MID-WESTERN REGIONAL COUNCIL
PO Box 156, MUDGEE NSW 2850
86 Market Street, Mudgee | 109 Herbert Street, Gulgong | 77 Louee Street, Rylstone
T 1300 765 002 or 02 6378 2850 | F 02 6378 2815
council@midwestern.nsw.gov.au

Development Application (DA) form

Made under the Environment Planning and Assessment Act 1979, Section 4.12

ABOUT THIS FORM

You can use this form to request approval to undertake development in the Mid-Western Regional Local Government Area where Council is the consent authority (including removal of trees listed on the Council's heritage tree list). This form should not be used for applications for Section 4.55 (formerly Section 96) Modifications.

1. PROPERTY DESCRIPTION/LAND TO BE DEVELOPED

It is important that the property is accurately identified by its legal description. This information is shown on your Rates notices, property deeds etc.

Unit/Street number	Street name
3B	Sydney Road

Suburb/Locality	Postcode
Burrundulla	2850

Lot number	Section no.	Deposited plan no.	Parish
6		1069441	MUDGEE

2. APPLICANT DETAILS

If the applicant is not the owner of the land, then the owner's written consent to lodge the application is required. All correspondence, both written and verbal and notice of determination will be sent to the applicant. It is important to notify Council of any change of address and/or telephone number if this occurs during the process of the application.

Title	Given Name/s	Family name
Mr	Mishka	Talent

Postal address (all correspondence will be sent to this address)	Email address
C/- IT Power (Australia) Pty Ltd, PO Box 6127, O'Connor, ACT 2602	mtalent@itpau.com.au

Home number	Business number	Mobile number
0403520690	02 6257 3511	0403520690

Signature of applicant/s		

3. CONSENT OF OWNER(S)

As owner/s of the land to which this application relates, I/we consent to this application. I/we also give consent for authorised Council Officers or agents to enter (without prior notice) the land to carry out inspections (original signatures required). (See Note 1).

Name/s

Christopher Cox, Director of BURRUNDULLA PTY LTD (ACN 000 202 568)

Signature/s		

Date		
12/6/2019		

BURRUNDULLA PTY. LIMITED A.C.N. 000 202 568 Common Seal

If you are signing on the owner's behalf as the owner's legal representative, please state the nature of your legal authority and attach documentary evidence (eg power of attorney, executor, trustee, company director)

Specify legal representation	ABN
Director / Secretary	82 000 202 568

4. DESCRIPTION OF PROPOSED DEVELOPMENT

Please briefly describe everything you are seeking approval for from Council. If you are constructing a building, what is the proposed use? (e.g. Change of Use – retail shop to restaurant, dwelling, shed, subdivision work etc).

Construction of two 5MW solar farms using single axis trackers.

5. COST OF THE PROPOSED DEVELOPMENT

The cost of the proposal should include all of the costs of developing the site (e.g. building, construction, landscaping, car parking, drainage, fencing etc) but should not include the cost of the land.

$ 13,200,000

6. DISCLOSURE REQUIRED FOR REPORTABLE POLITICAL DONATIONS OR GIFTS

A reportable gift or political donation is defined under the Election Funding and Disclosures Act 1981. If you have made a political donation to a political party, elected member, group or candidate or provided a gift to a local councillor or council employee where the value exceeded $1,000 or the combined value in any financial year exceeded $1,000 in the past two (2) years, a disclosure statement must be provided with the lodgement of a development application.

A disclosure statement can be obtained from Council's website (www.midwestern.nsw.gov.au) or Administration building.

Is a disclosure statement attached to this application?	YES	NO
		✓

7. TYPE OF DEVELOPMENT

You may require a tick in more than one box. Please tick which type of development you are applying for.

- [ ] **Local Development** is **all** types of development that requires consent, other than those listed below
- [✓] **Integrated Development** requires development consent from Council and other State Government authority(ies)
- [ ] **Designated Development** requires the preparation of an Environmental Impact Statement (EIS) under the provisions of the EP&A Act. Council or the Minister may be the consent authority (EIS required)
- [ ] **Subdivision** requires consent from Council
- [ ] **Demolition** is the **removal** of any structure

8. INTEGRATED DEVELOPMENT

This question is only applicable if integrated development was nominated above in Question 7.

Integrated development is where an approval is required from another Government department or agency. Please specify what Act approval is being sought under (tick appropriate boxes). Note a fee is applicable.

- [ ] Coal Mine Subsidence Compensation Act 2017 (s22)
- [ ] Fisheries Management Act 1994 (s144, s201, s205, s219)
- [ ] Heritage Act 1977 (s58)
- [ ] Mining Act 1992 (s63, s64)
- [ ] National Parks and Wildlife Act 1974 (s90)
- [ ] Protection of the Environment Operations Act 1997 (ss43(a), 47 and 55; ss43(b), 48 and 55; ss43(d), 55 and 122)
- [✓] Roads Act 1993 (s138)
- [ ] Rural Fires Act 1997 (s100B)
- [ ] Water Management Act 2000 (s89, s90, s91)

9. CONCEPT DEVELOPMENT

Are you applying for a *Concept Development Application*? (previously Staged Development) **(Division 4.4 Environmental Planning & Assessment Act 1979)**	YES	NO
		✓

10. OTHER APPROVALS SOUGHT

Certain types of development may include activities that also require other approvals from Council in addition to Development Consent. These additional approvals are required by the Local Government Act, 1993, and by the Roads Act, 1993.

Approval under Section 68 Local Government Act 1993	YES	NO
		✓

Note: Requires separate application to be completed.

- ☐ Structures or places of public entertainment: includes installing a temporary structure on the land
- ☐ Water supply sewerage and stormwater drainage work: includes carrying out water supply work
- ☐ Management of waste: includes placing a waste storage container in a public space
- ☐ Public roads: includes swinging or hoisting goods across or over any part of a public road by means of a crane, hoist etc

Note: These approvals are not required at this stage and can be made at a later date. A separate application needs to be lodged and a fee is applicable.

Approval under Section 138 Roads Act 1993	YES	NO
		✓

Does this application propose any form of alteration to Council's road reserve, i.e. driveway, footpath reconstruction, drainage connection or the like?

Note: Full details of the layout of proposed driveway crossing, drainage connections and the like are required to be with the development application. A separate application needs to be lodged and a fee is applicable.

11. HERITAGE AND CONSERVATION

Is the building or site an Item of Environmental Heritage or within a Heritage Conservation Area or within the vicinity of an Item of Environmental Heritage?	YES	NO
		✓

If you answered 'no', please go to Question 13.

If your answer is 'yes' to either of the below questions, a heritage impact statement will be required with lodgement of the development application. If the proposed works are minor, the details can be provided in the submitted Statement of Environmental Effects.

	YES	NO
Are you demolishing all or any part of the building?		
Are you altering or adding to any part of the building?		

12. PLANNING FOR BUSHFIRE PROTECTION

If you answer 'yes' to the following question, a bushfire assessment is required to be prepared and attached. The following documents are to be obtained from Council or www.bushfire.nsw.gov.au:

- Building in Bushfire Prone Areas – Guidelines for single dwelling development applications
- Building in Bushfire Prone Areas – Guidelines for subdivision applications

Is the subject site located in a bushfire hazard area?	YES	NO
		✓

13. CONSTRUCTION CERTIFICATE

Is an application for a Construction Certificate being made at the same time as the application for Development Consent?	YES	NO
		✓

14. BUILDING SUSTAINABILITY INDEX (BASIX)

WHAT IS BASIX?

BASIX is a web-based planning tool designed to assess the potential performance of residential buildings against a range of sustainability indices. By applying practical measures to the design of a new home, BASIX ensures there is the potential to save energy and water – saving you money on your bills and protecting the environment.

A BASIX Certificate identifies the sustainability features required to be incorporated in the building design. These features may include sustainable design elements such as recycled water, rainwater tanks, AAA-rated showerheads and taps, native landscaping, heat pump or solar water heaters, gas space heaters, roof eaves/awnings and wall/ceiling insulation.

WHEN DO I NEED A BASIX CERTIFICATE?

You need a BASIX Certificate in the Mid-Western Regional Local Government Area when BASIX applies to the type of development for which you require approval. Commencement dates and details of types of development are at www.basix.nsw.gov.au.

The applicant is required to submit the BASIX Certificate with the Development Application or Complying Development Certificate application. The plans and specifications must also identify the BASIX commitments which will be checked by a professional building certifier during construction. Where submitted plans or specifications are inconsistent with the relevant BASIX Certificate, Council should require applicants to submit consistent applications before progressing the assessment process, either by amending plans/specifications or by submitting a new BASIX Certificate with commitments that match the rest of the application.

HOW DO I GENERATE A BASIX CERTIFICATE?

Applicants can generate the BASIX Certificate only on the NSW Department of Planning and Environment's BASIX website: www.basix.nsw.gov.au. For more information, phone DPE's BASIX Help Line on 1300 650 908.

	YES	NO
Is a BASIX Certificate required?		✓
Is a BASIX Certificate attached?		✓

Note: Council **CANNOT** accept a Development Application for residential purposes without a BASIX Certificate that has been issued no earlier than 3 months before the date on which this application is being made.

15. SITE PLAN AND PLAN/DRAWINGS OF PROPOSED DEVELOPMENT

The site plan is to indicate the following: location, boundary dimensions, site area and north point of the site; existing vegetation and trees on the land; location and uses of existing buildings on the site and adjoining sites, where applicable; existing levels of the land in relation to buildings and roads.

Plans or drawings of the proposed development must include the following: location of proposed new buildings or works in relation to the site's boundaries; floor plans of proposed buildings; proposed finished levels; proposed parking and access (dimensioned where appropriate), proposed landscaping (indicating plant types and their height at maturity) and proposed method of drainage.

	YES	NO
Three (3) copies of all plans/drawings (plus 1 A4 set) are submitted.	✓	

16. STATEMENT OF ENVIRONMENTAL EFFECTS (SEE)

A Statement of Environmental Effects (SEE) or an Environmental Impact Statement (EIS) must accompany your application. The SEE is a short report which includes written information about the proposed development that cannot be readily shown on your plans.

The SEE should describe **in detail** the proposed development. The SEE should outline the likely impacts and issues of the proposed development and how you will minimise these impacts.

Where relevant, a SEE must include, however is not limited to the following details:

- How the development achieves the requirements of the Mid-Western Regional Local Environmental Plan 2012, Development Control Plans and State Environmental Planning Policies
- Previous use of the site. Some previous land uses may have led to site contamination
- Flooding, drainage, landslip, soil erosion, mine subsidence, bushfires and any other risk
- Impacts on existing and future amenity of the locality
- Availability of utility services, power, telephone and water/sewer
- Impacts on historical, aboriginal heritage and archaeological aspects
- Impacts on flora and fauna
- Access for the disabled
- Social and economic effects

For shops, offices, commercial or industrial or change of use development: hours of operation; erection of any signage; plant and machinery to be installed; the type, size and quantity of goods to be made; provision of car parking and stored or transportation of goods and loading and unloading facilities

	YES	NO
Is a Statement of Environment Effects included as part of this application?	✓	

BURRUNDULLA LTY LTD
ABN 82 000 202 568
3B SYDNEY ROAD
MUDGEE NSW 2850
27 May 2019

The General Manager
Mid-Western Regional Council
PO Box 156
MUDGEE NSW 2850

Dear Sir,

RE: IT Power (Australia) Pty Ltd
Development Application affecting Lot 6 DP 1069441

Burrundulla Pty Ltd, being the registered proprietor of lot 6 DP 1069441 hereby consents to lodgement by IT Power (Australia) Pty Ltd of a development application over parts of the land seeking approval for the construction of solar farms.

Yours Sincerely

Christopher Cox
Secretary, Burrundulla Pty Ltd

STATEMENT OF ENVIRONMENTAL EFFECTS

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

Burrundulla Mini Sustainable Energy Park

Zenith
TOWN PLANNING

sustainable thinking

Zenith Town Planning Pty Ltd
PO Box 591 Moruya NSW 2537
0408 258 877|zenithplan@bigpond.com|www.zenithplan.com.au

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TABLE OF CONTENTS

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
Version	Draft 4 June 2019
	Final 13 June 2019

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.

