between the fence and development area boundaries. If necessary shade cloth is to be placed along the security fence to provide temporary screening until the shrubs are mature and have grown to full height. The impacts are considered acceptable given the nature of the proposed development and screening measures, and that it will contribute to clean energy generation.

5.4.7 Planning Proposal General Amendment 2019

The revised clause 6.10 considerations that are proposed under Planning Proposal General Amendment 2019 are addressed below.

- *incorporates appropriate measures to minimise any adverse visual impact on the landscape*

It is proposed to plant native endemic shrubs that will grow to a height of 2 to 2.5 metres within a 6 metre setback between security and/or stock fencing and development area boundaries. Placement of green shade cloth on the security fencing as a temporary measure until the shrubs mature and reach full height

- *will be screened from view from the Castlereagh Highway and other public places by existing vegetation or by planting indigenous vegetation*

Native endemic shrubs that will grow to a height of 2 to 2.5 metres are to be planted within a 6 metre setback between fencing and development area boundaries. This will screen the PV modules from the Castlereagh Highway, Rocky Waterhole Road and any other public place within the visual catchment of the development site.

- *the development will be designed and sited to respond sympathetically to the land form of which it will form a part*

The parts of the site to be used to install rows of PV modules are flat. The drainage line and small farm dam in the centre of the development site is to remain and a setback of 40 metres from modules to the edge of the drainage line is to be incorporated.

The PV arrays are mounted on a single axis tracking system whereby the panels rotate to remain perpendicular to the sun. The panels will have a horizontal height of 1.6 metres with the peak of the modules reaching an approximate height of 2.5 metres when the array is fully tilted to 60 degrees from horizontal, i.e. in the early morning and late evening. The modules will have a uniform height above natural ground level similar to neighbouring plantings of grapes for wine production.

- *the development will use unobtrusive and non-reflective materials to blend structures into the natural environment*

All developments have impacts on surrounding environments, including visual impacts. There are impacts from clearing for agriculture, the planting of rows of grapes for wine, signage along road corridors and all other human interventions on the land. The visual assessment carried out for the proposed development has estimated visual impacts on neighbouring receivers and the proposal incorporates mitigative landscaping measures to ensure that these impacts are acceptable. The solar farm incorporates non-reflective materials as reflectivity is lost energy and indicative of inefficiency in a solar system.

- *the development will incorporate appropriate measures to minimise the reflection of sunlight from glazed surfaces*

Solar photovoltaic (PV) panels are constructed of dark, light-absorbing material and covered with anti-reflective coating. In order to maximise the efficiency, the panels are designed to limit reflection and to absorb around 98% of sunlight received. The glare generated from solar panels is significantly lower than many other surfaces, including water. However, the metal frames surrounding panels have the potential to reflect sunlight. In this case and due to the sensitivity of the landscape to visual change, the frames are to be black powder-coated to minimise potential for reflectivity.

5.4.8 Mitigation measures

It is recommended that a vegetated buffer be incorporated to screen the development from the Castlereagh Highway and neighbouring properties. This should include large native shrubs planted outside the perimeter development area fencing within a 6 metre setback between the boundaries and the fencing. An additional low fence is proposed on the road reserve side of the plantings to protect them from grazing stock.

The photomontages below indicate the current views of the development site from each approach along the Castlereagh Highway and with screening of the Burrundulla Mini Sustainable Energy Park following the establishment of trees. These photomontages demonstrate the effective screening that mature vegetation provides.

Plate 10: On approach to Mudgee – the development site on the left

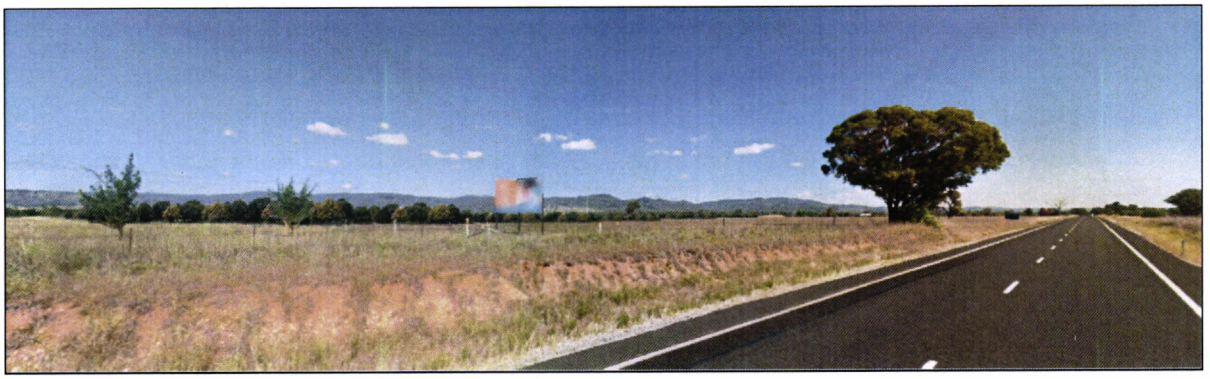

Plate 11: On approach to Mudgee – the development site on the left with vegetated screening

Plate 12: Leaving Mudgee – the development site on the right

Plate 13: Leaving Mudgee – the development site on the right with vegetated screening

5.5 Traffic and access

5.5.1 Existing access arrangements and proposed movements

An assessment of the impacts on traffic and the adequacy of access arrangements has been carried out. The assessment includes a description of the existing road network and notes that the Castlereagh Highway (B55) is a state highway, managed by Roads and Maritime Services. The primary function of the section of the Castlereagh Highway is to provide vehicular access between Mudgee and Ilford. The Castlereagh Highway is listed as an approved B-Double Route by RMS and as classified as an arterial road in the *Mudgee Township Traffic Management Plan 2014*. This plan contains traffic counts at Sydney Road near the Burrundulla Road intersection. The existing condition along Sydney Road at Burrundulla is operating with a carriageway level of service A. The closest major intersection at Lions Drive is operating at a level of service B. The Castlereagh Highway along the frontage of the development site is constructed with dual carriageway 3.5 metre wide lanes and sealed shoulders of minimum 1 metre width and table drains either side.

The assessment is based on the following:

Vehicles accessing the site during construction over 12 weeks:

- 90 B-Double trucks (total number of B-Doubles over the construction phase that will deliver equipment and materials between 10.00am and 2.00pm weekdays.
- Light vehicles suitable for transporting up to 100 workers with work being carried out between 7.00am and 4.00pm weekdays.
- Bus service for workers if required.

Vehicles accessing the site during operation:

- Maintenance access vehicles (2 light vehicles) access to the site in 3 monthly intervals

It is estimated that during construction there would be on average two B-Double trips per hour and a maximum of 50 light vehicle trips per hour (or 20 light vehicle trips per hour if a bus service transports workers to the site), giving a total of maximum of 50 vehicle trips per hour. On a daily basis there would be 8 B-Double trips per day and a maximum of 80 light vehicle trips per day (or 20 with a bus service), giving a total maximum of 100 vehicle trips per day.

It is noted that the greatest interaction with traffic external to the site will be during the peak PM period, estimated to be between 4.00 pm – 5.00 pm. The AM peak period with traffic heading to the site will not generate as many interactions due to the expected peak arrival time of 6.00 am – 7.00 am by the workers. During both peak periods the majority of traffic will be moving against the primary direction of the peak flow, with the current peak vehicle movements heading out of Mudgee to the north to access coal mines. It is expected that the peak vehicles trips would have only a minor impact on the surrounding road network and not reduce the current level of service (A) of the Castlereagh Highway. A major upgrade to the Lions Drive/Sydney Road intersection is planned for 5 to 10 years by which time the construction phase of the proposed solar farm will be complete.

It is recommended that the existing site entry that is located at the north-western corner of the Castlereagh Highway frontage be constructed as a sealed access point. Plans accompanying the assessment indicate that the proposed site entrance has been designed to accommodate the turning path of a B-Double truck, with a sealed entrance a minimum of 26 metres into the site to minimise disruption to the highway and to ensure that a B-Double is able to queue off the road if necessary when accessing the site before the site access gate. The site entry is located on a straight section of the Castlereagh Highway and will have in excess of 300 metres of sight distance in either direction in accordance with the requirements of Austroads Guide to Road Design and Council specifications. Construction worker site access and parking areas should be constructed in accordance with appropriate safe construction site management principles.

The findings of the assessment are that the proposed construction of the solar farm will cause no major long-term effects to the surrounding road network due to the need for minimal regular maintenance by a small number of staff. Construction traffic appropriately managed with a bus service for workers and out of

peak hour deliveries to the site, combined with the construction of an appropriate site entry catering for B-Double access will ensure traffic impacts are minimised during the construction phase of the project.

5.5.2 Mitigation measures

The following mitigation measures are recommended:

- If possible, provide a bus service to convey workers to the site during construction to minimise the number of light vehicles accessing the site,
- Construct the site entrance according to Triaxial Plan MX10595.0-CM1.0 appended to the traffic assessment, and
- Heavy vehicles should arrive and depart from the site outside of the morning and afternoon peak traffic periods, i.e. between 10.00am and 2.00pm weekdays.

5.6 Noise

5.6.1 Assessment of impacts

An assessment of the impacts of noise emissions has been carried out. The purpose of the noise assessment is to quantify potential environmental noise emissions associated with the construction and operation of the project. Where impacts are identified, recommendations are made to mitigate and manage noise.

The assessment includes the following key tasks:

- review construction and operating activities to identify key noise generating plant, equipment, machinery or activities proposed to be undertaken as part of the project;
- identify the closest and/or potentially most affected receptors situated within the area of influence to the project;
- establish existing noise levels to determine project-specific construction Noise Management Levels (NMLs), and operational noise criteria;
- undertake 3D noise modelling to predict levels that may occur as a result of the construction and operation of the project at the closest and/or potentially most affected receptors;
- provide a comparison of predicted noise levels against relevant construction NMLs and operational criteria;
- assess the potential noise impacts associated with construction and operational aspects of the project; and
- provide feasible and reasonable noise mitigation and management measures, and monitoring options, where NMLs or operational criteria may be exceeded.

The assessment has been conducted in accordance with the following key policy and guidelines where relevant:

- NSW Department of Environment and Climate Change, NSW Interim Construction Noise Guideline (ICNG), 2009,
- Environment Protection Authority's (EPA's), Noise Policy for Industry (NPI), 2017,
- NSW Department of Environment, Climate Change and Water (DECCW), NSW Road Noise Policy (RNP), 2011.
- Australian Standard AS 2436–2010 (R2016) (AS 2436) – Guide to Noise and Vibration Control on Construction, Demolition and Maintenance sites,
- Australian Standard AS 1055:2018 – Description and Measurement of Environmental Noise,
- Australian Standard AS IEC 61672.1–2004 (AS 61672) – Electro Acoustics - Sound Level Meters Specifications Monitoring, and
- Australian Standard AS IEC 60942-2004 (AS 60942) – Electroacoustics – Sound Calibrators.

A number of potential noise sensitive receptors were identified as listed in Table 4 and shown in Figure 13 below. These receptors comprise rural living and rural farm properties.

Table 4: Noise sensitive receptors

ID	Description/address	ID	Description/address
R1	446 Rocky Waterhole Road	R16	39 Wallinga Lane
R2	354 Burrundulla Road	R17	13 Wallinga Lane
R3	328 Burrundulla Road	R18	411 Spring Flat Road
R4	322 Burrundulla Road	R19	345 Spring Flat Road
R5	327 Burrundulla Road	R20	281 Spring Flat Road
R6	371 Burrundulla Road	R21	282 Spring Flat Road
R7	447 Burrundulla Road	R22	217 Spring Flat Road
R8	404 Burrundulla Road	R23	3B Sydney Road
R9	447 Burrundulla Road	R24	3B Sydney Road
R10	473 Burrundulla Road	R25	3B Sydney Road
R11	452 Burrundulla Road	R26	3B Sydney Road
R12	312 Castlereagh Highway	R27	252 Burrundulla Road
R13	344 Castlereagh Highway	R28	275 Burrundulla Road
R14	83 Wallinga Lane	R29	243 Castlereagh Highway
R15	55 Wallinga Lane	R30	297 Burrundulla Road

Construction and operational noise levels were predicted to each assessed receptor assuming receiver heights of 1.5m above ground level for typical construction activities and allowing for road traffic noise.

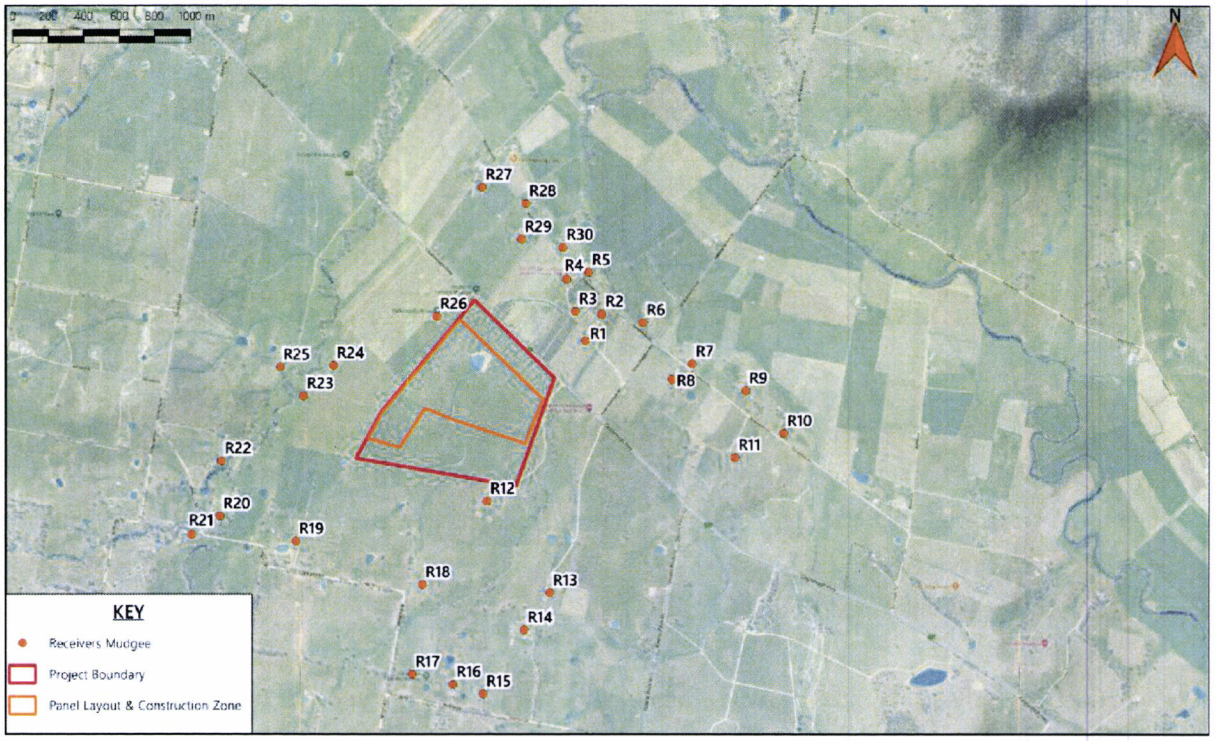

Figure 13: Location of noise sensitive receptors

The findings of the assessment are that construction noise levels have the potential to exceed relevant construction NMLs at thirteen of thirty receptor locations when works are nearest to those locations. Of these, four receivers are located on the development site and in the same ownership. The remaining affected receivers are R1 at 446 Rocky Waterhole Road, R2 at 354 Burrundulla Road, R3 at 328 Burrundulla Road, R4 at 322 Burrundulla Road, R5 at 327 Burrundulla Road, R6 at 371 Burrundulla Road, R12 at 312 Castlereagh Highway, R29 at 243 Castlereagh Highway and R30 at 297 Burrundulla Road.

The exceedance would be temporary, and of short duration and is primarily due to piling and trenching activities, particularly at R12. However, it is likely that the effect of construction noise at receivers R1 to R4 and R29 will be reduced or possibly inaudible due to the masking noise from the Castlereagh Highway.

Operational noise predictions identify that relevant noise criteria would be satisfied at all receivers. The noise assessment demonstrates that road noise criteria will be satisfied at all receivers on the proposed transport route.

Recommendations have been provided to minimise the potential noise impacts from construction, albeit of a temporary nature during the daytime construction period. Recommendations are also given to ensure operational noise levels are verified.

Based on the results, there are no noise related issues which would prevent approval of the application. The results of the assessment shows compliance with the relevant operational and road noise criteria. Accordingly, no additional ameliorative measures are required.

5.6.2 Mitigation measures

The following mitigation measures are recommended to address noise emissions during the construction phase:

- a construction noise management protocol to minimise noise emissions, manage out of hours (minor) works to be inaudible, and to respond to potential concerns from the community,
- where possible use localised mobile screens or construction hoarding around plant to act as barriers between construction works and receivers, particularly where equipment is near the site boundary and/or a residential receiver including areas in constant or regular use (e.g. unloading and laydown areas),
- operating plant in a conservative manner (no over-revving), shutdown when not in use, and be parked/started at farthest point from relevant assessment locations,
- selection of the quietest suitable machinery available for each activity,
- avoidance of noisy plant/machinery working simultaneously where practicable,
- minimise impact noise wherever possible,
- utilise a broadband reverse alarm in lieu of the traditional high frequency type reverse alarm,
- provide toolbox meetings, training and education to drivers and contractors visiting the site during construction so they are aware of the location of noise sensitive receivers and to be cognisant of any noise generating activities,
- signage is to be placed at the front entrance advising truck drivers of their requirement to minimise noise both on and off-site, and
- utilise project related community consultation forums to notify residences within close proximity of the site with project progress, proposed/upcoming potentially noise generating works, its duration and nature and complaint procedure.

It is recommended that noise emissions from the solar farm be minimised when operational. To assist in noise management, it is recommended that a one-off noise validation monitoring assessment be completed to quantify emissions from the site and to confirm that relevant criteria are satisfied.

5.7 Air quality

5.7.1 Assessment of impacts

The Office of Environment and Heritage maintain air quality monitoring stations across rural NSW. The nearest monitoring station to the development site is located at Dubbo. The instruments used at most rural

network sites are low cost indicative particulate monitors that respond to all aerosols including smoke and fog.

Total Suspended Particles (TSP) are measured at this station. Data is collected in 15 minute intervals and reported hourly on the OEH website. Total suspended particulates are solid particles and liquid droplets 100 micrometres or less in diameter. They come from natural and human-made sources, such as pollen, bushfires and motor vehicle emissions. Dust emissions are also a source of air pollution in the hot, dry climate of the Central West and can cause poor air quality.

Particles are measured as PM_{10} and $PM_{2.5}$. PM_{10} are particles less than 10 micrometres in diameter. Sources include crushing or grinding operations and dust stirred up by vehicles on roads. Particles less than 10 micrometres in diameter are measured as an hourly average reading of 12 at Dubbo at 1.00pm on Sunday 19 May 2019. $PM_{2.5}$ are fine particles less than 2.5 micrometres in diameter. Sources include all types of combustion, including motor vehicles, power plants, residential wood burning, forest fires, agricultural burning, and some industrial processes. Particles less than 2.5 micrometres in diameter are also measured as an hourly average reading of 12 at Dubbo at 1.00pm on Sunday 19 May 2019. Total suspended particles have an average hourly reading of 12 on 19 May 2019. This is a comparatively moderate to high reading indicative of the autumn climate of Dubbo and the Central West region and is possibly due to hazard reduction burns carried out by the NSW Rural Fire Service and other agencies that manage native bushland, and the ploughing and sowing of new crops and pasture. By comparison, the hourly average at 9.00am on Tuesday 21 May 2019 at Dubbo was 3 which is low and likely to be due to light nocturnal winds causing dispersal of smoke and dust.

Activities that disturb the earth's surface and that are carried out with the use of machinery have the potential to generate dust emissions. This may be exacerbated by wind exposure to an exposed ground surface. The previous use of the land for farming may have involved regular tilling, sowing and harvesting that may create dust and impact on air quality. The current condition of the land is modified with pasture growth with some exposed soil surfaces. The construction of the solar farm will not involve extensive earthworks and only excavation for footings for the array framework and ancillary structures will be carried out. Along with the delivery of materials using heavy vehicles, construction works may generate dust, however, once operational the change of use of the land from agricultural to solar photovoltaic electricity generation is expected to reduce particulate emissions and lead to an improvement in local air quality. Vehicle movements would be restricted to internal access roads and the majority of the site would be revegetated with grasses.

5.7.2 Mitigation measures

To minimize dust generation during the construction and operational phases the following mitigation measures are proposed:

During construction:

- Limit vehicle movements to areas necessary to deliver panels, ancillary structures and equipment
- Suppress dust emissions using watering and cease works during dry and windy conditions
- Ensure ground disturbance is limited to areas necessary to place footings or to be used for access
- Ensure minimal handling of excavated materials
- Ensure stockpiles of excavated material is bunded and protected from wind and vehicle movements

During operation:

- Grade and add road base to internal accessways
- Revegetate the site with suitable endemic native groundcover immediately construction works are completed
- Ensure all plant and equipment operates in accordance with specifications

5.8 Waste management

5.8.1 Waste materials and management

Life Cycle Analysis considers the total energy input and annual energy output of the project. This is termed the energy payback time and varies depending upon the project's design and geographic location. For solar projects the general timeframe for energy payback is achieved in less than four years for projects with a 25-30 year operating period (Bhandari et al., 2015; Department of Industry, Resources and Energy NSW, 2016). Alsema et al (2006) found that PV modules have an energy payback of 1.5-2 years in southern Europe and 2.7–3.5 years for central Europe. Due to the greater solar resource in Australia the energy payback for this project is expected to be at the lower end of these ranges.

The Fraunhofer Institute for Solar Energy Systems (2015) considered the ratio of energy produced by a solar photovoltaic module compared to the energy used to create the module. It was estimated that the PV modules would provide more than 10 times the amount of energy used to make the system.

A desktop assessment of the waste generated during construction and operation of the solar farm has been carried out to determine the appropriate means of waste disposal and recycling. The assessment takes into account the requirements of relevant legislation and policy including the Protection of the Environment Operations (POEO) Act 1997, POEO (Waste) Regulation 2014 and the Waste Avoidance and Resource Recovery Act 2001.

The largest amount of waste will be generated during the construction phase. Wastes would include wooden pallets, cardboard and plastics. Construction of a solar farm would not generate any putrescible waste products. Minimal waste would be generated when the farm is operational other than small amounts of replacement parts and packaging required for maintenance and repair works.

It is expected that the solar farm will be operational for at least 20 to 25 years. Upon decommissioning all infrastructure, panels and mounting frames including footings and inverters would be disassembled and removed from the site.

There are currently limited opportunities to recycle the components of solar panels, however, it is anticipated that the waste recycling industry will expand and develop new technologies and uses for those components by the time decommissioning occurs.

There are two waste facilities near the project site, both of which are operated by Mid-Western Regional Council. The Mudgee Waste Depot is located 30 km south of the site and is open 8.00 am to 5.30 pm Monday to Friday, and 8:00 am to 5:00 pm on the weekend.

The Gulgong Waste Depot is a smaller facility that is located 6 km northeast of the site. It is open 8.00 am to 4.30 pm Monday to Friday, and 8:00 am to 5:00 pm on the weekend.

There are specific requirements for certain waste streams:

- Some wastes can only be disposed of by appointment at the Mudgee Waste Depot, such as asbestos and grease trap waste. The Gulgong Waste Depot accepts only small loads of mixed commercial waste up to a trailer load and larger quantities of sorted brick, concrete, and timbers.

- Tyres, recyclables, green waste and scrap metals are accepted, as directed by staff.

The Council operates the Mudgee Recycling Facility which is run out of the Mudgee Waste Depot. This offers recycling for batteries (household and cars), paint, fluorescent lights, gas bottles, motor and other oils, and fire extinguishers. Dangerous goods and items other than these are not accepted.

The Council also operates a trade waste service for businesses within the Mudgee-Gulgong area five days a week. This includes a bulk recycling collection service for paper, cardboard or commingled recycling.

Estimates of waste materials and proposed management arrangements for each phase of the development project are provided in Table 5 below.