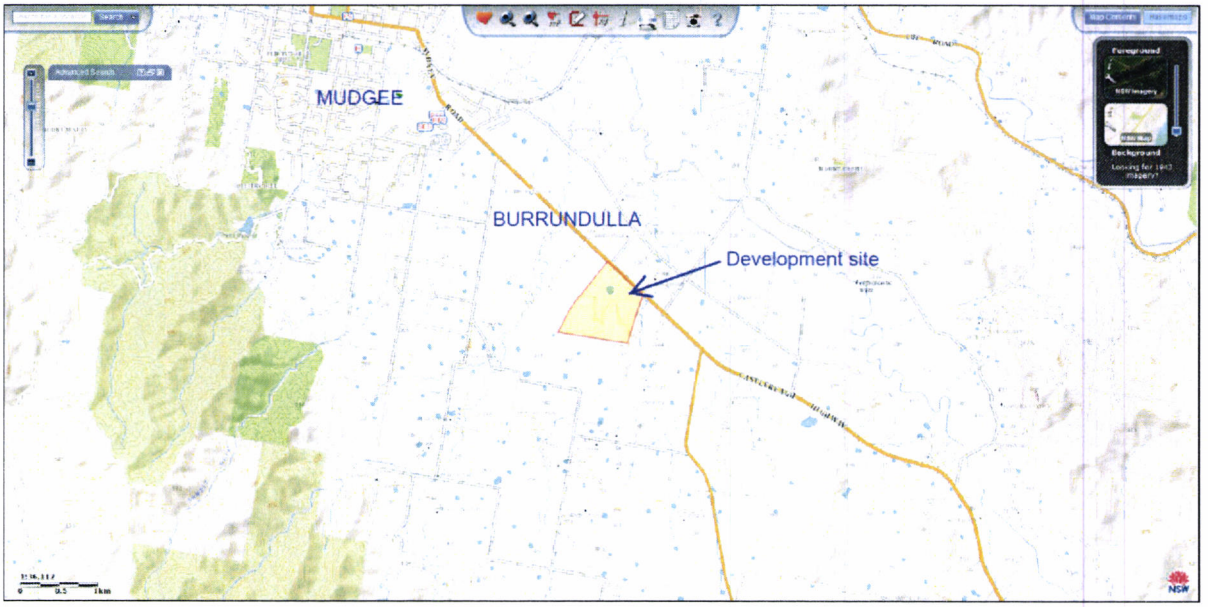

Figure 1: Locality map. Source: SIX Maps, 2019

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.

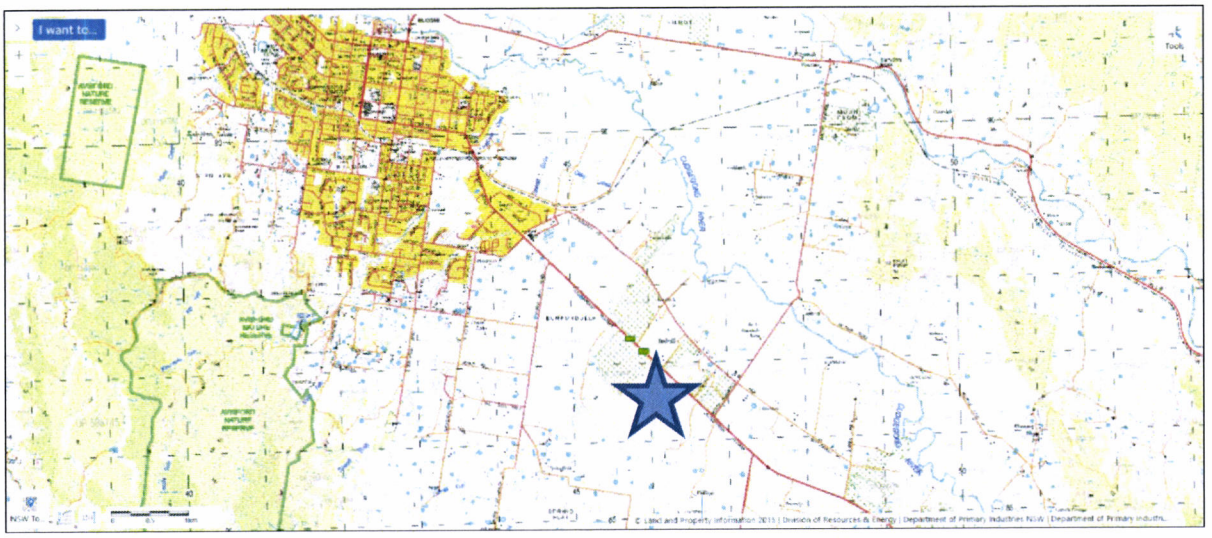

Figure 3: Extract from the topographic map. Source: Land & Property Information 2015

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.

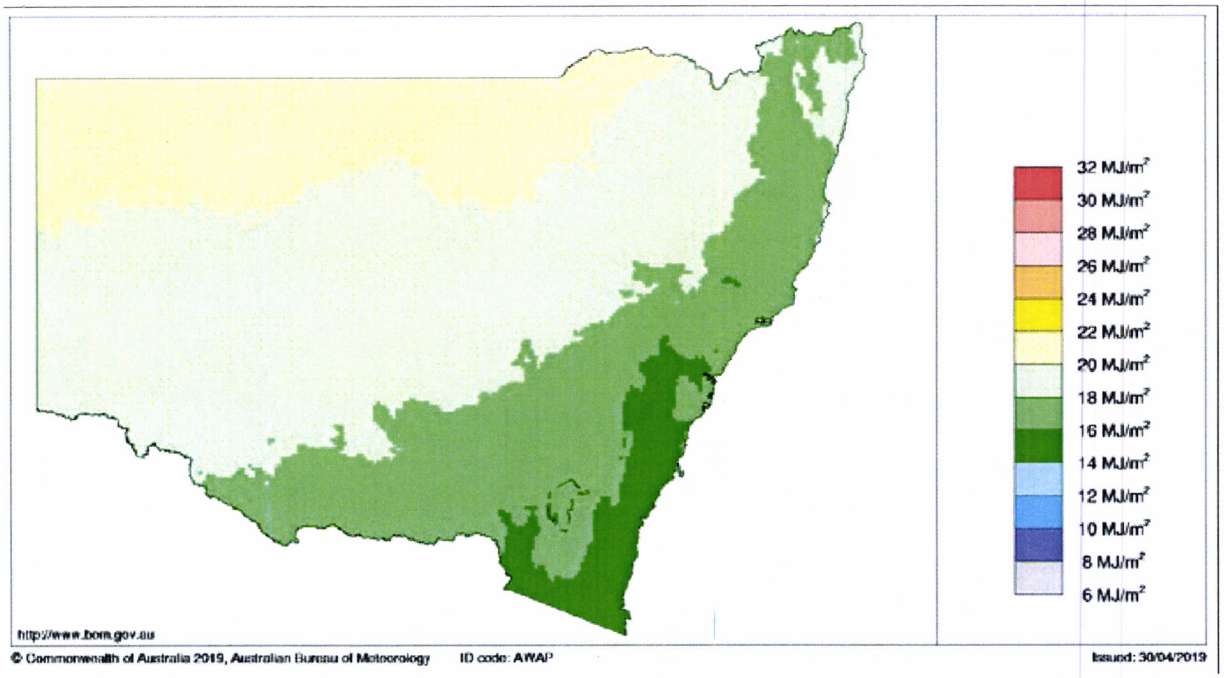

Figure 4: Average daily solar exposure. Source: Australian Bureau of Meteorology

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.

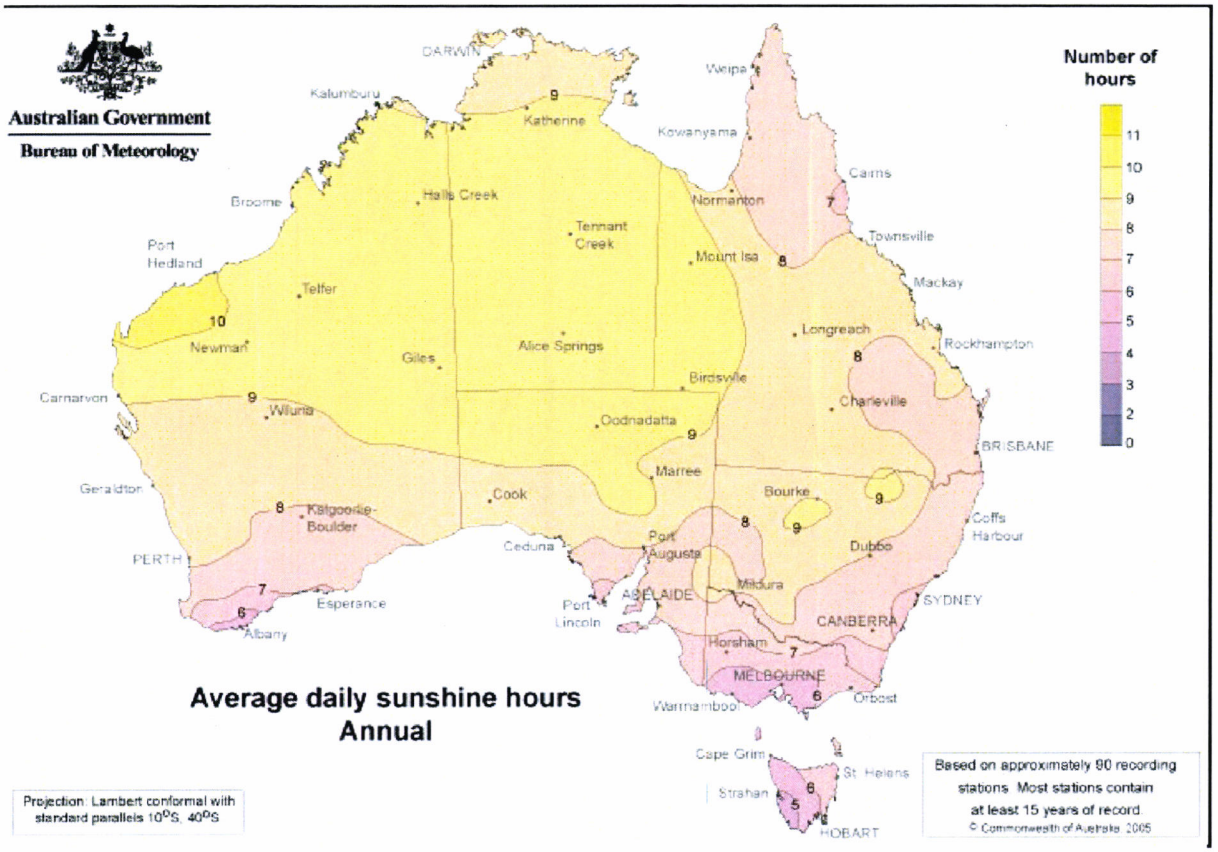

Figure 5: Average daily sunshine hours. Source: Australian Bureau of Meteorology

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.