Table 5: Estimated waste materials and waste management arrangements

Phase	Waste material	Proposed management
Construction	• Packaging waste such as cardboard, wood pallets, plastic wrap, scrap metal, general waste including approximately 1,640 wooden pallets and carboard packing boxes • Concrete waste during setting of footings and mounts • Electric cable waste and cable reels • Plastic pipe offcuts/scrap • Empty drums and containers (minimal quantities) • Minimal used lubricating oil and filters • Unused or spent chemicals	Waste products will be sorted and stored separately in skip bins located in the materials laydown area in accordance with EPA Waste Classification Guidelines. This will facilitate disposal through appropriate waste streams as follows: Recycling: • Steel and scrap metal (recycled) • Timber/cardboard (recycled) • Recyclable plastics Landfill: • General wastes and plastic (other than where recyclable) All recycling and general waste would be collected and taken to off-site waste management facilities for disposal Fluids would be recycled where possible or taken to off-site waste management facilities for disposal
Operational	• Minimal volumes of domestic wastes such as office consumables, paper, plastics and glass • Waste resulting from maintenance or replacement of equipment	All waste materials would be taken to off-site waste management facilities for recycling or disposal
Decommissioning	• PV modules (31,416 modules) and supporting poles and mounts • Glass for panels (500 tonnes) • Silicon for wafers (80 tonnes) • Inverters / transformers / batteries • PV boxes, skids, scrap metal (1,640 tonnes) • Electrical cables • Fencing • Storage containers (two 40-foot containers)	The solar farm infrastructure would be dismantled into separate waste products such as metals, glass, plastics and concrete. All products would be sorted on site into recyclable and general waste streams in accordance with the EPA Waste Classification Guidelines and taken to Council's Waste Management Facility for recycling or disposal. It is expected that the waste recycling industry will expand and develop new technologies and

Phase	Waste material	Proposed management
		uses for components by the time decommissioning occurs. At the present time only a single company in South Australia has the capacity to recycle specific materials

It is recommended that a waste management plan be prepared following approval and prior to construction to specify precise volumes of each waste material, classify that waste material and identify appropriate management procedures including means of transport and the destination. Waste management should be predicated on the international hierarchy of waste management to avoid/reduce, reuse, recycle, recover, treat and dispose of waste products to avoid or reduce waste materials where possible, and to re-use, recycle and recover the majority of waste materials generated during each of the construction, operational and decommissioning phases.

5.8.2 Mitigation measures

It is recommended that a waste management plan be developed to provide detailed procedures to manage the waste stream. The plan should contain:

- Strategies to reduce waste during all project phases,
- Recycling, re-use and recovery strategies and opportunities,
- Classification of all waste streams,
- Tracking register and details,
- On site recycling management,
- Allocation of responsibilities for recycling, re-use and disposal,
- Reporting and notification procedures if a waste incident occur.

If vegetation clearance is required during preparation of the site prior to and/or during the construction phase, that vegetation should be re-used for mulch and on-site soil erosion control where possible.

5.9 The community and economy

5.9.1 Change of use of agricultural land

According to the *Mid-Western Regional Comprehensive Land Use Strategy*, approximately 61% of land in the LGA is used for agriculture, comprising 2% for cropping, 57% for grazing, less than 1% for horticulture and less than 1% for intensive animal production. Power generation occupies less than 1% of land.

The development site has a land capability class of 3. This indicates high capability land – land that has moderate limitations and is capable of sustaining high-impact land uses, such as cropping with cultivation, using more intensive, readily available and widely accepted land management practices. However, careful management of limitations is required for cropping and intensive grazing to avoid land and environmental degradation (*The land and soil capability assessment scheme – A general rural land evaluation scheme for NSW, 2nd Approximation*, OEH).

Figure 14 below shows land capability mapping for the development site and land surrounding Mudgee. Land shaded blue is class 3 land capability.

Figure 14: Land capability mapping. Source: OEH 2019

The loss of agricultural land would be minimal and temporary. It would be offset by the contribution that the solar farm will make to the local economy through direct and indirect employment and expenditure over the short term and through the benefits that renewable energy power supply will bring to the nation. If necessary and practical in terms of security, the land surrounding panel arrays can continue to be used for farming purposes such as the cultivation of vegetables or the grazing of cattle during the operation of the solar farm. The arrays of panels can be removed once the facility is decommissioned and the land can be returned to agricultural use. It is considered that the impact in terms of loss of productive agricultural land should be seen in the context of the impacts on farmland of other forms of power generation, for example, fracking for coal seam gas, and mining for coal and uranium as well as the infrastructure to support the processing of coal and gas.

5.9.2 Employment

The solar PV system is designed to generate in excess of 20 GWh of energy annually with the system offsetting almost 17 thousand tonnes of CO^2 equivalent emissions (Sources: *National Greenhouse and*

Energy Reporting (Measurement) Determination 2008 (Schedule 1) and Department of the Environment and Energy) and providing enough energy to power about 4,300 NSW homes.

Most power generated by the solar farm will be directed to the township of Mudgee. Another benefit to the community will be through an understanding of sustainable development and by gaining a commitment to greater reliance on renewable energy.

Similarly, the clustering of solar power generation would bring regional economic development benefits as the Central West area gains a reputation as a suitable location for renewable energy and linked industries.

It is anticipated that there will be 50 personnel directly involved in construction on site which is expected to take approximately three to six months. Varying levels of expertise will be required ranging from labourers to qualified electricians and project managers.

In addition, personnel would be involved in transport and delivery of materials to the site. Some of this employment is to be sourced locally. This will bring direct economic benefits to the local economy through wages and salaries and indirect benefits through the need for accommodation and sustenance in the area for non-local employees.

Once operational the site will be unmanned, however, two to three personnel will be necessary to carry out maintenance every quarter or as required.

The skills required to be involved in the construction and ongoing maintenance of Burrundulla Mini Sustainable Energy Park may require some personnel to undergo further training and education, leading to an upskilling of the local workforce and enhanced employment opportunities generally.

5.9.3 Summary and mitigation measures

In summary:

- The development of a 10MW solar farm will contribute to the electricity grid in a sustainable manner that reduces greenhouse gas emissions and will assist the transition of our economy from reliance on fossil fuels to renewable sources to decarbonise electricity production
- The solar farm will assist Commonwealth and NSW Governments to achieve targets and objectives relating to emissions and addressing climate change
- The solar farm will generate community economic benefits through employment opportunities during the construction phase as well as limited maintenance and inspection jobs once operational. The development of a solar farm will create a new market for local contractors and expand diversity of income for the land holder

- The loss of productive agricultural land is minimal and temporary. The arrays of panels can be removed once the facility is decommissioned and the land can be returned to agricultural use
- If necessary and practical in terms of security, the land surrounding panel arrays can continue to be used for farming purposes such as the cultivation of vegetables or the grazing of cattle during the operation of the solar farm
- Any impacts on the natural environment including the scenic quality of the rural landscape are minimal and can be mitigated. Alternatively, the natural environment may benefit such as through the restoration of native grasses in and around panel arrays

While the impacts of a solar farm on neighbouring property values have not been studied in-depth, numerous studies have found the impact of wind energy generation on neighbouring property values to be negligible. As solar farms do not have the same impacts as wind farms (i.e., PV facilities do not cast a shadow on neighbouring properties, cause light flicker, or have the same visual impact as wind farms), the impacts on property values caused by solar farms are anticipated to be less than the impacts of wind farms. Some communities have opted for mitigation measures to reduce visual impacts of solar farms through the use of vegetative screening or decorative fencing, since PV modules are usually mounted close to the ground. (U.S. Department of Energy, National Renewable Energy Laboratory, www.nrel.gov/state-local-tribal/blog/top-five-large-scale-solar-myths.html)

It is recommended that labour to construct the solar farm be sourced from within Mid-Western LGA wherever possible.

5.10 Heritage

The Aboriginal people of the Mudgee area belong to the Wiradjuri Nation, which extended from the Blue Mountains in the east to the Lachlan and Murrumbidgee rivers in the west, with the Murray River forming the southern border and the Wellington plains and hills the northern border.

The Mowgee clan extended over a 50km radius and settled around the Cudgegong River which provided food, and water. Local districts were named after the Wiradjuri tribal areas, including Mudgee which means *nest in the hills* and Gulgong meaning *a gully*.

The first European to arrive in the Mudgee area was James Blackman who crossed the Cudgegong River in 1821. He had built a slab hut on the Mudgee townsite by 1837. Blackman was followed by William Lawson who took up 6,000 acres along the Cudgegong River. He was immediately followed by George and Henry Cox who stablished the 'Menah' run, 3 km north-west of the present township.

The village of Mudgee was gazetted in 1838. By 1841, there were 36 dwellings, mostly of slab construction, including three hotels, a hospital, a post office, two stores and the first Anglican church. The first school was established in a slab hut in the 1840s and the police station was moved to Mudgee in the mid-1840s.

As settlement expanded, conflict increased with the indigenous Wiradjuri people. Major food sources were slaughtered, sacred sites desecrated and prime riverside land was occupied. Armed settlers roamed the countryside murdering Aborigines on sight.

A goldrush began when a huge nugget was found at Hargraves in 1851. Mudgee became a centre for the local goldfields, benefiting from the influx of prospectors which peaked with the finds at Gulgong and Hill End at the beginning of the 1870s. Mudgee's population increased to 1500 by 1861 and it was declared a municipality in 1860. Methodist and Presbyterian churches, the present Catholic and Anglican churches, and the first National school were all built in the 1850s. In addition, a police station, courthouse, post office, mechanics institute, the present Uniting Church and a town hall were added between 1860 and 1865. The area became noted for its quality wool and merino studs, its vineyards, its agricultural production and the famous poet and short-story writer, Henry Lawson.

5.10.1 Indigenous heritage

The generic due diligence process outlined in the *Due Diligence Code of Practice for the Protection of Aboriginal Objects in NSW* was implemented to ensure that an adequate due diligence process that addresses Aboriginal cultural heritage issues has been carried out. This process follows the following five steps:

1. Will the activity disturb the ground surface?

Earthworks will involve trenching which is required for cabling of each PV array/module to inverters and a substation. Other earthworks would be pile-driving to support module frames, and to enable the placement of concrete slabs and gravel accessways. Most of the infrastructure would be pre-fabricated off-site, delivered and assembled on-site.

2a. Search the AHIMS database

In accordance with the code, an on-line search was carried out of the *Aboriginal Heritage Information Management Service (AHIMS)* that is maintained by the Office of Environment and Heritage. The search is part of the due diligence process and remains valid for 12 months. The search results are appended as Attachment C.

A search of Lot 6 DP 1069441 was performed on 15 May 2019. The search results are:

- There are no Aboriginal sites recorded in or near the selected location, and
- There are no Aboriginal places that have been declared in or near the selected location.

It is noted that surveys for Aboriginal objects have not been carried out in all parts of NSW and Aboriginal objects may exist on a parcel of land even though they have not been recorded in *AHIMS*. Further, not all

known Aboriginal sites are registered on the *AHIMS* database and not all sites consist of physical evidence or remains, e.g. dreaming and ceremonial sites.

2b. Activities in areas where landscape features indicate the presence of Aboriginal objects

The site does not possess landscape features that indicate the presence of Aboriginal objects. It is not likely to have been used for camping or feasting due to the potential for ponding of water during rain events.

3. Can you avoid harm to the object or disturbance of the landscape features

Not applicable as the site has been disturbed and farmed, does not possess significant landscape features and no known Aboriginal objects are listed in *AHIMS*.

4. Desktop assessment and visual inspection

The desktop assessment found that no known Aboriginal objects are listed in *AHIMS*. A site survey by a representative of Mudgee Local Aboriginal Lands Council was carried out on 24 May 2019. A report of the findings of the survey will be provided to Mid-Western Regional Council upon receipt.

5. Further investigations and impact assessment

An extensive search of *AHIMS* records is not considered necessary given that there are no recorded sites or places at the development site. Mudgee Local Aboriginal Lands Council has been advised of the plans to develop the Burrundulla Mini Sustainable Energy Park and a representative carried out a ground survey on Friday 24 May 2019. A clearance report will be provided to Council upon receipt.

Council may also impose a condition of consent to comply with provisions of the *National Parks and Wildlife Act 1974* should any evidence of Aboriginal occupation be found during site works. An *Aboriginal Heritage Impact Permit* may be required to be obtained if indigenous heritage objects are found.

5.10.2 Non-indigenous heritage

There are 188 heritage properties in Mudgee that are listed in *Schedule 5 Environmental heritage* of *Mid-Western LEP 2012* with a further 5 properties listed at South Mudgee. Eight of these properties have been assessed to be of state heritage significance with the remainder of local significance. The Mudgee Heritage Conservation Area, which covers a large section of the urban area of Mudgee, is also listed as being of local significance in Schedule 5.