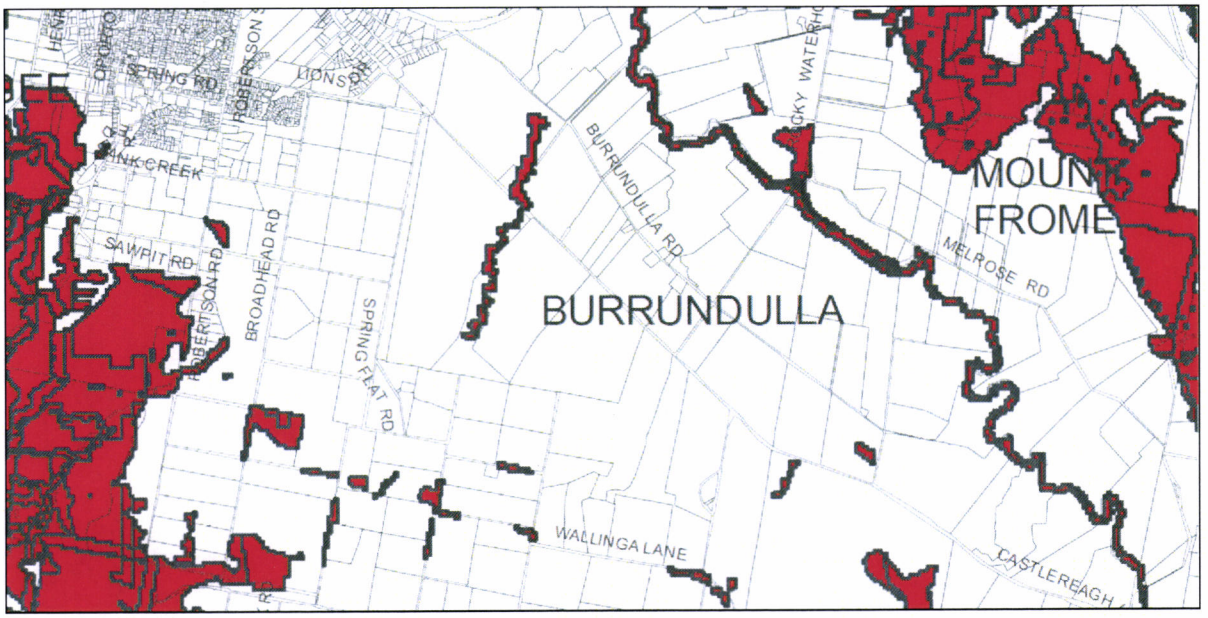

Figure 6: Extract from Mid-Western LEP 2012 Sensitive Biodiversity Map Sheet BIO_006

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).

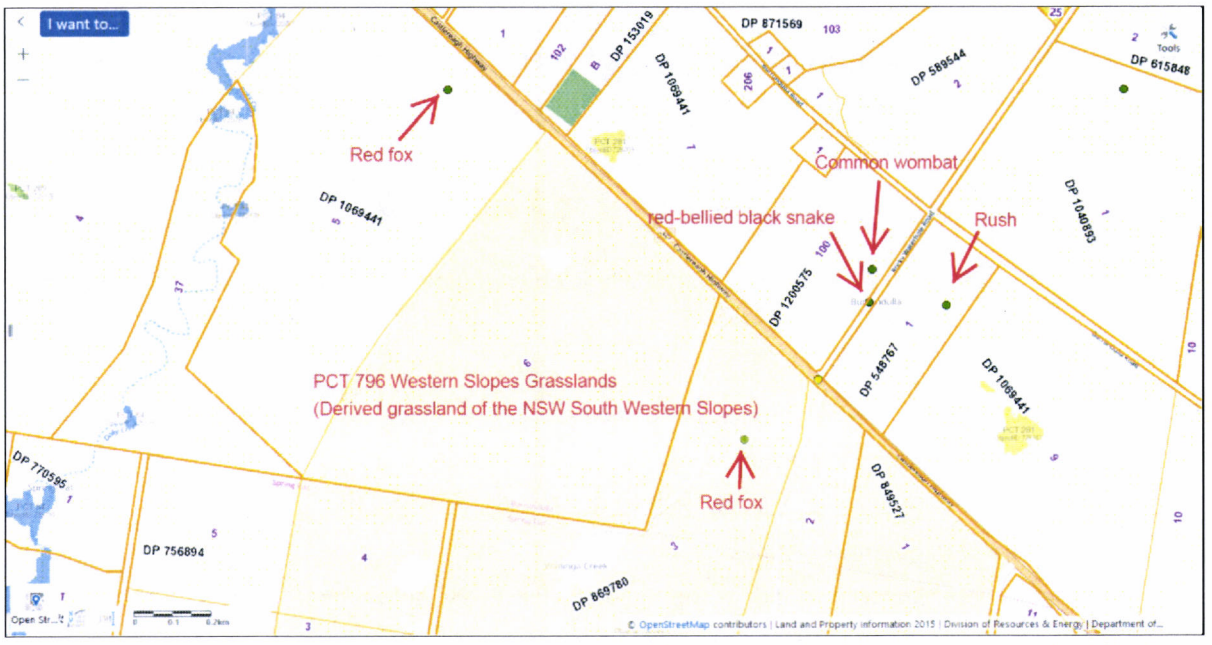

Figure 7: Recorded vegetation communities and species sightings. Source: OEH 2019

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.

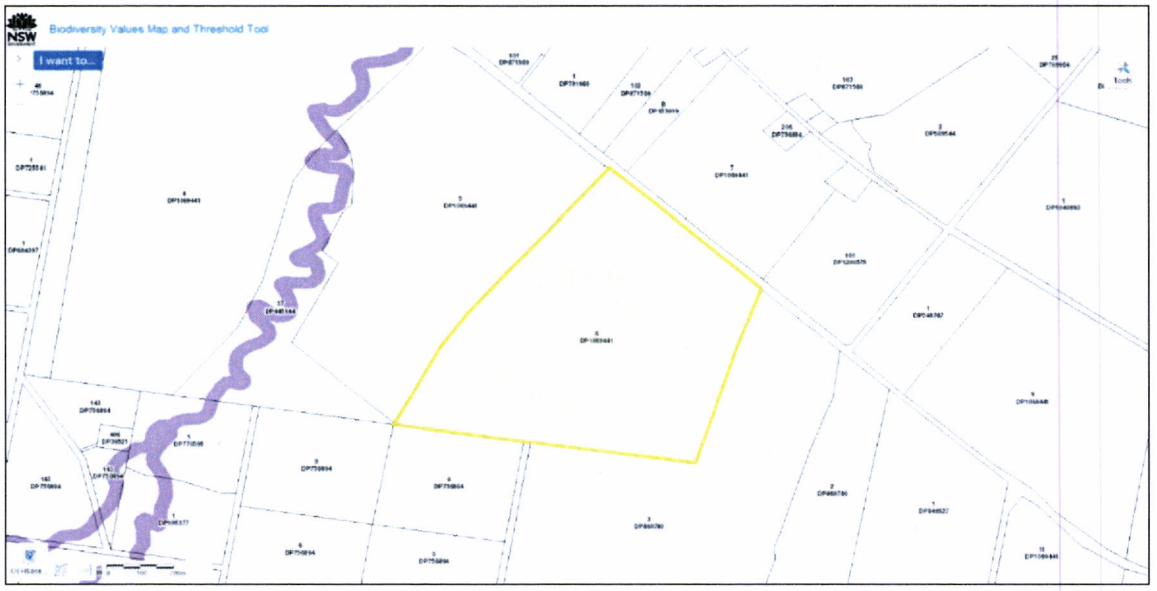

Figure 8: Biodiversity Values Map. Source: OEH, 2019

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.

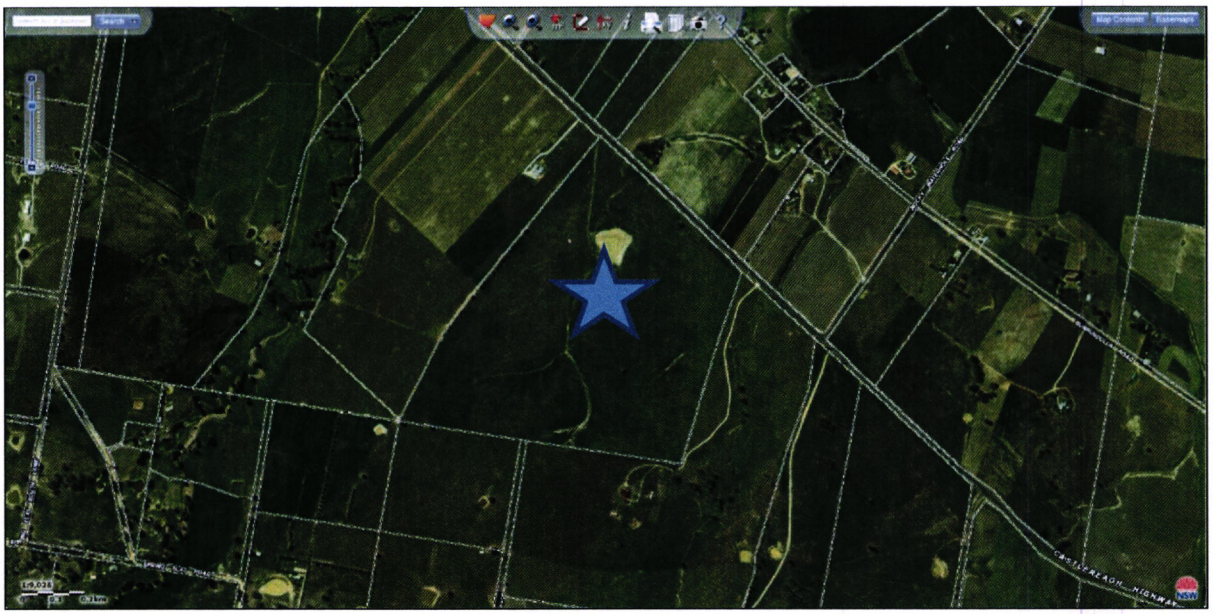

Figure 9: Aerial image of Lot 6. Source: SIX Maps

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).

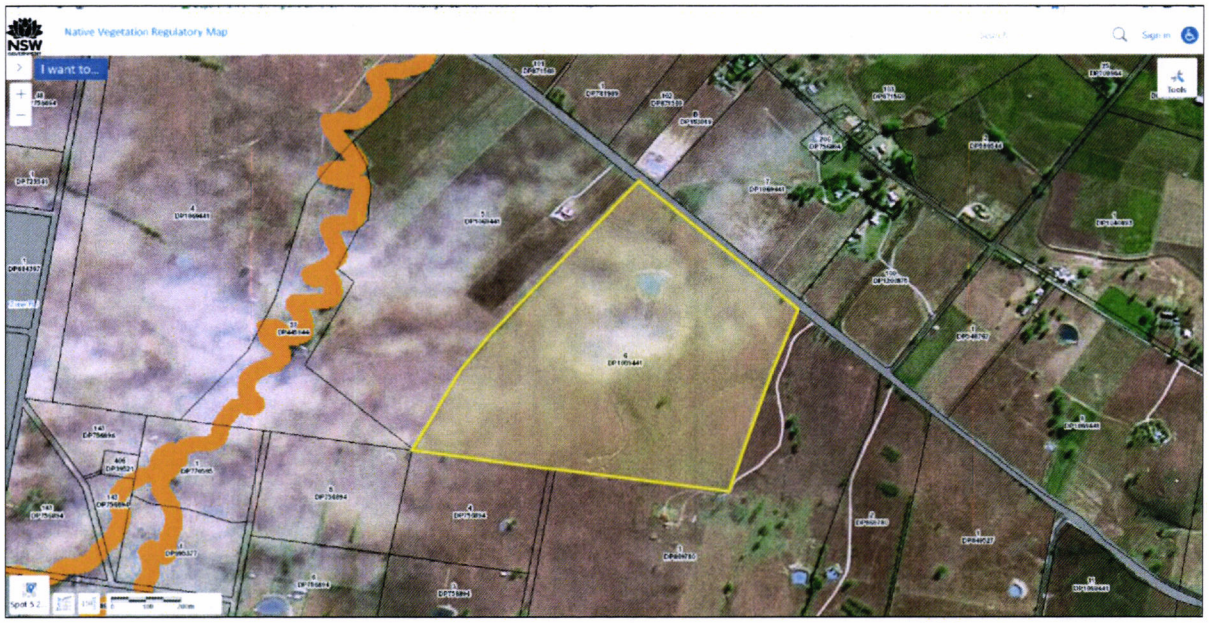

Figure 10: Native Vegetation Regulatory Map. Source: OEH, 2018

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.

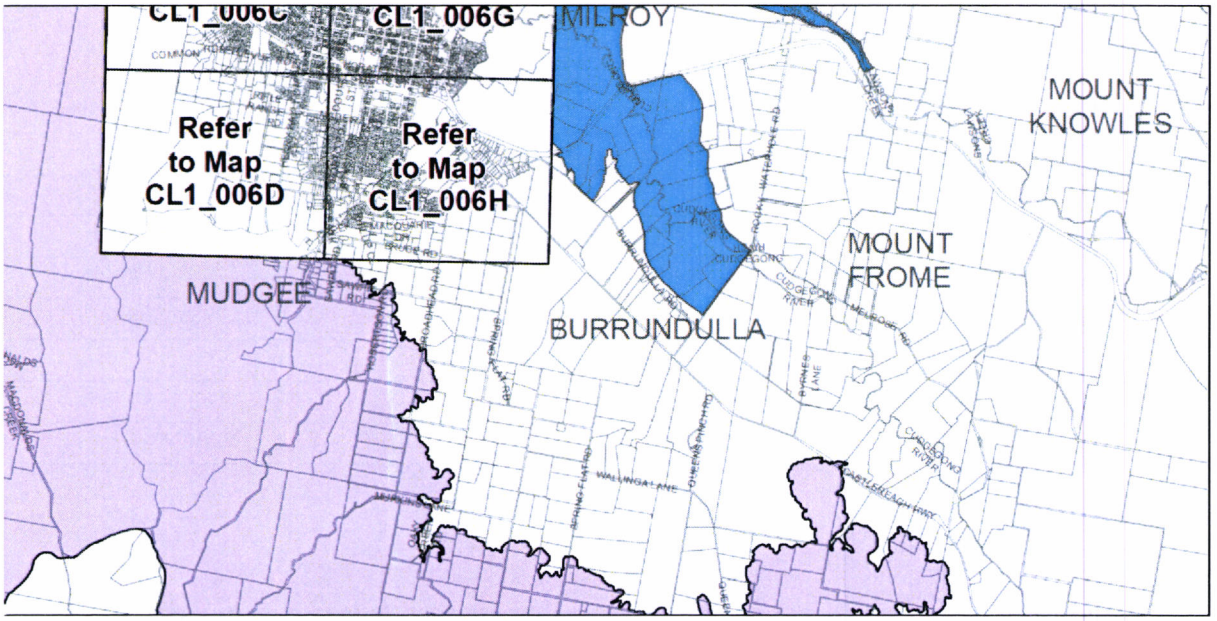

Figure 12: Extract from the Visual Sensitive Land Map, Mid-Western LEP 2012

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

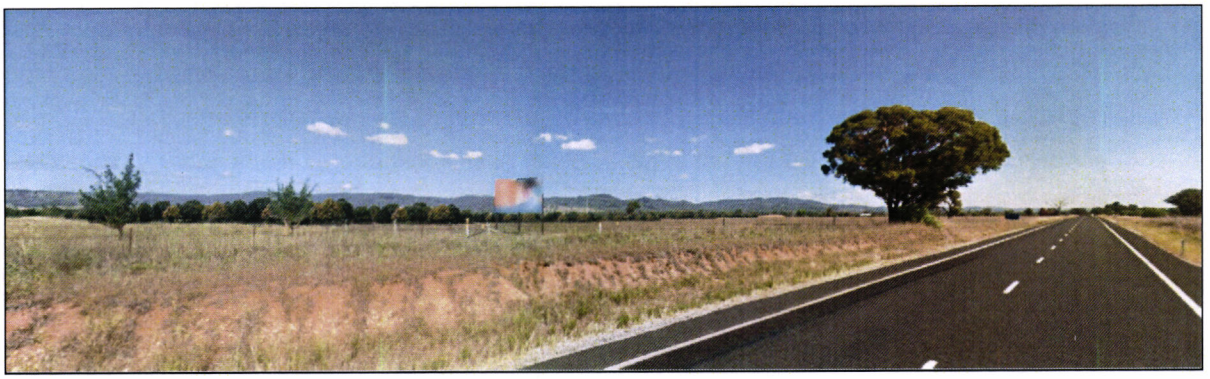

Plate 11: On approach to Mudgee – the development site on the left with vegetated screening

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.

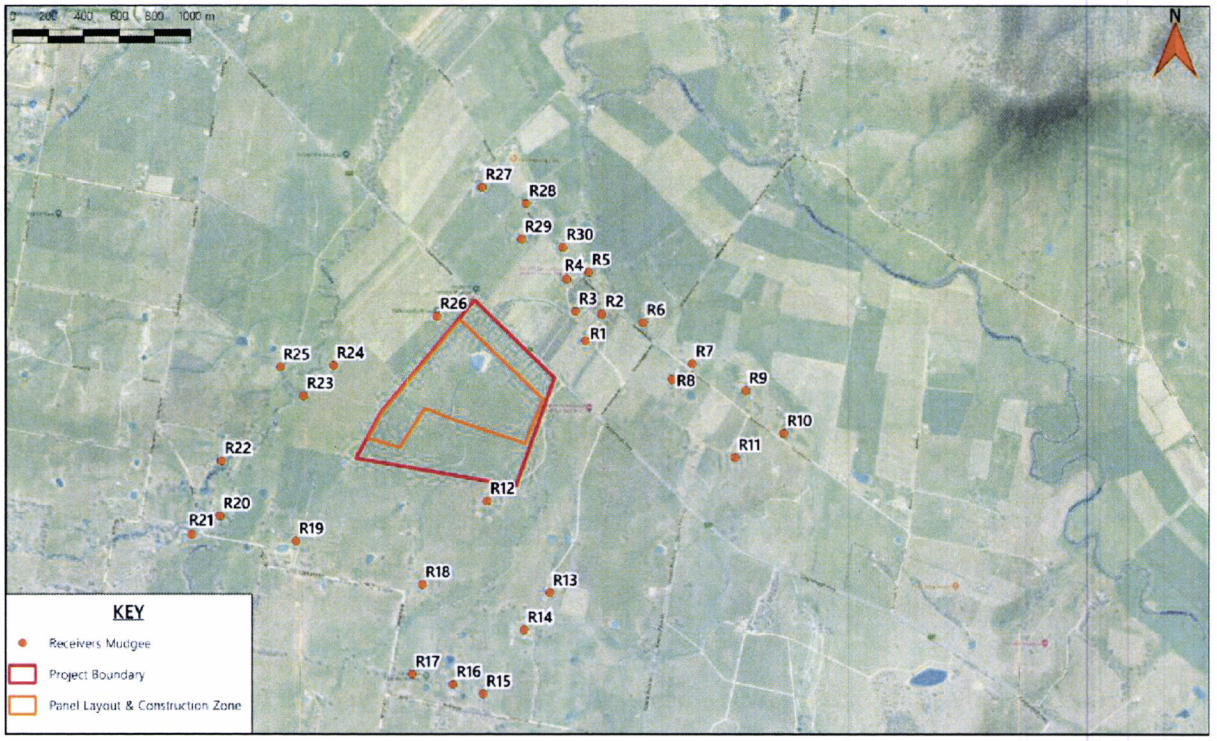

Figure 13: Location of noise sensitive receptors

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.

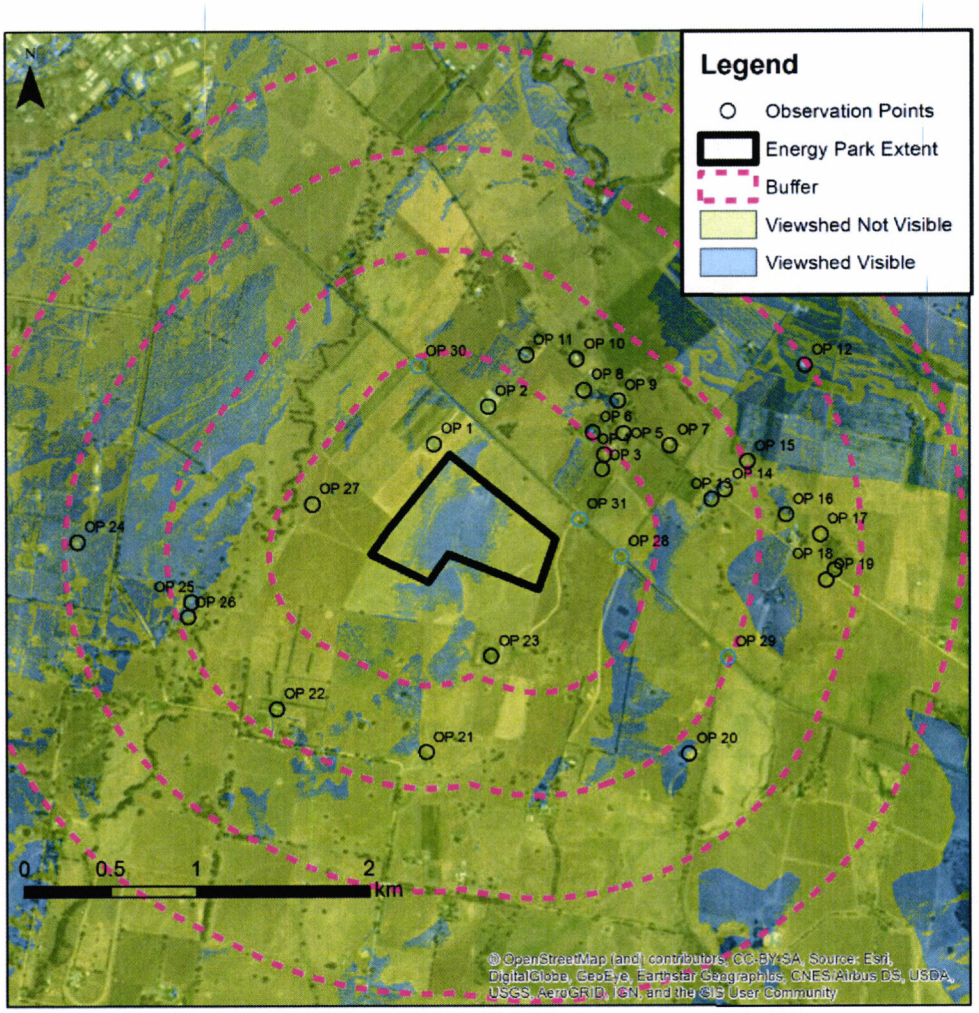

Figure 15: Viewshed and observation points

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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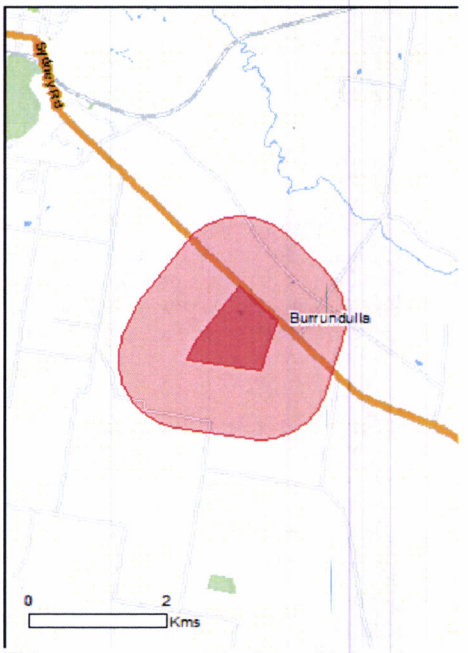

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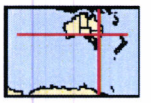


Summary

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

P O Box 591

Moruya New South Wales 2537

Attention: Allen Grimwood

Email: zenithplan@bigpond.com

Date: 15 May 2019

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.