State significant items are:

- Catholic church, south-east corner of Church and Market Streets
- Convent and hall, corner of Church and Market Streets
- Catholic Church Hall, 13 Church Street
- Railway buildings and railway station, Inglis Street
- Catholic Presbytery, 57 Market Street
- Town Hall, 64 Market Street
- Post Office, 80 Market Street

Lot 6 DP 1069441 is not listed as an item of environmental heritage in *Schedule 5 Environmental heritage* of *Mid-Western LEP 2012,* is not within a heritage conservation area and there are no listed heritage items in the vicinity of the site. The closest item to the site is Wallinga Homestead (item 401) which is located about 780 metres to the south-east at the nearest point to the site and with two intervening properties.

Clause 5.10 Heritage conservation of *Mid-Western LEP 2012* applies to development relating to a listed heritage item and to development within the vicinity of a heritage item. The relevant objective of clause 5.10 is *to conserve the heritage significance of heritage items and heritage conservation areas, including associated fabric, settings and views.*

Clause 5.10 (5) enables a consent authority to require that a heritage management document be prepared for development of a listed item, or development in the vicinity of a heritage item, that assesses the extent of effects on heritage significance. Development in the vicinity of a heritage item is taken to mean development that is proposed on a site that is located adjoining or adjacent a site which is occupied by a heritage item. In this case, there are no listed items in the vicinity of the development site, therefore a heritage management document is not required.

5.10.3 Mitigation measures

In relation to indigenous heritage and depending upon advice provided in the clearance report, further consultation may need to be carried out with the Mudgee Local Aboriginal Lands Council prior to commencing site works and construction to determine whether it is necessary for members of the local indigenous community to be present on site during ground-disturbing works.

No mitigation measures are necessary in relation to non-indigenous heritage.

5.11 Electromagnetic radiation

5.11.1 Potential radiation sources

The information presented in this section has been sourced from the Australian Radiation Protection and Nuclear Safety Agency (ARPANSA). It includes a description of the type of electromagnetic radiation that may be produced by the generation and distribution of electricity.

The generation, distribution and use of electricity can produce extremely low frequency (ELF) electric and magnetic fields (EMF) from electrically charged particles. The electric field is produced by the voltage whereas the magnetic field is produced by the current. The strength of the electric field is measured in units of volts per metre whilst the strength of the magnetic field is expressed in units of tesla (T), microtesla (μT), gauss (G) or milligauss (mG).

ELF EMF is produced by both natural and artificial sources. Naturally occurring ELF EMF is associated with atmospheric processes such as ionospheric currents, thunderstorms and lightning. Artificial sources are the dominant sources of ELF EMF and are usually associated with the generation, distribution and use of electricity at the frequency of 50 or 60 Hz. The widespread use of electricity means that people are exposed to ELF electric and magnetic fields in the home, in the environment and in the workplace.

According to the Australian Radiation Protection and Nuclear Safety Agency, which maintains continual oversight of emerging research into the potential health effects of the EMF exposure, there is no established evidence of health effects from exposure to electric and magnetic fields from powerlines, substations, transformers or other electrical sources, regardless of proximity.

5.11.2 Mitigation measures

The location of the solar farm and the distance separation between nearby dwellings and the site mean that any impacts on health are mitigated. No additional mitigation measures are proposed.

5.12 Glare and glint

5.12.1 Potential glare and glint

Glare is defined as a continuous source of excessive brightness relative to ambient lighting. Glint is defined as a momentary flash of bright light. Solar photovoltaic (PV) panels are constructed of dark, light-absorbing material and covered with anti-reflective coating. In order to maximise the efficiency, the panels are designed to limit reflection and to absorb around 98% of the light received. The glare generated from solar panels is significantly lower than many other surfaces, including water, however, the glass panels and metal frames have the potential to generate glare and glint. An assessment of the potential glare and glint generated by the proposed solar farm is necessary to ensure visual receptors such as road users, air traffic control towers and pilots are not impacted by the development of solar farms.

Residents and local government officials often cite glare or blinding from solar facilities as a primary concern. While concentrating solar technologies do use mirrors which can cause glare, most solar farms

use PV modules to generate electricity. PV modules use non-reflective glass and are designed to absorb rather than reflect the light that hits the panels in order to convert solar energy into electricity. PV modules are generally less reflective than windows and are installed at numerous airports. (U.S. Department of Energy, National Renewable Energy Laboratory, www.nrel.gov/state-local-tribal/blog/top-five-large-scale-solar-myths.html)

In a fixed PV solar array, the angle of incidence varies as the sun moves across the sky, that is, the angle of incidence is at its lowest around noon where the sun is directly overhead and increases in the early mornings and late evenings as the incidence angles increase. The variation of the angle is reduced where the PV array is mounted on a single axis tracking system whereby the panels rotate to remain perpendicular to the sun as proposed in the Burrundulla Mini Sustainable Energy Park. Therefore, an array mounted on a tracking system has less potential to cause glare whilst it tracks the sun.

A desktop assessment has been carried out using the Solar Glare Hazard Analysis Tool. The results of the glare analysis are appended as Attachment D. The assessment is based on identifying the potential sensitive receptors and then assessing the potential glare and glint hazard and impacts on those receptors using the tool. Glare resulting from PV solar farms is analysed at different viewpoints based on the location, orientation and specifications of the solar panels. Mitigation measure are recommended to reduce potential impacts to an acceptable level. This tool is used by the United States Federal Aviation Administration for glare hazard analysis near airports and is also recognised by the Australian Government Civil Aviation Safety Authority (CASA).

The analysis estimates green glare and yellow glare received at each identified potential receptor. Green glare is glare with low potential to cause an after-image when observed prior to typical blink response time, and yellow glare has a higher potential to cause an after-image when observed prior to a typical blink response time. The analysis is on a minute-by-minute basis because sun reflections from solar panels are likely to last at least one minute. Glint is a short-term flash which lasts for less than a minute is therefore unlikely to occur from the sun, due to the pace at which the sun and panels move. Glint is not considered to be a factor affecting motorists or pilots and is not considered further in this assessment.

The heights of the observation points were assumed to be 1.5 m for a motorist and 1.65 m for a standing person. Existing vegetation or structures can affect visual connectivity with solar panels. Similarly, atmospheric conditions such as cloud cover can influence light reflection and the resulting impact on visual receptors. Many of the potential visual receptors were discounted because local topography would obscure views towards the solar farm. Other potential visual receptors were discounted because the view of the solar farm would be obscured by stands of trees, for example, trees surrounding observation point 3 (OP3) would act as a visual barrier.

It is noted that the site is cleared with five paddock trees remaining on the site. There are no existing structures on the development site. Of the twenty-eight observation points identified, only ten residences were identified as potential visual receptors.

Potential sensitive receptors, or observation points, are shown in Figure 15. Four road observation routes and 25 residential observation points were identified as potential visual receptors. These were identified as follows:

- Considering the elevation of the site relative to surrounding land to determine land potentially affected. The blue shaded area in Figure 15 indicates areas of possible visual impact,
- Including residential properties and public roads within a 2 km radius of the site. Properties located at greater distances are unlikely to be affected, and
- Excluding properties where existing structures, topography or vegetation will act as visual barriers, for example, to the south-west of the site.

Mudgee Airport is located approximately 7.2 km north of the site. There are no air traffic control towers at the airport thus it was not considered a potential visual receptor of the site. A GlareGauge analysis was run on the flight paths to the runway, and there is not expected to be any glare visible from aircraft approaching or taking off.

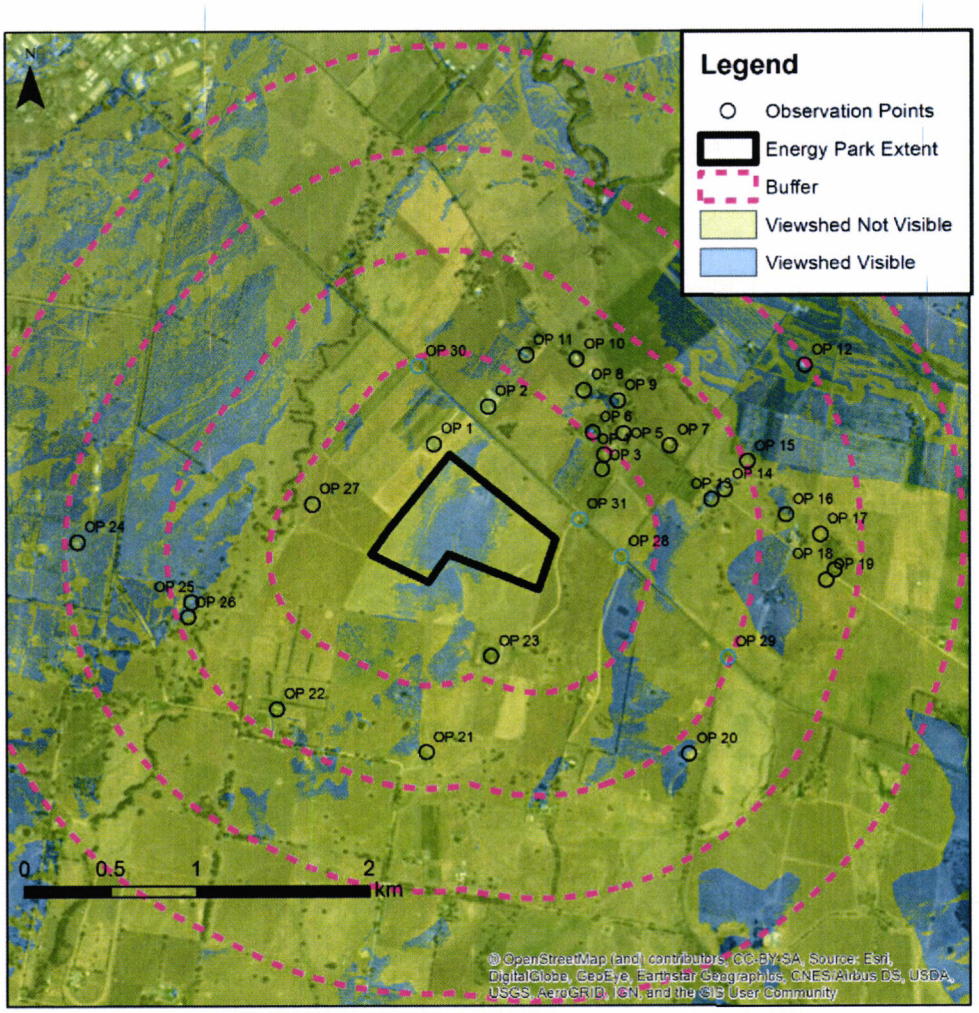

Figure 15: Viewshed and observation points

The results of the Solar Glare Hazard Analysis Tool for the Burrundulla Mini Sustainable Energy Park are detailed in Table 6.

Table 6: Solar Glare Hazard Analysis Tool specification inputs

Observation point (property)	Type or property	Green glare	Yellow glare	Results
OP1	Commercial	0	1,421	Up to 12 minutes of glare around 5-6 am in Oct-Mar
OP2	Commercial	0	0	No glare
OP3	Residential	0	0	No glare
OP4	Residential/shed	0	0	No glare
OP5	Residential	0	0	No glare
OP6	Residential	0	0	No glare
OP7	Residential	0	0	No glare
OP8	Residential/commercial	0	0	No glare
OP9	Residential	0	0	No glare
OP10	Residential	0	0	No glare
OP11	Residential	0	0	No glare
OP12	Residential/shed	0	0	No glare
OP13	Residential/commercial	0	0	No glare
OP14	Residential/commercial	0	0	No glare
OP15	Residential/commercial	0	0	No glare
OP16	Residential/commercial	0	0	No glare
OP17	Residential	0	0	No glare
OP18	Residential	0	0	No glare
OP19	Residential	0	0	No glare
OP20	Residential	16	25	Up to 2 minutes of glare around 5 pm in May-Jul
OP21	Residential	0	0	No glare
OP22	Residential	0	0	No glare
OP23	Residential	0	0	No glare
OP24	Residential	319	740	

Observation point (property)	Type or property	Green glare	Yellow glare	Results
				Up to 13 minutes of glare around 6-7 am in Feb-Apr and Aug-Oct
OP25	Residential	146	1,679	Up to 15 minutes of glare around 6-7:30 am in Mar-Sep
OP26	Residential/shed	149	1,492	Up to 15 minutes of glare around 6-7:30 am in Mar-Sep
OP27	Residential	0	3,864	Up to 17 minutes of glare around 5-7 am in Aug-May
OP28	Route – intersection Castlereagh Highway and Rocky Waterhole Road	0	0	No glare
OP29	Route – intersection Castlereagh Highway and Queens Pinch Road	0	0	No glare
OP30	Route – intersection Castlereagh Highway and unnamed property roads	0	0	No glare
OP31	Route – intersection Castlereagh Highway and unnamed property roads	0	0	No glare

Receptors OP1 and OP24 - OP27may receive glare, with OP20 receiving a very small amount. These are mostly located to the west and south-west of the array. The GlareGauge analysis predicted up to 15 minutes of glare around sunrise at these receptors. OP1 is a commercial building being the Burrundulla Wines cellar door outlet and is in the same ownership as the development site. Although OP27 is located such that it would receive more glare than the other receptors, it is actually unlikely to receive any since there are mature trees already planted along the western boundary of the property. As indicated in the viewshed model, this receptor is also lower down than the array so would be further shielded by the landscape. It is important to note that the GlareGauge tool does not take into account the elevation of potential receptors.

5.12.2 Mitigation measures

To reduce potential glare at OP1 and OP24 - OP26 it is recommended that trees be planted around the north-western and south-western corner of the site boundary. Additional vegetation screening could be considered around the remainder of the site boundary to minimise the visual impact to road users and any other nearby properties.

6. CONCLUSION

The site is considered suitable for the proposed development of the Burrundulla Mini Sustainable Energy Park. It is located adjacent a 22kV power line which connects to the Essential Energy Mudgee Zone substation enabling efficient connections to transfer power generated by the solar PV panels to local users and the grid.

The site is flat, is free of constraints and is accessible to large delivery vehicles during the construction phase and utility vehicles for ongoing maintenance.

The likely impacts of the development have been considered in this Statement and supporting documents. Considerations include impacts on biodiversity, natural hazards, visual and scenic amenity, glare and glint, traffic, noise, air quality, waste management, water resources, indigenous and non-indigenous heritage, the community and the local economy. Any impacts on these interests have been found to be acceptable and mitigation measures have been recommended where necessary.

According to the Australian Radiation Protection and Nuclear Safety Agency, which maintains continual oversight of emerging research into the potential health effects of the EMF exposure, there is no established evidence of health effects from exposure to electric and magnetic fields from powerlines, substations, transformers or other electrical sources, regardless of the proximity.

Below is a summary of mitigation measures. It is recommended that an environmental management plan be prepared to cover the construction and operational phases. Where necessary Table 7 includes a recommendation as to whether the mitigation measure should be included in the management plan.

Table 7: Summary of mitigation measures

Consideration	Mitigation measures	Environmental Management Plan
Biodiversity	To avoid interference with any vegetation communities located on the adjoining land and to mitigate against significant impacts on any threatened or migratory entities it is recommended that: • any vegetation planted to screen the development are to be native species endemic to the area • Access to the site is to be limited to that point shown on development plans and within the development area • Storage of materials is to be carried out wholly within the development area. • Ensure adequate erosion and sedimentation control measures are in place during construction to mitigate against soil entering adjacent native vegetation	Yes
Natural hazards	None recommended	n/a
Water resources	Design – site drainage and water quality controls:	Yes

Consideration	Mitigation measures	Environmental Management Plan
	• Undertake hydrological assessment of the sites catchment in accordance with relevant methods outlined in Australian Rainfall and Runoff. • Determine sediment management targets and drainage control standards in accordance with Managing Urban Stormwater: Soils and Construction Vol 1 (Blue Book) (DECC, 2008). • Develop a site erosion and sediment control plan in accordance with the Blue Book. • Develop site drainage design incorporating detention basins and sedimentation management structures where relevant. • Permanent site drainage should coincide with temporary arrangements where possible	
	Construction and/or demolition – site drainage and water quality controls: • Catch drains to be located downslope of any proposed road works. • Install location appropriate sediment fences or other applicable control measures depending on whether the feature is upstream or downstream of a disturbed part of the site or will need to be trafficable. • All stormwater collection points need to have appropriate sedimentation and erosion controls. • Undertake ongoing inspections of stormwater facilities and water control measures to assess their effectiveness. • Vibration grids or wash bays at all construction exits. • Level spreaders at locations where concentrated flow is discharged offsite to ensure sheet flow like conditions are maintained. • Flat land erosion control options include erosion control blankets, gravelling, mulching, soil binder, turfing and revegetation	Yes
	Construction and/or demolition – stormwater point source control: In the event of concrete works: • Do not undertake works if chance of heavy rain. • Store rinsate5 water, if applicable, separately to other water on site and dispose of offsite as appropriate. • Block on site drains in the area of the works and remove any contaminated runoff. In the event that dewatering practices are required: • Pump hose intakes for withdrawing water from excavations will be elevated to minimise sediment pumping and directed to a containment area for settling prior to discharge. • Limit direct discharge off site (consistent with the design requirements for sediment pond discharge). • Stormwater collected on site should be reused where possible. Controls should be inspected and maintained	Yes

Consideration	Mitigation measures	Environmental Management Plan
	on a regular basis. All water released from sediment basins should be clear or disposed off site by vehicle. • Material and waste storage areas should be designed and operated to minimise interaction with surface waters. • Vehicle washdown areas should be located away from water courses	
Visual & scenic amenity	Screening is proposed comprising the planting of native shrubs endemic to the locality that will grow to approximately 2 to 2.5 metres in height. The shrubs will be planted within a 6 metre setback between security and stock fencing and development area boundaries. If necessary shade cloth is to be placed along the security fence to provide temporary screening until the shrubs are mature and have grown to full height	n/a
Traffic	• An area is allocated to be used as a temporary laydown and car parking area within the property at the south-western corner, • Heavy vehicles should arrive and depart from the site outside of the morning and afternoon peak traffic periods, • A new culvert should be constructed beneath the proposed new entrance to divert stormwater flows, and • Signage to be erected near the entrance to indicate that construction vehicles are accessing the site.	Yes, with reference to site access during the establishment and construction phases
Noise	The following mitigation measures are recommended to address noise emissions during the construction phase: • a construction noise management protocol to minimise noise emissions, manage out of hours (minor) works to be inaudible, and to respond to potential concerns from the community, • where possible use localised mobile screens or construction hoarding around plant to act as barriers between construction works and receivers, particularly where equipment is near the site boundary and/or a residential receiver including areas in constant or regular use (e.g. unloading and laydown areas), • operating plant in a conservative manner (no over-revving), shutdown when not in use, and be parked/started at farthest point from relevant assessment locations, • selection of the quietest suitable machinery available for each activity, • avoidance of noisy plant/machinery working simultaneously where practicable, • minimise impact noise wherever possible, • utilise a broadband reverse alarm in lieu of the traditional high frequency type reverse alarm, • provide toolbox meetings, training and education to drivers and contractors visiting the site during construction so they are aware of the location of noise sensitive receivers and to be cognisant of any noise generating activities,	Yes, for construction and operational phases

Consideration	Mitigation measures	Environmental Management Plan
	• signage is to be placed at the front entrance advising truck drivers of their requirement to minimise noise both on and off-site, and • utilise project related community consultation forums to notify residences within close proximity of the site with project progress, proposed/upcoming potentially noise generating works, its duration and nature and complaint procedure. It is recommended that the noise emissions from the solar farm be minimised when operational. To assist in noise management, it is recommended that a one-off noise validation monitoring assessment be completed to quantify emissions from site and to confirm emissions relevant criteria are satisfied	
Air quality	During construction: • Limit vehicle movements to areas necessary to deliver panels, ancillary structures and equipment • Suppress dust emissions using watering and cease works during dry and windy conditions • Ensure ground disturbance is limited to areas necessary to place footings or to be used for access • Ensure minimal handling of excavated materials • Ensure stockpiles of excavated material is bunded and protected from wind and vehicle movements During operation: • Grade and add road base to internal accessways • Revegetate the site with suitable groundcover immediately construction works are completed • Ensure all plant and equipment operates in accordance with specifications	Yes, for construction and operational phases
Waste management	It is recommended that a waste management plan be developed to provide detailed procedures to manage the waste stream. The plan should contain: • Strategies to reduce waste during all project phases, • Recycling, re-use and recovery strategies and opportunities, • Classification of all waste streams, • Tracking register and details, • On site recycling management, • Allocation of responsibilities for recycling, re-use and disposal, • Reporting and notification procedures if a waste incident occur. If vegetation clearance is required during preparation of the site prior to and/or during the construction phase, that vegetation should be re-used for mulch and on-site soil erosion control where possible.	Yes, for construction phase
The community & local economy	labour to construct the solar farm be sourced from within Mid-Western LGA wherever possible	n/a

Consideration	Mitigation measures	Environmental Management Plan
Heritage	Depending on results of the site survey, it may be necessary to consult with the Mudgee Local Aboriginal Lands Council prior to commencing site works and construction to determine whether it is necessary for representatives of the lands council to be present on site during ground-disturbing works	Yes, for construction phase
Electromagnetic radiation	No mitigation measures are proposed.	n/a
Glare and glint	It is recommended that trees be planted around the north-western and south-western corner of the site boundary to reduce the impacts to affected receptors. Additional vegetation screening could be considered around the remainder of the site boundary to minimise the visual impact to road users and any other nearby properties	n/a

The proposed development of the Burrundulla Mini Sustainable Energy Park is permissible under provisions of *SEPP (Infrastructure) 2007* and in zone RU4 Primary Production Small Lots of *Mid-Western LEP 2012*. It would assist to generate electricity to supply the township of Mudgee and at the same time contribute to reducing greenhouse gas emissions and achieving the national targets.

Any potential impacts of the development may be avoided, minimized or mitigated. The development is considered to be in the public interest.

ATTACHMENT A

Mudgee Bionet search results (10km radius from site)

Scientific name	Common name	BC Act	EPBC Act
Birds			
Anthochaera phrygia	Regent Honeyeater	E	CE
Apus pacificus	Fork-tailed Swift		Migratory (C,J,K)
Ardea ibis	Cattle Egret		Migratory (C,J)
Artamus cyanopterus cyanopterus	Dusky Woodswallow	V	
Calyptorhynchus lathami	Glossy Black-Cockatoo	V	
Chthonicola sagittata	Speckled Warbler	V	
Circus assimilis	Spotted Harrier	V	
Climacteris picumnus victoriae	Brown Treecreeper (E subsp)	V	
Daphoenositta chrysoptera	Varied Sittella	V	
Glossopsitta pusilla	Little Lorikeet	V	
Hirundapus caudacutus	White-throated Needletail		Migratory (C,J,K)
Lophochroa leadbeateri	Major Mitchell's Cockatoo	V	
Melanodryas cucullata cucullata	Hooded Robin (S/E form)	V	
Merops ornatus	Rainbow Bee-eater		Migratory (J)
Ninox connivens	Barking Owl	V	
Ninox strenua	Powerful Owl	V	
Petroica boodang	Scarlet Robin	V	
Plegadis falcinellus	Glossy Ibis		Migratory (C)
Mammals			
Dasyurus maculatus	Spotted-tailed Quoll	V	E
Petrogale penicillata	Brush-tailed Rock-wallaby	E	V
Phascolarctos cinereus	Koala	V	V
Pteropus poliocephalus	Grey-headed Flying-fox	V	V
Pomatostomus temporalis temporalis	Grey-crowned Babbler (E subsp)	V	
Flora			
Acacia ausfeldii	Ausfeld's Wattle	V	
Dichanthium setosum	Bluegrass	V	V
Eucalyptus cannonii	Capertee Stringybark	V	
Leucochrysum albicans var. tricolor	Hoary Sunray		E
Swainsona recta	Small Purple-pea	E	E
Swainsona sericea	Silky Swainson-pea	V	

C = CAMBA; J = JAMBA; K = KAMBA (international agreements)

E = endangered; CE = critically endangered; V = vulnerable

EPBC Act Protected Matters Report

This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected.

Information on the coverage of this report and qualifications on data supporting this report are contained in the caveat at the end of the report.

Information is available about Environment Assessments and the EPBC Act including significance guidelines, forms and application process details.