3 Marist Place, Parramatta NSW 2150
Locked Bag 5020 Parramatta NSW 2220
Tel: (02) 9585 6380 Fax: (02) 9873 8599

ABN 30 841 387 271
Email: ahims@environment.nsw.gov.au
Web: www.environment.nsw.gov.au

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

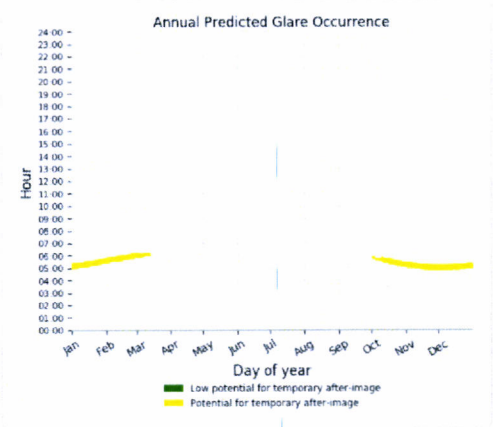
Results for: MUD3C

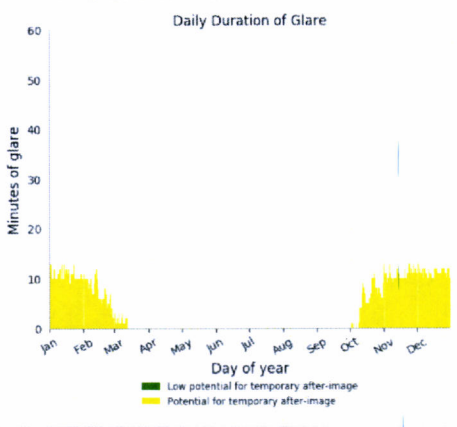
Receptor	Green Glare (min)	Yellow Glare (min)
OP 1	0	1421
OP 2	0	0
OP 3	0	0
OP 4	0	0
OP 5	0	0
OP 6	0	0
OP 7	0	0
OP 8	0	0
OP 9	0	0
OP 10	0	0
OP 11	0	0
OP 12	0	0
OP 13	0	0
OP 14	0	0
OP 15	0	0
OP 16	0	0
OP 17	0	0
OP 18	0	0
OP 19	0	0
OP 20	16	25
OP 21	0	0
OP 22	0	0
OP 23	0	0
OP 24	319	740
OP 25	146	1679

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

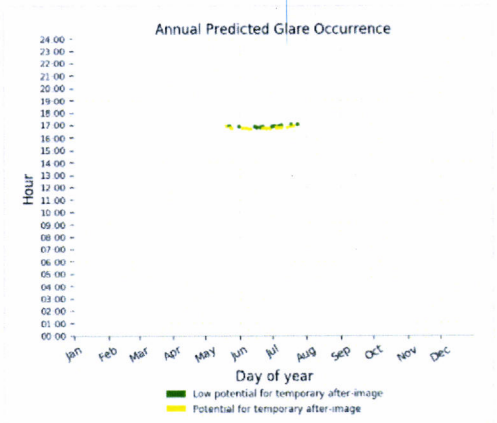
0 minutes of yellow glare
0 minutes of green glare

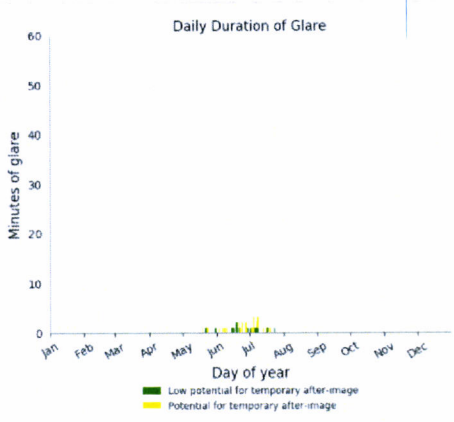
Point Receptor: OP 19

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

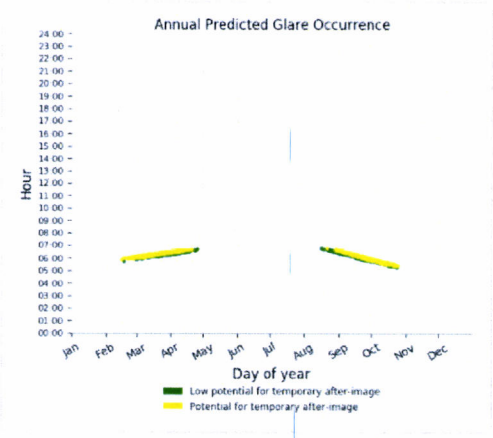
0 minutes of yellow glare
0 minutes of green glare

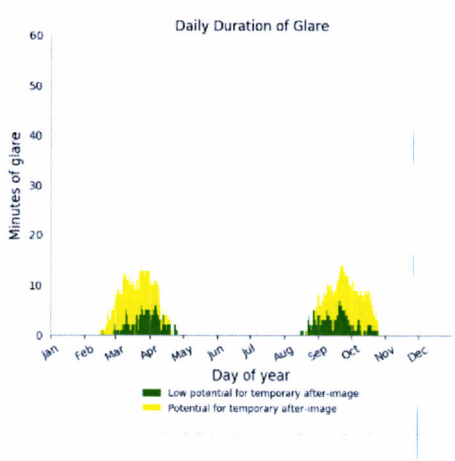
Point Receptor: OP 23

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 24

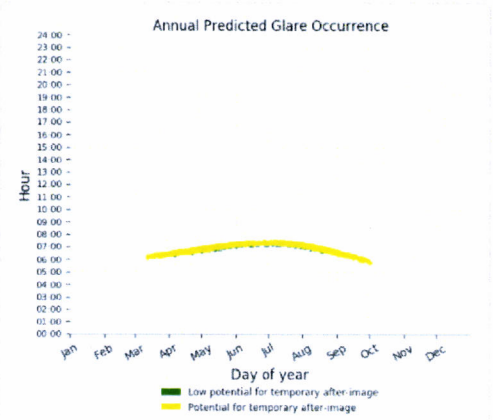
740 minutes of yellow glare
319 minutes of green glare

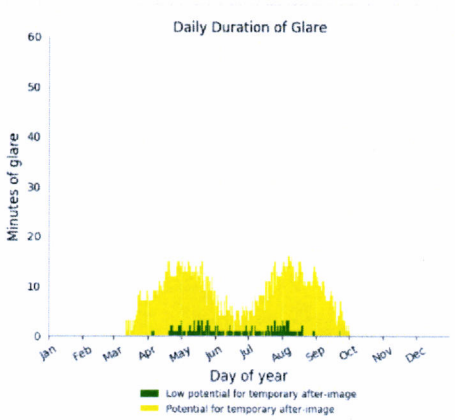




Point Receptor: OP 25

1679 minutes of yellow glare
146 minutes of green glare

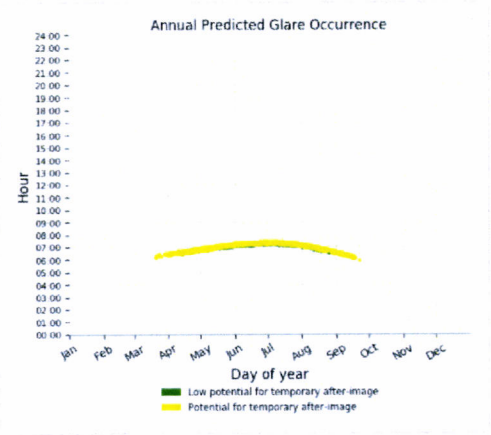


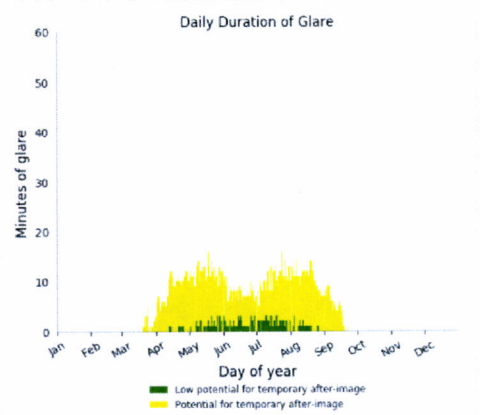


Point Receptor: OP 26

1492 minutes of yellow glare

149 minutes of green glare

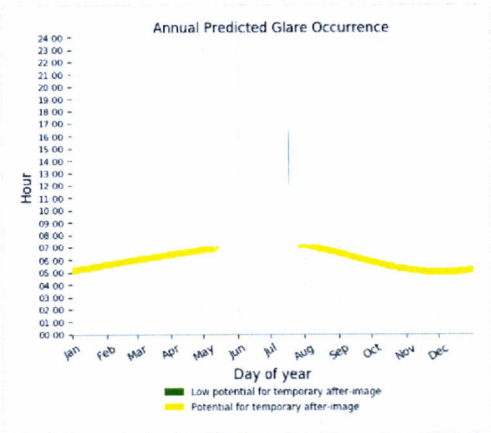


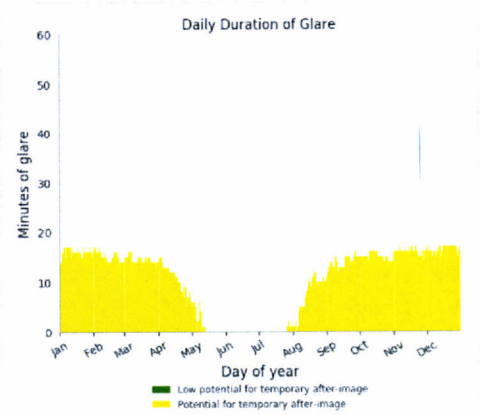


Point Receptor: OP 27

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.

TRIAXIAL
CONSULTING

COMPLEX PROBLEMS
RESOLVED SIMPLY

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PROVISION OF CONSULTING ENGINEERING SERVICES

BURRUNDULLA MINI SUSTAINABLE ENERGY PARK
3B CASTLEREAGH HIGHWAY, BURRUNDULLA
LOT 6, DP1069441

TRAFFIC ASSESSMENT REPORT

24 MAY 2019
REFERENCE: MX10959.00-02.RPT.JD-REV1

Document Control:

Client	ITP Renewables		
Prepared By:	Triaxial Consulting Ltd		
Report Author	Jim Disher		
File Reference:	MX10595.00-02.rpt		
Report Date:	24th May 2019		
Current Revision:	1		
Revision History:	**Report Author**	**Reviewed By**	**Report Date**
0	JD	JS	22/05/19
1	JD	JS	24/05/19

INDEX

1 INTRODUCTION

Triaxial have been engaged ITP Renewables to prepare a traffic assessment report. The purpose of this report is to assess the traffic implications of the development proposal. This report is to be included in the development application lodged with Mid Western Regional Council.

The site is currently utilised as grazing land and is shown in the photo below:

Figure 1: Existing Site

2 PROPOSAL

2.1 DEVELOPMENT SITE

The site is proposed to be utilised by ITP Renewables for the construction of a solar farm on an area of approximately 67Ha size located at Lot 6 DP1069441.

The proposed development site is located near Mudgee, approximately 2.4km from the intersection of Lions Drive with the Castlereagh Highway. The site is currently zoned as RU1

primary production. The proposed site has not been identified as a possible future residential release area in the Mudgee Urban Release Strategy (2014). The closest proposed residential development is located over 700 metres away at Spring Flat Road, with a proposed subdivision of 25 x 5 acre blocks in the planning stage, noted as area 23 on the Mudgee Urban Release Strategy (2014). The site is surrounded by existing farming land.

The Castlereagh Highway along the frontage of the site is constructed with dual carriageway 3.5m wide lanes and sealed shoulders of minimum 1m width and table drains either side.

The Western end of the site is located approximately 1 kilometre from the intersection of Queens Pinch Road and the Castlereagh Highway.

3 DESIGN SERVICE VEHICLES

3.1 CONSTRUCTION PHASE 0-3 MONTHS

It is proposed that the following vehicles will access the site during the following stages of the project:

Vehicles accessing the site during construction will consist of:

- 90 B-Double trucks (total number of B-Doubles over the construction phase).
- Light vehicles suitable for transporting up to 50 workers for an anticipated construction period of 24 weeks.
- Bus service for workers if required.

3.2 TYPICAL USE DURING OPERATIONAL PHASE

The following list depicts the weekly schedule of vehicles required for the facility to operate.

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

4 EXISTING TRAFFIC CONDITIONS

4.1 ROAD HIERARCHY – SURROUNDING ROAD NETWORK

The NSW administrative road hierarchy comprises the following road classifications, which align with generic road hierarchy as follows:

- **Castlereagh Highway (B55)** is a state highway, managed by Roads and Maritime Services , with primary function of providing vehicular access between Mudgee and Ilford.

  The B55 Castlereagh Highway is listed as an approved B-Double Route by RMS as shown in Figure 2 and is classified as an Arterial road in the Mudgee Township Traffic Management Plan (2014).