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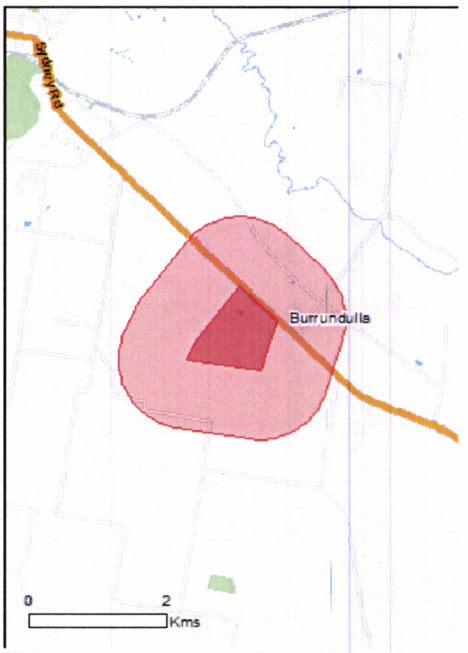

Coordinates
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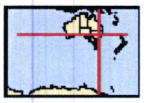

Summary

Matters of National Environmental Significance

This part of the report summarises the matters of national environmental significance that may occur in, or may relate to, the area you nominated. Further information is available in the detail part of the report, which can be accessed by scrolling or following the links below. If you are proposing to undertake an activity that may have a significant impact on one or more matters of national environmental significance then you should consider the Administrative Guidelines on Significance.

World Heritage Properties:	None
National Heritage Places:	None
Wetlands of International Importance:	4
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	None
Listed Threatened Ecological Communities:	3
Listed Threatened Species:	30
Listed Migratory Species:	11

Other Matters Protected by the EPBC Act

This part of the report summarises other matters protected under the Act that may relate to the area you nominated. Approval may be required for a proposed activity that significantly affects the environment on Commonwealth land, when the action is outside the Commonwealth land, or the environment anywhere when the action is taken on Commonwealth land. Approval may also be required for the Commonwealth or Commonwealth agencies proposing to take an action that is likely to have a significant impact on the environment anywhere.

The EPBC Act protects the environment on Commonwealth land, the environment from the actions taken on Commonwealth land, and the environment from actions taken by Commonwealth agencies. As heritage values of a place are part of the 'environment', these aspects of the EPBC Act protect the Commonwealth Heritage values of a Commonwealth Heritage place. Information on the new heritage laws can be found at http://www.environment.gov.au/heritage

A permit may be required for activities in or on a Commonwealth area that may affect a member of a listed threatened species or ecological community, a member of a listed migratory species, whales and other cetaceans, or a member of a listed marine species.

Commonwealth Land:	None
Commonwealth Heritage Places:	None
Listed Marine Species:	18
Whales and Other Cetaceans:	None
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Australian Marine Parks:	None

Extra Information

This part of the report provides information that may also be relevant to the area you have nominated.

State and Territory Reserves:	None
Regional Forest Agreements:	None
Invasive Species:	26
Nationally Important Wetlands:	None
Key Ecological Features (Marine)	None

Details

Matters of National Environmental Significance

Wetlands of International Importance (Ramsar)	[Resource Information]
Name	Proximity
Banrock station wetland complex	800 - 900km upstream
Riverland	800 - 900km upstream
The coorong, and lakes alexandrina and albert wetland	900 - 1000km upstream
The macquarie marshes	200 - 300km upstream

Listed Threatened Ecological Communities		[Resource Information]
For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.		
Name	Status	Type of Presence
Grey Box (Eucalyptus microcarpa) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia	Endangered	Community likely to occur within area
Natural Temperate Grassland of the South Eastern Highlands	Critically Endangered	Community may occur within area
White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland	Critically Endangered	Community may occur within area

Listed Threatened Species		[Resource Information]
Name	Status	Type of Presence
Birds		
Anthochaera phrygia Regent Honeyeater [82338]	Critically Endangered	Species or species habitat known to occur within area
Botaurus poiciloptilus Australasian Bittern [1001]	Endangered	Species or species habitat may occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
Grantiella picta Painted Honeyeater [470]	Vulnerable	Species or species habitat likely to occur within area
Lathamus discolor Swift Parrot [744]	Critically Endangered	Species or species habitat likely to occur within area
Leipoa ocellata Malleefowl [934]	Vulnerable	Species or species habitat may occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area
Polytelis swainsonii Superb Parrot [738]	Vulnerable	Species or species habitat likely to occur within area

Name	Status	Type of Presence
Rostratula australis Australian Painted-snipe, Australian Painted Snipe [77037]	Endangered	Species or species habitat may occur within area
Fish		
Galaxias rostratus Flathead Galaxias, Beaked Minnow, Flat-headed Galaxias, Flat-headed Jollytail, Flat-headed Minnow [84745]	Critically Endangered	Species or species habitat may occur within area
Maccullochella peelii Murray Cod [66633]	Vulnerable	Species or species habitat may occur within area
Macquaria australasica Macquarie Perch [66632]	Endangered	Species or species habitat may occur within area
Frogs		
Litoria booroolongensis Booroolong Frog [1844]	Endangered	Species or species habitat likely to occur within area
Mammals		
Chalinolobus dwyeri Large-eared Pied Bat, Large Pied Bat [183]	Vulnerable	Species or species habitat likely to occur within area
Dasyurus maculatus maculatus (SE mainland population) Spot-tailed Quoll, Spotted-tail Quoll, Tiger Quoll (southeastern mainland population) [75184]	Endangered	Species or species habitat likely to occur within area
Nyctophilus corbeni Corben's Long-eared Bat, South-eastern Long-eared Bat [83395]	Vulnerable	Species or species habitat likely to occur within area
Petauroides volans Greater Glider [254]	Vulnerable	Species or species habitat may occur within area
Petrogale penicillata Brush-tailed Rock-wallaby [225]	Vulnerable	Species or species habitat may occur within area
Phascolarctos cinereus (combined populations of Qld, NSW and the ACT) Koala (combined populations of Queensland, New South Wales and the Australian Capital Territory) [85104]	Vulnerable	Species or species habitat known to occur within area
Pteropus poliocephalus Grey-headed Flying-fox [186]	Vulnerable	Foraging, feeding or related behaviour may occur within area
Plants		
Dichanthium setosum bluegrass [14159]	Vulnerable	Species or species habitat likely to occur within area
Euphrasia arguta [4325]	Critically Endangered	Species or species habitat likely to occur within area
Leucochrysum albicans var. tricolor Hoary Sunray, Grassland Paper-daisy [56204]	Endangered	Species or species habitat may occur within area
Philotheca ericifolia [64942]	Vulnerable	Species or species habitat likely to occur within area
Prasophyllum petilum Tarengo Leek Orchid [55144]	Endangered	Species or species habitat may occur within area

Name	Status	Type of Presence
Prasophyllum sp. Wybong (C.Phelps ORG 5269) a leek-orchid [81964]	Critically Endangered	Species or species habitat may occur within area
Swainsona recta Small Purple-pea, Mountain Swainson-pea, Small Purple Pea [7580]	Endangered	Species or species habitat likely to occur within area
Thesium australe Austral Toadflax, Toadflax [15202]	Vulnerable	Species or species habitat may occur within area
Reptiles		
Aprasia parapulchella Pink-tailed Worm-lizard, Pink-tailed Legless Lizard [1665]	Vulnerable	Species or species habitat may occur within area
Delma impar Striped Legless Lizard [1649]	Vulnerable	Species or species habitat may occur within area

Listed Migratory Species [Resource Information]

* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.

Name	Threatened	Type of Presence
Migratory Marine Birds		
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Migratory Terrestrial Species		
Hirundapus caudacutus White-throated Needletail [682]		Species or species habitat likely to occur within area
Motacilla flava Yellow Wagtail [644]		Species or species habitat may occur within area
Myiagra cyanoleuca Satin Flycatcher [612]		Species or species habitat likely to occur within area
Rhipidura rufifrons Rufous Fantail [592]		Species or species habitat may occur within area
Migratory Wetlands Species		
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat may occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat may occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]		Species or species habitat may occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area

Other Matters Protected by the EPBC Act

Listed Marine Species		[Resource Information]
* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.		
Name	Threatened	Type of Presence
Birds		
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat may occur within area
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Ardea alba Great Egret, White Egret [59541]		Species or species habitat likely to occur within area
Ardea ibis Cattle Egret [59542]		Species or species habitat may occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat may occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area
Chrysococcyx osculans Black-eared Cuckoo [705]		Species or species habitat likely to occur within area
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]		Species or species habitat may occur within area
Haliaeetus leucogaster White-bellied Sea-Eagle [943]		Species or species habitat may occur within area
Hirundapus caudacutus White-throated Needletail [682]		Species or species habitat likely to occur within area
Lathamus discolor Swift Parrot [744]	Critically Endangered	Species or species habitat likely to occur within area
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within area
Motacilla flava Yellow Wagtail [644]		Species or species habitat may occur within area
Myiagra cyanoleuca Satin Flycatcher [612]		Species or species habitat likely to occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within

Name	Threatened	Type of Presence area
Rhipidura rufifrons Rufous Fantail [592]		Species or species habitat may occur within area
Rostratula benghalensis (sensu lato) Painted Snipe [889]	Endangered*	Species or species habitat may occur within area

Extra Information

Invasive Species [Resource Information]

Weeds reported here are the 20 species of national significance (WoNS), along with other introduced plants that are considered by the States and Territories to pose a particularly significant threat to biodiversity. The following feral animals are reported: Goat, Red Fox, Cat, Rabbit, Pig, Water Buffalo and Cane Toad. Maps from Landscape Health Project, National Land and Water Resouces Audit, 2001.

Name	Status	Type of Presence
Birds		
Acridotheres tristis Common Myna, Indian Myna [387]		Species or species habitat likely to occur within area
Anas platyrhynchos Mallard [974]		Species or species habitat likely to occur within area
Carduelis carduelis European Goldfinch [403]		Species or species habitat likely to occur within area
Columba livia Rock Pigeon, Rock Dove, Domestic Pigeon [803]		Species or species habitat likely to occur within area
Passer domesticus House Sparrow [405]		Species or species habitat likely to occur within area
Streptopelia chinensis Spotted Turtle-Dove [780]		Species or species habitat likely to occur within area
Sturnus vulgaris Common Starling [389]		Species or species habitat likely to occur within area
Turdus merula Common Blackbird, Eurasian Blackbird [596]		Species or species habitat likely to occur within area
Mammals		
Bos taurus Domestic Cattle [16]		Species or species habitat likely to occur within area
Canis lupus familiaris Domestic Dog [82654]		Species or species habitat likely to occur within area

Name	Status	Type of Presence
Capra hircus Goat [2]		Species or species habitat likely to occur within area
Felis catus Cat, House Cat, Domestic Cat [19]		Species or species habitat likely to occur within area
Feral deer Feral deer species in Australia [85733]		Species or species habitat likely to occur within area
Lepus capensis Brown Hare [127]		Species or species habitat likely to occur within area
Mus musculus House Mouse [120]		Species or species habitat likely to occur within area
Oryctolagus cuniculus Rabbit, European Rabbit [128]		Species or species habitat likely to occur within area
Rattus rattus Black Rat, Ship Rat [84]		Species or species habitat likely to occur within area
Sus scrofa Pig [6]		Species or species habitat likely to occur within area
Vulpes vulpes Red Fox, Fox [18]		Species or species habitat likely to occur within area
Plants		
Asparagus asparagoides Bridal Creeper, Bridal Veil Creeper, Smilax, Florist's Smilax, Smilax Asparagus [22473]		Species or species habitat likely to occur within area
Nassella trichotoma Serrated Tussock, Yass River Tussock, Yass Tussock, Nassella Tussock (NZ) [18884]		Species or species habitat likely to occur within area
Opuntia spp. Prickly Pears [82753]		Species or species habitat likely to occur within area
Pinus radiata Radiata Pine Monterey Pine, Insignis Pine, Wilding Pine [20780]		Species or species habitat may occur within area
Rubus fruticosus aggregate Blackberry, European Blackberry [68406]		Species or species habitat likely to occur within area
Salix spp. except S.babylonica, S.x calodendron & S.x reichardtii Willows except Weeping Willow, Pussy Willow and Sterile Pussy Willow [68497]		Species or species habitat likely to occur within area
Solanum elaeagnifolium Silver Nightshade, Silver-leaved Nightshade, White Horse Nettle, Silver-leaf Nightshade, Tomato Weed, White Nightshade, Bull-nettle, Prairie-berry, Satansbos, Silver-leaf Bitter-apple, Silverleaf-nettle, Trompillo [12323]		Species or species habitat likely to occur within area

Caveat

The information presented in this report has been provided by a range of data sources as acknowledged at the end of the report.

This report is designed to assist in identifying the locations of places which may be relevant in determining obligations under the Environment Protection and Biodiversity Conservation Act 1999. It holds mapped locations of World and National Heritage properties, Wetlands of International and National Importance, Commonwealth and State/Territory reserves, listed threatened, migratory and marine species and listed threatened ecological communities. Mapping of Commonwealth land is not complete at this stage. Maps have been collated from a range of sources at various resolutions.

Not all species listed under the EPBC Act have been mapped (see below) and therefore a report is a general guide only. Where available data supports mapping, the type of presence that can be determined from the data is indicated in general terms. People using this information in making a referral may need to consider the qualifications below and may need to seek and consider other information sources.

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

Threatened, migratory and marine species distributions have been derived through a variety of methods. Where distributions are well known and if time permits, maps are derived using either thematic spatial data (i.e. vegetation, soils, geology, elevation, aspect, terrain, etc) together with point locations and described habitat; or environmental modelling (MAXENT or BIOCLIM habitat modelling) using point locations and environmental data layers.

Where very little information is available for species or large number of maps are required in a short time-frame, maps are derived either from 0.04 or 0.02 decimal degree cells; by an automated process using polygon capture techniques (static two kilometre grid cells, alpha-hull and convex hull); or captured manually or by using topographic features (national park boundaries, islands, etc). In the early stages of the distribution mapping process (1999-early 2000s) distributions were defined by degree blocks, 100K or 250K map sheets to rapidly create distribution maps. More reliable distribution mapping methods are used to update these distributions as time permits.

Only selected species covered by the following provisions of the EPBC Act have been mapped:

- migratory and
- marine

The following species and ecological communities have not been mapped and do not appear in reports produced from this database:

- threatened species listed as extinct or considered as vagrants
- some species and ecological communities that have only recently been listed
- some terrestrial species that overfly the Commonwealth marine area
- migratory species that are very widespread, vagrant, or only occur in small numbers

The following groups have been mapped, but may not cover the complete distribution of the species:

- non-threatened seabirds which have only been mapped for recorded breeding sites
- seals which have only been mapped for breeding sites near the Australian continent

Such breeding sites may be important for the protection of the Commonwealth Marine environment.

Coordinates

-32.631475 149.628129,-32.637113 149.625983,-32.635866 149.616413,-32.633463 149.6177,-32.627626 149.623279,-32.631439 149.628086,-32.631475 149.628129

ATTACHMENT C

Office of Environment & Heritage

NSW GOVERNMENT

AHIMS Web Services (AWS)
Search Result

Purchase Order/Reference : 1219

Client Service ID : 421021

Zenith Town Planning

Date: 15 May 2019

[redacted]

Dear Sir or Madam:

AHIMS Web Service search for the following area at Lot : 6, DP:DP1069441 with a Buffer of 0 meters, conducted by Allen Grimwood on 15 May 2019.

The context area of your search is shown in the map below. Please note that the map does not accurately display the exact boundaries of the search as defined in the paragraph above. The map is to be used for general reference purposes only.

A search of the Office of the Environment and Heritage AHIMS Web Services (Aboriginal Heritage Information Management System) has shown that:

0	Aboriginal sites are recorded in or near the above location.
0	Aboriginal places have been declared in or near the above location. *

If your search shows Aboriginal sites or places what should you do?

- You must do an extensive search if AHIMS has shown that there are Aboriginal sites or places recorded in the search area.
- If you are checking AHIMS as a part of your due diligence, refer to the next steps of the Due Diligence Code of practice.
- You can get further information about Aboriginal places by looking at the gazettal notice that declared it. Aboriginal places gazetted after 2001 are available on the NSW Government Gazette (http://www.nsw.gov.au/gazette) website. Gazettal notices published prior to 2001 can be obtained from Office of Environment and Heritage's Aboriginal Heritage Information Unit upon request

Important information about your AHIMS search

- The information derived from the AHIMS search is only to be used for the purpose for which it was requested. It is not be made available to the public.
- AHIMS records information about Aboriginal sites that have been provided to Office of Environment and Heritage and Aboriginal places that have been declared by the Minister;
- Information recorded on AHIMS may vary in its accuracy and may not be up to date .Location details are recorded as grid references and it is important to note that there may be errors or omissions in these recordings,
- Some parts of New South Wales have not been investigated in detail and there may be fewer records of Aboriginal sites in those areas. These areas may contain Aboriginal sites which are not recorded on AHIMS.
- Aboriginal objects are protected under the National Parks and Wildlife Act 1974 even if they are not recorded as a site on AHIMS.
- This search can form part of your due diligence and remains valid for 12 months.

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ATTACHMENT D

FORGESOLAR GLARE ANALYSIS

Project: **Burrundulla Mini Sustainable Energy Park**
Proposed 10 MW solar farm near Mudgee, NSW. Referred to as MUD1C/3C or Burrundulla Mini Sustainable Energy Park.

Site configuration: **MUD3C-1C with OPs**
Analysis conducted by ITP Engineering (engineering@itpau.com.au) at 04:48 on 30 May, 2019.

U.S. FAA 2013 Policy Adherence

The following table summarizes the policy adherence of the glare analysis based on the 2013 U.S. Federal Aviation Administration Interim Policy 78 FR 63276. This policy requires the following criteria be met for solar energy systems on airport property:

- No "yellow" glare (potential for after-image) for any flight path from threshold to 2 miles
- No glare of any kind for Air Traffic Control Tower(s) ("ATCT") at cab height.
- Default analysis and observer characteristics (see list below)

ForgeSolar does not represent or speak officially for the FAA and cannot approve or deny projects. Results are informational only.

COMPONENT	STATUS	DESCRIPTION
Analysis parameters	PASS	Analysis time interval and eye characteristics used are acceptable
Flight path(s)	N/A	No flight paths analyzed
ATCT(s)	N/A	No ATCT receptors designated

Default glare analysis parameters and observer eye characteristics (for reference only):

- Analysis time interval: 1 minute
- Ocular transmission coefficient: 0.5
- Pupil diameter: 0.002 meters
- Eye focal length: 0.017 meters
- Sun subtended angle: 9.3 milliradians

FAA Policy 78 FR 63276 can be read at https://www.federalregister.gov/d/2013-24729

SITE CONFIGURATION

Analysis Parameters

DNI: peaks at 1,000.0 W/m^2
Time interval: 1 min
Ocular transmission coefficient: 0.5
Pupil diameter: 0.002 m
Eye focal length: 0.017 m
Sun subtended angle: 9.3 mrad
Site Config ID: 28104.4988

PV Array(s)

Name: MUD1C
Axis tracking: Single-axis rotation
Tracking axis orientation: 0.0°
Tracking axis tilt: 0.0°
Tracking axis panel offset: 0.0°
Max tracking angle: 60.0°
Resting angle: 60.0°
Rated power: -
Panel material: Smooth glass with AR coating
Reflectivity: Vary with sun
Slope error: correlate with material

Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	-32.630493	149.625229	474.47	2.62	477.08
2	-32.632155	149.627825	472.64	2.62	475.26
3	-32.634233	149.627053	472.89	2.62	475.51
4	-32.634089	149.623684	479.91	2.62	482.53
5	-32.633438	149.622869	477.97	2.62	480.59
6	-32.632643	149.622890	475.82	2.62	478.44
7	-32.631938	149.623384	474.71	2.62	477.32
8	-32.631487	149.624542	474.08	2.62	476.70

Name: MUD3C
Axis tracking: Single-axis rotation
Tracking axis orientation: 0.0°
Tracking axis tilt: 0.0°
Tracking axis panel offset: 0.0°
Max tracking angle: 60.0°
Resting angle: 0.0°
Rated power: -
Panel material: Smooth glass with AR coating
Reflectivity: Vary with sun
Slope error: correlate with material

Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	-32.628614	149.622397	471.83	2.62	474.45
2	-32.629337	149.623448	471.26	2.62	473.88
3	-32.630403	149.622740	474.51	2.62	477.13
4	-32.631253	149.622804	474.30	2.62	476.92
5	-32.635680	149.618706	484.11	2.62	486.73
6	-32.635644	149.618405	484.49	2.62	487.11
7	-32.632780	149.618513	480.91	2.62	483.53

Discrete Observation Receptors

Name	ID	Latitude (°)	Longitude (°)	Elevation (m)	Height (m)
OP 1	1	-32.628508	149.621034	473.30	1.50
OP 2	2	-32.626881	149.623909	470.68	1.50
OP 3	3	-32.629673	149.629853	467.67	1.50
OP 4	4	-32.628842	149.630443	468.37	1.50
OP 5	5	-32.628065	149.630990	467.15	1.50
OP 6	6	-32.628020	149.629803	469.00	1.50
OP 7	7	-32.628616	149.633365	462.17	1.50
OP 8	8	-32.626086	149.628823	467.42	1.50
OP 9	9	-32.626619	149.630679	464.99	1.50
OP 10	10	-32.624794	149.628555	465.29	1.50
OP 11	11	-32.624613	149.625872	467.48	1.50
OP 12	12	-32.625110	149.640442	461.45	1.50
OP 13	13	-32.631011	149.635542	468.09	1.50
OP 14	14	-32.630582	149.636261	465.76	1.50
OP 15	15	-32.629317	149.637415	462.81	1.50
OP 16	16	-32.631641	149.639451	469.67	1.50
OP 17	17	-32.632546	149.641272	467.93	1.50
OP 18	18	-32.634123	149.641997	470.81	1.50
OP 19	19	-32.634570	149.641525	472.14	1.50
OP 20	20	-32.642155	149.634352	489.15	1.50
OP 21	21	-32.642064	149.620641	488.12	1.50
OP 22	22	-32.640133	149.612891	490.71	1.50
OP 23	23	-32.637879	149.624060	480.53	1.50
OP 24	24	-32.632847	149.602484	499.63	1.50
OP 25	25	-32.635471	149.608433	488.04	1.50
OP 26	26	-32.636112	149.608299	488.24	1.50
OP 27	27	-32.631165	149.614710	481.33	1.50
OP 28	28	-32.633487	149.630851	472.66	1.50
OP 29	29	-32.637883	149.636355	476.78	1.50
OP 30	30	-32.625134	149.620241	472.37	1.50
OP 31	31	-32.631820	149.628727	469.81	1.50

GLARE ANALYSIS RESULTS

Summary of Glare

PV Array Name	Tilt (°)	Orient (°)	"Green" Glare min	"Yellow" Glare min	Energy kWh
MUD1C	SA tracking	SA tracking	0	0	-
MUD3C	SA tracking	SA tracking	630	9,221	-

Total annual glare received by each receptor

Receptor	Annual Green Glare (min)	Annual Yellow Glare (min)
OP 1	0	1421
OP 2	0	0
OP 3	0	0
OP 4	0	0
OP 5	0	0
OP 6	0	0
OP 7	0	0
OP 8	0	0
OP 9	0	0
OP 10	0	0
OP 11	0	0
OP 12	0	0
OP 13	0	0
OP 14	0	0
OP 15	0	0
OP 16	0	0
OP 17	0	0
OP 18	0	0
OP 19	0	0
OP 20	16	25
OP 21	0	0
OP 22	0	0
OP 23	0	0
OP 24	319	740
OP 25	146	1679

Receptor	Annual Green Glare (min)	Annual Yellow Glare (min)
OP 26	149	1492
OP 27	0	3864
OP 28	0	0
OP 29	0	0
OP 30	0	0
OP 31	0	0

Results for: MUD1C

Receptor	Green Glare (min)	Yellow Glare (min)
OP 1	0	0
OP 2	0	0
OP 3	0	0
OP 4	0	0
OP 5	0	0
OP 6	0	0
OP 7	0	0
OP 8	0	0
OP 9	0	0
OP 10	0	0
OP 11	0	0
OP 12	0	0
OP 13	0	0
OP 14	0	0
OP 15	0	0
OP 16	0	0
OP 17	0	0
OP 18	0	0
OP 19	0	0
OP 20	0	0
OP 21	0	0
OP 22	0	0
OP 23	0	0
OP 24	0	0
OP 25	0	0
OP 26	0	0
OP 27	0	0
OP 28	0	0
OP 29	0	0
OP 30	0	0