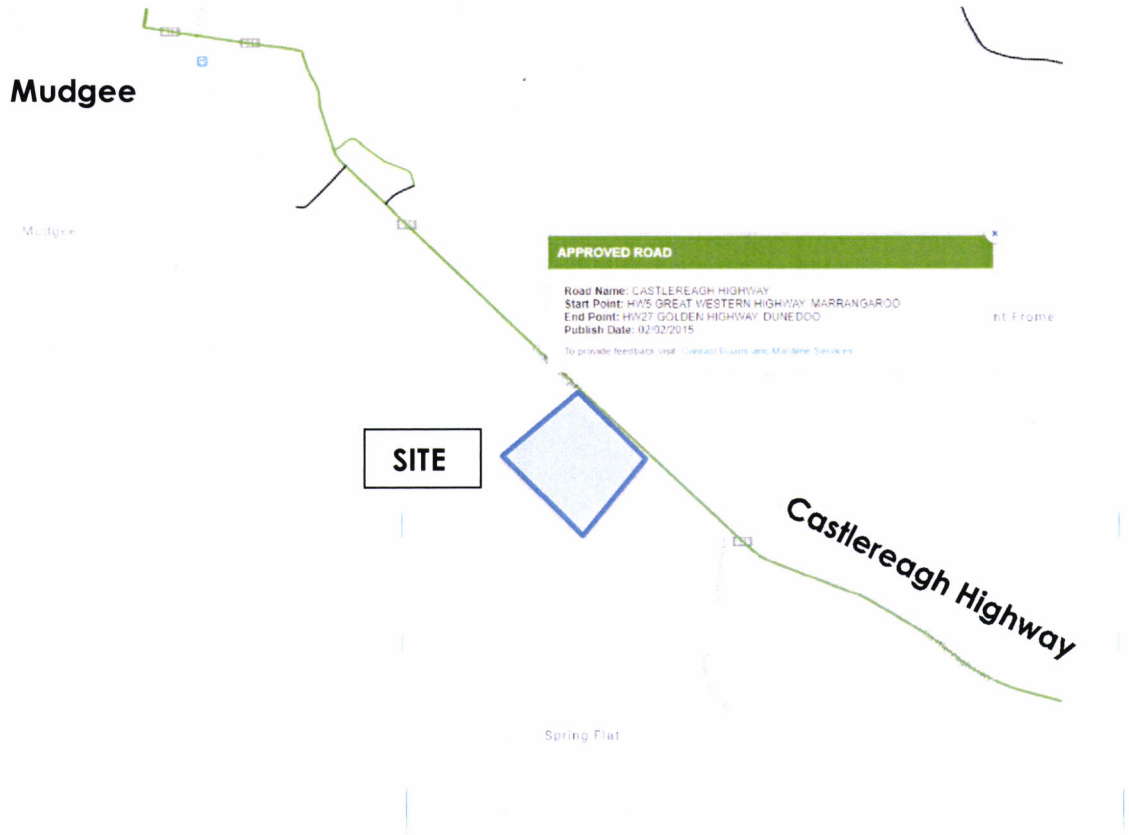

Figure 2: Existing travel conditions. Source: RMS website: http://www.rms.nsw.gov.au/business-industry/heavy-vehicles/maps/restricted-access-vehicles-map/map/

4.2 EXISTING TRAFFIC DATA

Traffic data was sourced from the Mudgee Township Traffic Management Study (2014) produced by Gennaoui Consulting.

Traffic counts for the nearest traffic count station to the site, being Sydney Road near the Burrundulla Road intersection and the corresponding level of service is detailed in table 3.7 of the report as shown below:

Street	Location			Lanes	N/E	S/W	Total	LoS
Church Street	Mortimer	&	Market	4UP	437	435	**872**	A
Church Street	Gladstone	&	Mortimer	4UP	515	525	**1040**	A
Church Street	Mealy St	&	Denison St	4UP	486	542	**1028**	B
Church Street	Denison	&	Gladstone	4UP	495	525	**1020**	A
Church Street	Horatio St	&	Inglis St	4UP	411	518	**929**	A
Church Street	Meares St	&	Railway X	2U*	340	462	**802**	A
Douro Street	Gladstone	&	Mortimer	4UP	329	439	**768**	A
Douro Street	Denison	&	Gladstone	4UP	354	443	**797**	A
Douro Street	at Railway X			2U*	282	415	**697**	A
Horatio Street	Church St	&	Perry	4UP	335	332	**667**	A
Market Street	Douro St	&	Perry	4UP	307	336	**643**	A
Market St	Douro St	&	Court	4UP	312	368	**680**	A
Mortimer Street	Church	&	Perry	4UP	308	326	**634**	A
Sydney Road	*at Railway Crossing*			*2U**	*572*	*517*	***1089***	*A*
Sydney Road	Burrundulla	&	Industrial	4UP*	329	402	**731**	A
Ulan	Short	&	Pitt / Lue	2U*	423	410	**833**	A
Ulan	Pitt/ Lue	&	Henry Lawson	2U*	330	366	**696**	A

Figure 3: Existing traffic count and corresponding level of service

As can be seen from the above table, the existing condition along Sydney Road at Burrundulla is operating with a carriageway level of service A, the highest available.

The existing operation of the closest major intersection, being the intersection of Lions Drive with the Castlereagh Highway has been listed as a level of service B. This is shown in the figure below:

Table 3.8: Existing Operation of Intersection in Mudgee

Intersections	Afternoon Peak		School Period	
	Ave Delay	LoS	Ave Delay	LoS
Roundabout Controlled				
Castlereagh Rd with Bell & Putta Bucca Rd *	12.0	A		
Church St with Short St *	12.1	A		
Church St with Market St *	13.0	A		
Church St with Mortimer St *	13.7	A		
Church St with Gladstone St *	11.8	A		
Church St with Horatio St *	13.7	A		
Church Street with Madeira Rd	8.7	A	8.7	A
Douro St with Market St *	12.4	A		
Perry St with Market St *	12.2	A		
Perry St with Lovejoy St *	11.0	A		
Ulan Rd with Pitt Ln and Lue Rd @	10.8	A		
Sign Controlled Intersections				
Bellevue Rd with Henry Bayly Dr @	7.0	A		
Castlereagh Rd with Bell Street @	8.2	A		
Castlereagh Rd with Putta Bucca Rd @	7.9	A		
Castlereagh Rd with Bell & Putta Bucca Rd *	10.5	A		
Castlereagh Road with Hill End Road #	16.4	B		
Church St with Denison St @	29.1	C		
Church St with Meares St @	19.6	B		
Douro St with Denison St @	20.3	B	21.6	B
Douro St with Gladstone St @	19.7	B		
Douro St with Horatio Street *	10.3	A	10.6	A
Douro St with Inglis St @	8.0	A		
Fairydale Ln with Gladstone St @	6.0	A		
Lewis St with Gladstone St @	12.1	A	13.5	A
Lewis St with Mortimer St @	10.4	A	11.6	A
Perry St with Gladstone St @	9.0	A	10.1	A
Sydney Rd with Industrial Rd @	11.0	A		
Sydney Rd with Lion St and Burrudulla Rd *	18.5	B		
Ulan Rd with Henry Lawson Dr @	8.2	A		

* Analysed with SIDRA Software @ Analysed with INTANAL software

Source: Traffix (2012)

Figure 4: Existing intersection level of service

As the construction phase of the project will be the main traffic generator and the operational phase will not introduce any traffic onto the road network, the existing conditions for the carriageway and intersection level of service have been adopted for this report.

5 PROPOSED TRAFFIC MANAGEMENT PLAN

5.1 PROJECTED TRAFFIC GENERATION POTENTIAL – TOTAL DEVELOPMENT

Based on advice from the client and a review of previous Solar Farm installations the proposed traffic generation for the development is separated into the construction and operational phases of the project as shown below. It is proposed to have up to 50 workers accessing the site during the construction phase, with work carried out between 7am – 4pm Monday to Friday.

Construction equipment is to be delivered to site via heavy vehicles (nominated as 25m long B-Doubles at this stage) between 10am – 2pm daily, hence not contributing to the AM or PM peak times.

Construction vehicle average trips per hour:

B-Double	2vtph (out of peak times)
Light vehicle access (workers – worst case)	50vtph
Light vehicle acces (workers with bus service)	20vtph
Total Development	**50vtph max.**

Vehicle average trips per day (vtpd) during construction are listed below:

B-Double	8vtpd
Light vehicle access (workers – worst case)	80vtpd
Light vehicle acces (workers with bus service)	20vpd
Total Development	**100vtd max.**

No reduction in these rates has been allowed for with pedestrian and cycle access to the facility. It is assumed that if all workers are accessing the site using light vehicles, there will be at least 2 workers per vehicle. Extra daily trips have been allowed for to access Mudgee township during the day if required. No weekend trips are expected.

As previously described the site will be unmanned during the operational phase and is expected to generate only up to two light vehicle trips in every 3 month period.

It is important to note that the greatest interaction with traffic external to the site will be during the peak PM period, estimated to be between 4pm – 5pm. The AM peak period with traffic heading to the site will not generate as many interactions due to the expected peak arrival time of 6am – 7am by the workers. During both peak AM and PM times it is important to note that the majority of the 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 the 3 coal mines.

The peak vehicle trips as listed in this report will have only a very minor impact on the surrounding road network. It is not envisaged that the development will cause a decrease in the level of service to either the road carriageway along the Castlereagh Highway.

The Mudgee Traffic Study nominates a 5-10 year timeframe for a major upgrade to the Sydney Road / Lions Drive intersection, the construction phase of this project is planned to be completed well before these upgrades are required, with no ongoing traffic generated by the development.

5.2 PROPOSED SITE ENTRY

We recommend that the site entry location be constructed in accordance with Triaxial plan MX10595.00-CM1.0, with a sealed access point from the Castlereagh Highway. 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 ensure that a B-Double is able to que off the road if required to when accessing the site before entering the site access gate.

Refer Appendix B – Triaxial Plan MX10595.00-CM1.0

The proposed site entry location is located on a straight section of the Castlereagh highway and will have in excess of 300m of sight distance in either direction in accordance with the requirements of Austroads Guide to Road Design and Mid Western Regional Council DCP requirements.

Refer Appendix A – Photos 1 and 2

5.3 CONSTRUCTION WORKER SITE ACCESS

As the site is located on the Southern side of Mudgee and easily accessible via the Castlereagh Highway through the Mudgee township, the construction worker site access and parking areas should be constructed in accordance with appropriate safe construction site management principles.

Depending on the accommodation arrangements made by the successful building contractor in the construction phase of the project, action should be taken to minimise any impacts on the Mudgee town area by the provision of a bus service to convey workers to site.

It is recommended that a bus service be utilised for workers to access the site during the construction phase.

6 SUMMARY

In summary, the proposed solar farm will cause no discernible long-term effects to the surrounding road network once constructed due to the unmanned operation of the site requiring only minimal regular maintenance on a three-monthly basis by minimal 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 a new appropriate site entry catering for B-Double access will ensure traffic impacts are minimised during the short term construction phase of the project.

APPENDIX A - SITE PHOTOS

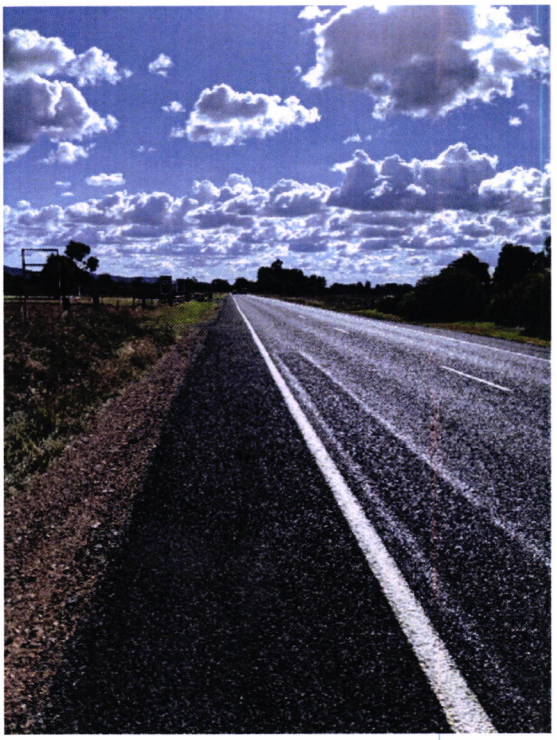

Photo 1
Proposed site entry location at Castlereagh Highway looking North (towards Mudgee)

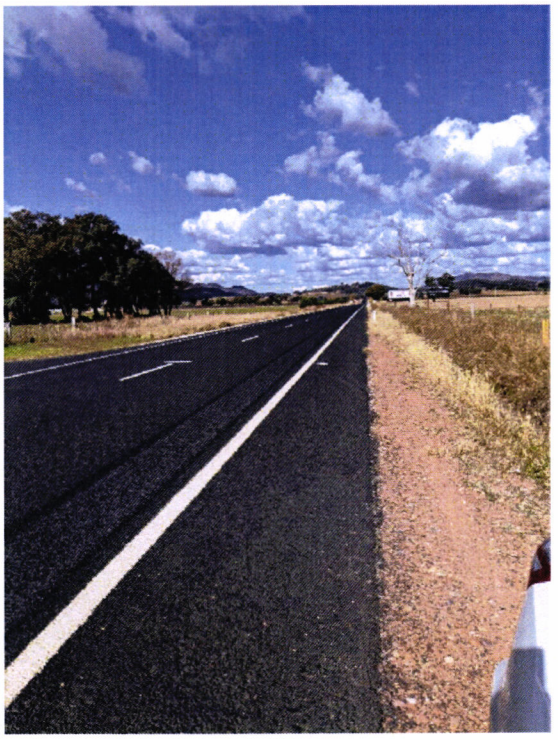

Photo 2
Proposed site entry location from Castlereagh Highway looking South

APPENDIX B – TRIAXIAL PLAN MX10595.00-CM1.0

SITE PLAN
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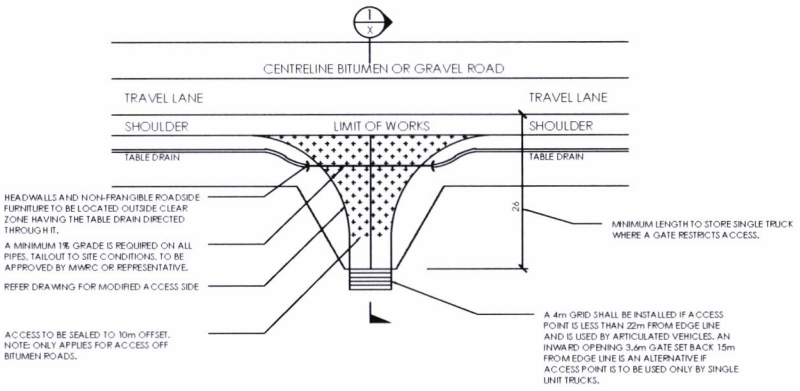
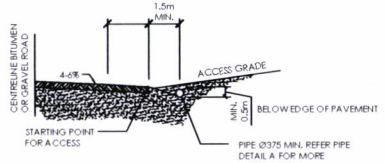


STANDARD VEHICLE ACCESS PLAN
N.T.S.



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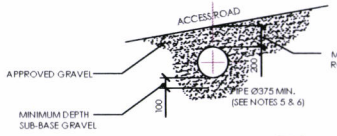
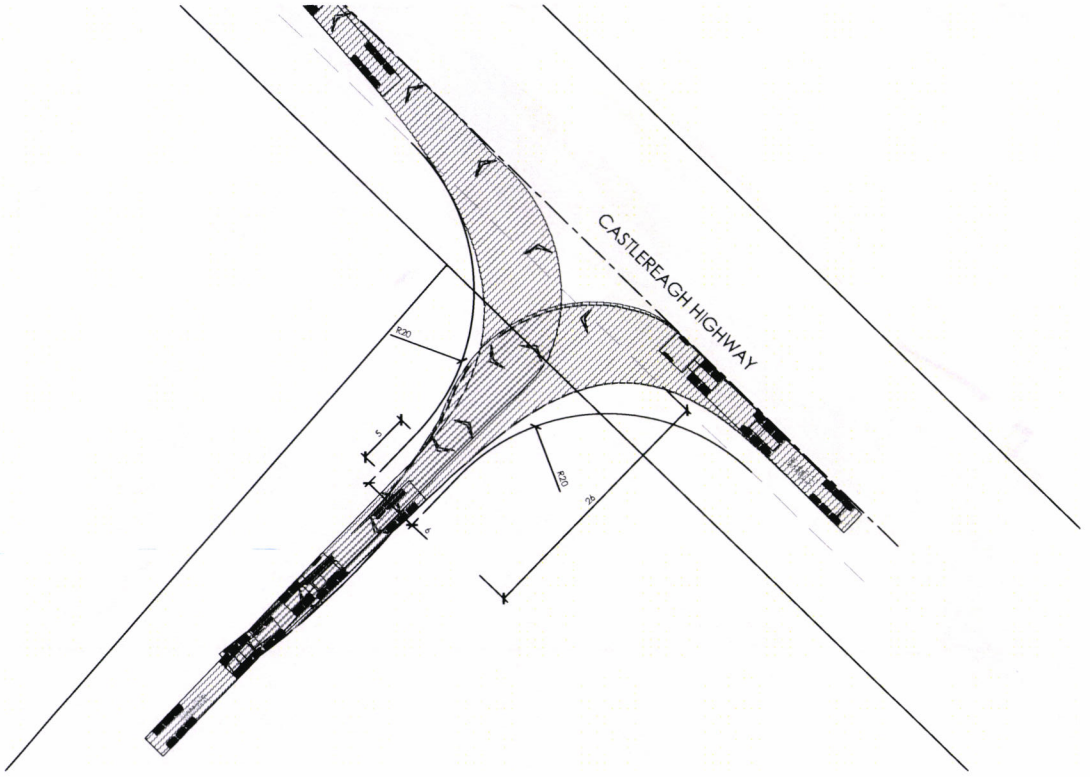


PIPE DETAIL N.T.S. A

NOTE:
1. ACCESS TO BE LOCATED WHERE MINIMUM GAP SIGHT DISTANCE OF 5 SECONDS IS AVAILABLE.
2. HEADWALLS ARE TO BE PRECAST CONCRETE HEADWALLS.
3. ACCESS TO BE CONSTRUCTED IN ACCORDANCE WITH MWRC COUNCIL PLAN M525A. ANY VARIATION TO THIS PLAN MUST BE APPROVED BY COUNCIL.
4. UNDER NO CIRCUMSTANCES MAY ACCESS INTRUDE BEYOND THE OUTER EDGE OF THE ROAD SHOULDER.
5. ANY VARIATION IN PIPE DIAMETER TO BE DETERMINED BY SITE INSPECTION.
6. PIPE LENGTH IS TO BE 4.0m MINIMUM
7. DRIVEWAY TO BE SHAPED TO DIRECT WATER ALONG IT INTO TABLE DRAIN AND NOT ONTO THROUGH ROAD.
8. THIS PLAN SHOULD BE READ IN CONJUNCTION WITH COUNCILS ADOPTED ACCESS TO PROPERTIES POLICY.

NOTE:
THIS IS A PRELIMINARY OR PLANNING DRAWING ONLY. FOR THE PURPOSE OF CONCEPTUAL DESIGN AND/OR PLANNING. FURTHER DETAILED ENGINEERING DESIGN INCLUDING SPECIFICATIONS, SIZING AND STORMWATER INVERTS TO BE PROVIDED PRIOR TO BUILDING RULES ASSESSMENT AND CONSTRUCTION.



VEHICLE SIMULATION PLAN
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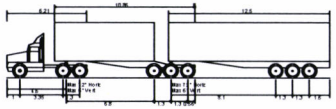

B-Double (25.0m)	
Overall Length	25.000m
Overall Width	2.500m
Overall Body Height	4.300m
Min Body Ground Clearance	0.540m
Track Width	2.500m
Lock-to-lock time	6.00s
Curb to Curb Turning Radius	15.000m

VEHICLE PROFILE
N.T.S.

2m 0 5 10 15 20 25m
SCALE 1:250 AT A1 SHEET | 1:500 AT A3 SHEET

100.0m 0.0 200.0 400.0 600.0 800.0 1000.0m
SCALE 1:10000 AT A1 SHEET | 1:20000 AT A3 SHEET

ARCHITECT

CLIENT
ITP RENEWABLES

PROJECT
VEHICLE SIMULATION
38 SYDNEY ROAD
BURRUNDULLA, NSW, 2850

DESIGNED	DRAWN	DATE	SIZE	CAD REF
JO.M.	JO.M.	MAY '19	A1	MX10595.00 - MC1.0

TRIAXIAL CONSULTING
COMPLEX PROBLEMS RESOLVED SIMPLY

1300 874 294 | TRIAXIAL.COM.AU
46 MARKET STREET, MUDGEE NSW 2850
PO BOX 1075, MUDGEE NSW 2850

DRAWING TITLE
VEHICLE SIMULATION PLAN

PROJECT No MX10595.00 | DRAWING No -MC1.0 | ISSUE A

ISSUED FOR INFORMATION	22.05.19	A	JLD
AMENDMENTS	DATE	ISSUE	BY

NOT FOR CONSTRUCTION

SITE PLAN
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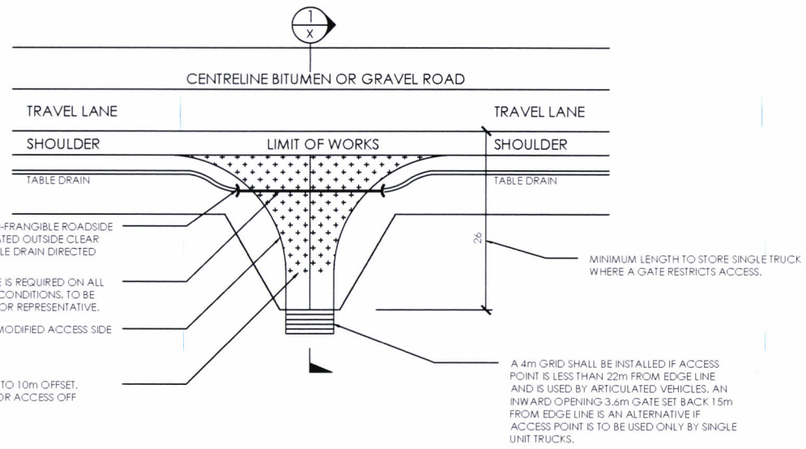
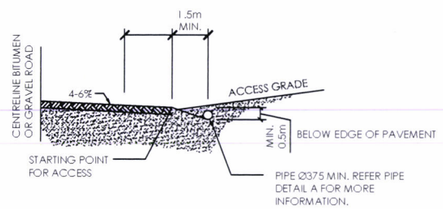
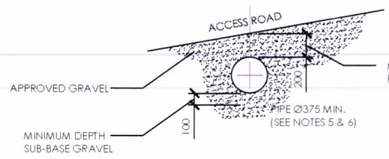


STANDARD VEHICLE ACCESS PLAN
N.T.S.