Receptor	Green Glare (min)	Yellow Glare (min)
OP 31	0	0

Point Receptor: OP 1

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 2

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 3

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 4

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 5

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 6

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 7

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 8

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 9

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 10

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 11

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 12

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 13

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 14

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 15

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 16

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 17

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 18

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 19

0 minutes of yellow glare

0 minutes of green glare

Point Receptor: OP 20

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 21

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 22

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 23

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 24

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 25

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 26

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 27

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 28

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 29

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 30

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 31

0 minutes of yellow glare
0 minutes of green glare

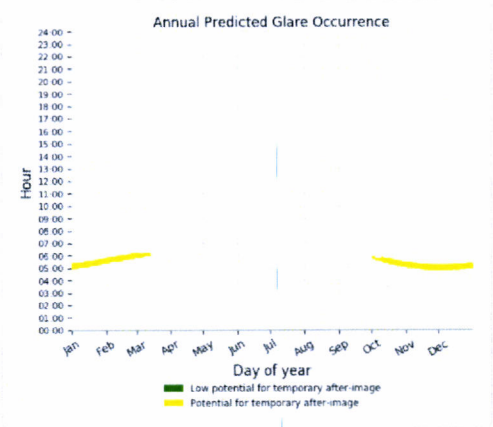
Results for: MUD3C

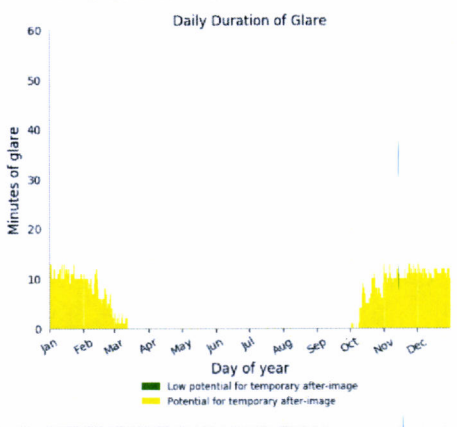
Receptor	Green Glare (min)	Yellow Glare (min)
OP 1	0	1421
OP 2	0	0
OP 3	0	0
OP 4	0	0
OP 5	0	0
OP 6	0	0
OP 7	0	0
OP 8	0	0
OP 9	0	0
OP 10	0	0
OP 11	0	0
OP 12	0	0
OP 13	0	0
OP 14	0	0
OP 15	0	0
OP 16	0	0
OP 17	0	0
OP 18	0	0
OP 19	0	0
OP 20	16	25
OP 21	0	0
OP 22	0	0
OP 23	0	0
OP 24	319	740
OP 25	146	1679

Receptor	Green Glare (min)	Yellow Glare (min)
OP 26	149	1492
OP 27	0	3864
OP 28	0	0
OP 29	0	0
OP 30	0	0
OP 31	0	0

Point Receptor: OP 1

1421 minutes of yellow glare
0 minutes of green glare





Point Receptor: OP 2

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 3

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 4

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 5

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 6

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 7

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 8

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 9

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 10

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 11

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 12

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 13

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 14

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 15

0 minutes of yellow glare

0 minutes of green glare

Point Receptor: OP 16

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 17

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 18

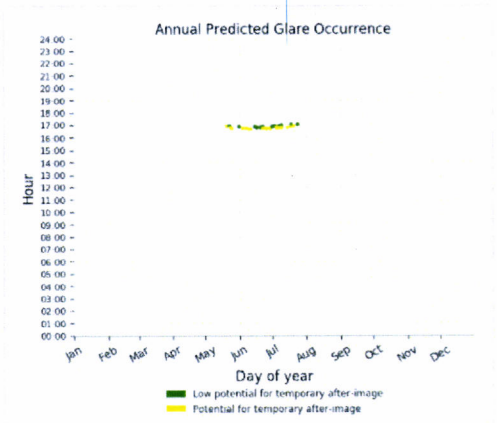
0 minutes of yellow glare
0 minutes of green glare

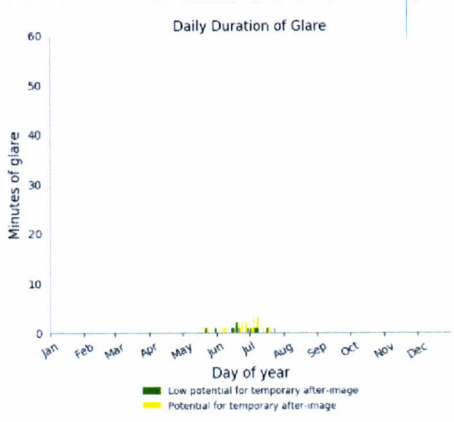
Point Receptor: OP 19

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 20

25 minutes of yellow glare
16 minutes of green glare





Point Receptor: OP 21

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 22

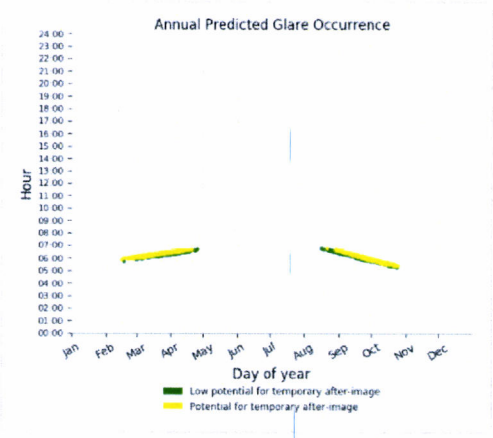
0 minutes of yellow glare
0 minutes of green glare

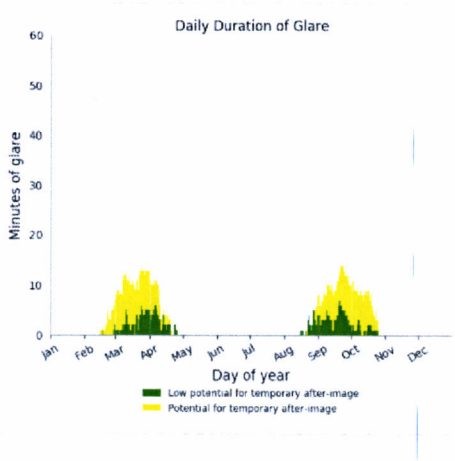
Point Receptor: OP 23

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 24

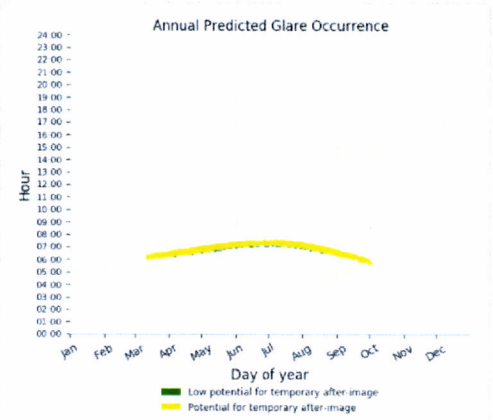
740 minutes of yellow glare
319 minutes of green glare

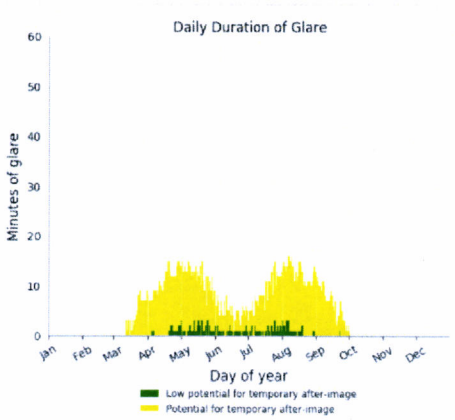




Point Receptor: OP 25

1679 minutes of yellow glare
146 minutes of green glare

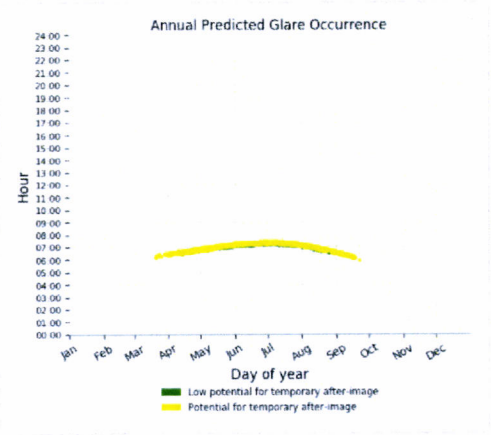


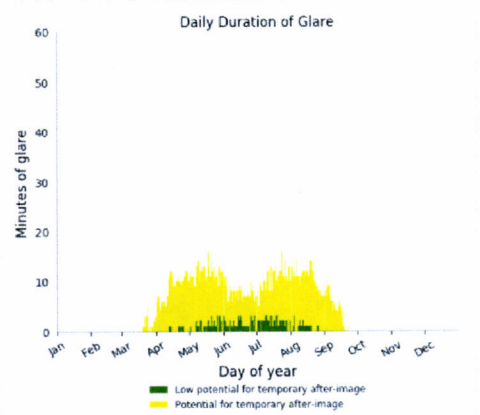


Point Receptor: OP 26

1492 minutes of yellow glare

149 minutes of green glare

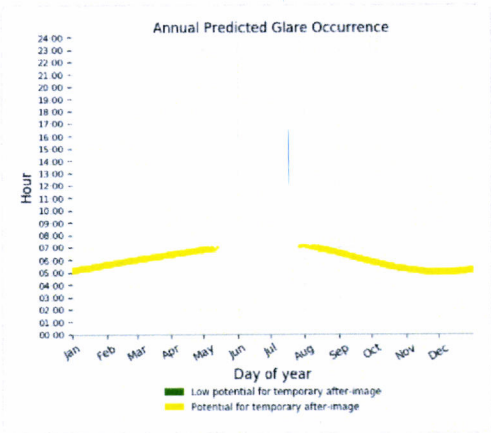


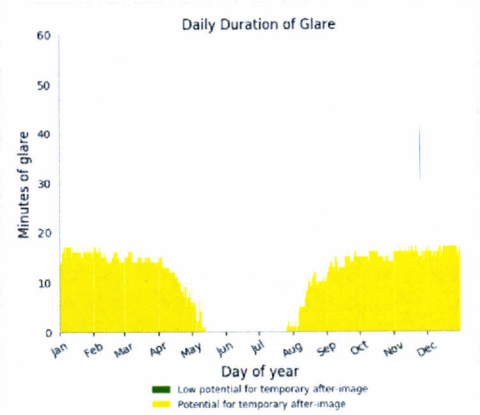


Point Receptor: OP 27

3864 minutes of yellow glare

0 minutes of green glare





Point Receptor: OP 28

0 minutes of yellow glare

0 minutes of green glare

Point Receptor: OP 29

0 minutes of yellow glare

0 minutes of green glare

Point Receptor: OP 30

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 31

0 minutes of yellow glare
0 minutes of green glare

Assumptions

"Green" glare is glare with low potential to cause an after-image (flash blindness) when observed prior to a typical blink response time.
"Yellow" glare is glare with potential to cause an after-image (flash blindness) when observed prior to a typical blink response time.
Times associated with glare are denoted in Standard time. For Daylight Savings, add one hour.
Glare analyses do not account for physical obstructions between reflectors and receptors. This includes buildings, tree cover and geographic obstructions.
Several calculations utilize the PV array centroid, rather than the actual glare spot location, due to algorithm limitations. This may affect results for large PV footprints. Additional analyses of array sub-sections can provide additional information on expected glare.
The subtended source angle (glare spot size) is constrained by the PV array footprint size. Partitioning large arrays into smaller sections will reduce the maximum potential subtended angle, potentially impacting results if actual glare spots are larger than the sub-array size. Additional analyses of the combined area of adjacent sub-arrays can provide more information on potential glare hazards. (See previous point on related limitations.)
Glare locations displayed on receptor plots are approximate. Actual glare-spot locations may differ.
Glare vector plots are simplified representations of analysis data. Actual glare emanations and results may differ.
The glare hazard determination relies on several approximations including observer eye characteristics, angle of view, and typical blink response time. Actual results and glare occurrence may differ.
Hazard zone boundaries shown in the Glare Hazard plot are an approximation and visual aid based on aggregated research data. Actual ocular impact outcomes encompass a continuous, not discrete, spectrum.