SECTION N.T.S. 1



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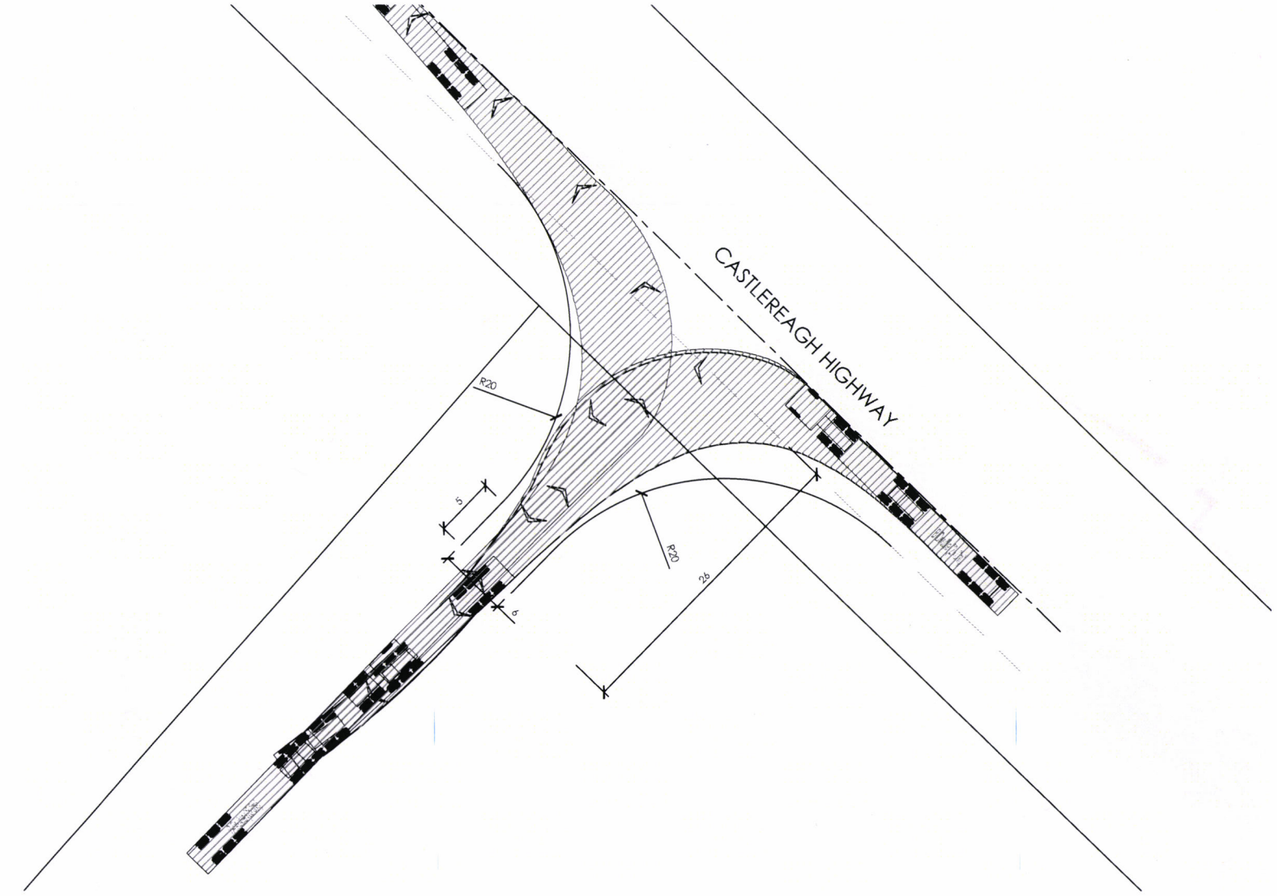
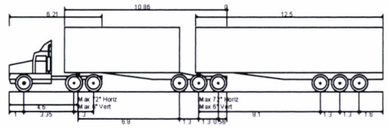


VEHICLE SIMULATION PLAN
SCALE 1:250 AT A1



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SCALE 1:250 AT A1 SHEET | 1:500 AT A3 SHEET

100.0m 0.0 200.0 400.0 600.0 800.0 1000.0m
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ARCHITECT

CLIENT
ITP RENEWABLES

PROJECT
VEHICLE SIMULATION
3B SYDNEY ROAD
BURRUNDULLA, NSW, 2850

DESIGNED	DRAWN	DATE	SIZE	CAD REF
JO.M.	JO.M.	MAY'19	A1	MX10595.00 - MC1.0

ISSUED FOR INFORMATION	22.05.19	A	JLD.
AMENDMENTS	DATE	ISSUE	BY

NOT FOR CONSTRUCTION

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PO BOX 1075, MUDGEE NSW 2850

DRAWING TITLE
VEHICLE SIMULATION PLAN

PROJECT No. MX10595.00 DRAWING No. MC1.0 ISSUE A

GOLDER

REPORT

Burrundulla Mini Sustainable Energy Park

Water Assessment

Submitted to:

ITP Renewables

ITP Renewables
Southern Cross House
Level 1, 19 Moore Street, Turner ACT
PO Box 6127, O'Connor, ACT, 2602

Submitted by:

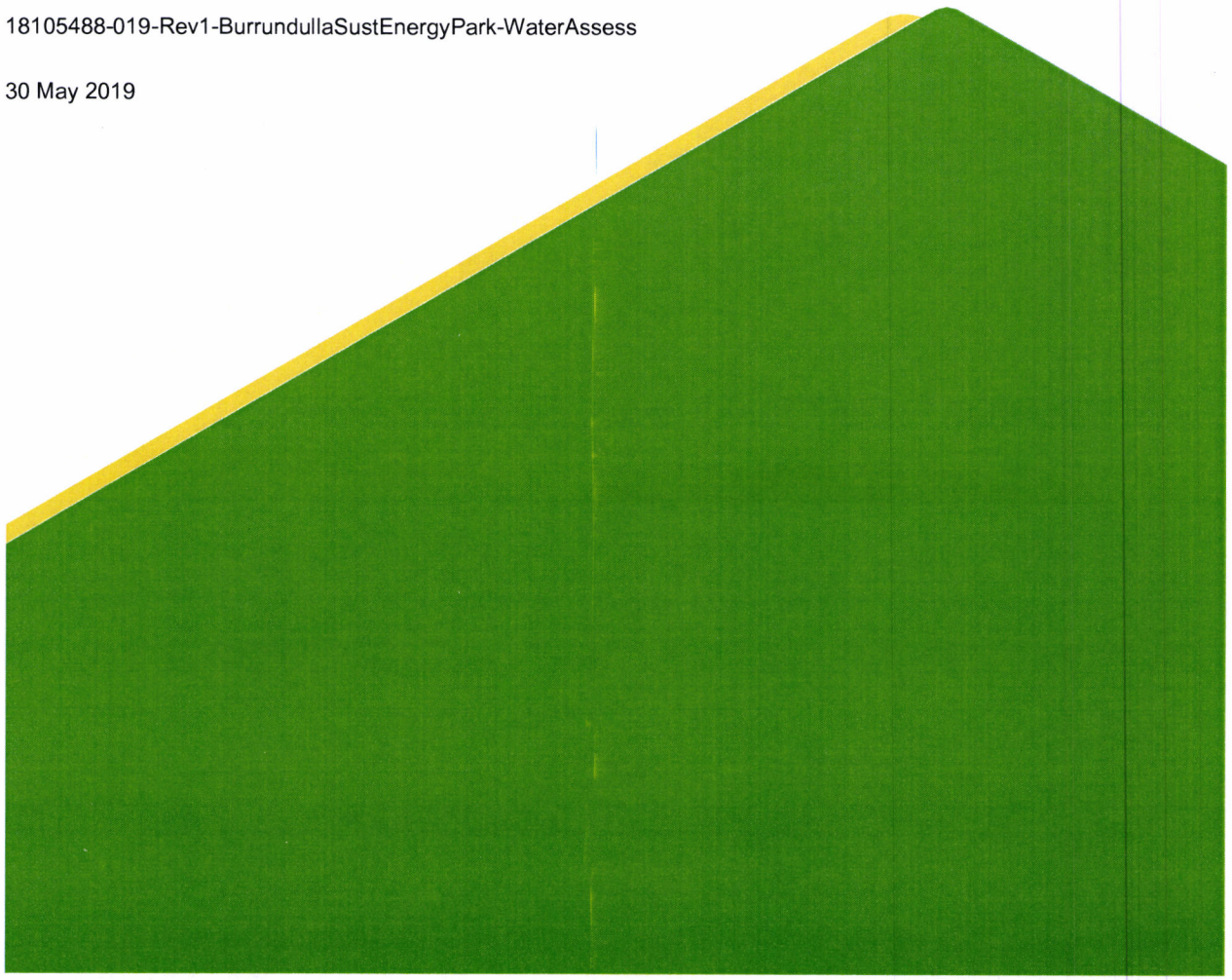
Golder Associates Pty Ltd

147 Coronation Drive, Milton, Queensland 4064, Australia

+61 7 3721 5400

18105488-019-Rev1-BurrundullaSustEnergyPark-WaterAssess

30 May 2019



Distribution List

ITP Renewables

Table of Contents

TABLES

FIGURES

APPENDICES

1.0 INTRODUCTION

The proposed Burrundalla Mini Sustainable Energy Park (also referred to as Mudgee1C/3C Solar Farm) is located on the Castlereagh Highway 105 km south-east of Dubbo and 5 km south-east of Mudgee, New South Wales (NSW). The Project site is within Lot 6 / DP 1069441. ITP Renewables (Australia) Pty Ltd (ITP Renewables) propose to construct a 10 MWDC solar facility within the site that is currently used for grazing.

This report, which provides a desktop water assessment to support the Development Application for the project, includes a:

- Desktop review of local hydrology and catchment and water quality data.
- Desktop review of surface and groundwater quality data.
- Desktop review of the flood risk potential against the Local Environmental Plan.
- Desktop impact assessment against NSW policies and referenced industry standards for solar arrays.
- Desktop management assessment with mitigation measures recommend for construction and operation.

1.1 Limitations of assessment

The assessment is based on publicly available information and data and does not include a site inspection, sampling, or any additional hydrological and/or hydraulic modelling.

1.2 Important information relating to this report

Your attention is drawn to the document titled - "Important Information Relating to this Report", which is included in Appendix B of this report. The statements presented in that document are intended to inform a reader of the report about its proper use. There are important limitations as to who can use the report and how it can be used. It is important that a reader of the report understands and has realistic expectations about those matters. The Important Information document does not alter the obligations Golder Associates has under the contract between it and its client.

2.0 PROJECT DESCRIPTION

The proposed Burrundalla Mini Sustainable Energy Park is located on the Castlereagh Highway 105 km south-east of Dubbo and 5.0 km south-east of Mudgee (Figure 1).

Mudgee is located on the western side of the Great Dividing Range, approximately 261 km west of Sydney on the Cudgegong River. The Cudgegong River is a tributary of the Macquarie River and is significant in the region. The Project area is within the Mid-Western Regional Council area.

The town of Mudgee is located on the banks for the Cudgegong River and is drained by streams with their headwaters in the foothills in the south of the town. The watercourses within the town and its surrounds 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 present in the Avisford Nature Reserve, located south of the town (south-east of the Project area) (Hunter Water Australia Strategic Services, 2001).

The proposed facility is located 500 m east of Oaky Creek. A drainage line flows through the Project area towards the Cudgegong River located 1.3 km to the north. The Cudgegong River flows north towards the town of Mudgee.

The Project area is relatively flat, with the land sloping downwards approximately 6 m from west to east. The land in the south is 482 m AHD dropping to 472 m AHD in the north where a farm dam (0.5 ha) exists. The land is mostly cleared of native vegetation and is currently used for grazing (Figure 2).

ITP Renewables propose to construct a solar farm with two systems on the parcel of land (Lot 6 / DP 1069441). System A on the western portion of the land parcel and System B on the eastern portion. Both systems will have a DC array capacity of 6.05 MW_{DC} and an AC output of 5 MW_{AC} resulting in a 10 MW solar farm.

There will be 31,416 solar modules installed in rows running north-south across the site. Each row of PV modules will rotate to track the sun across the sky from east to west each day. The solar farm will also consist of two inverter stations, located within the arrays and mounted on a 20 ft skid. The inverter stations will incorporate High/Medium voltage switchgear and transformers.

The mounting system will be constructed on piles that are driven into the ground approximately 1.6-3.5 m. Trenching for low voltage is around 600 mm and high voltage 1,200 mm. Once operational the site will be unmanned with maintenance expected to be carried out quarterly by a crew of 2 – 3 people.

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LEGEND

- Town
- Rainfall Station
- Distance and Direction to other Rainfall Station
- Roads
- Electricity Transmission Line
- Hydrolines
- Major Watercourses

Cadastre

- Lots/Plans of Interest
- Other Lots/Plans

Coordinate System: GDA 1994 MGA Zone 55
Projection: Transverse Mercator
Datum: GDA 1994

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NOTE(S)

Service Layer Credits: Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, MapmyIndia, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

REFERENCE(S)

Rainfall Station: © Commonwealth of Australia 2019, Bureau of Meteorology.
All other data: © State of NSW (Spatial Services - Department of Finance, Services and Innovation) 2019

CLIENT: ITP RENEWABLES

PROJECT: BURRUNDALLA MINI SUSTAINABLE ENERGY PARK

CONSULTANT: GOLDER

DRAWN:	27/05/2019
DESIGNED:	BG
PREPARED:	BG
REVIEWED:	DP
APPROVED:	JR

TITLE: **PROJECT LOCATION**

PROJECT NO.	CONTROL	REV.	FIGURE
18105488	019	0	1

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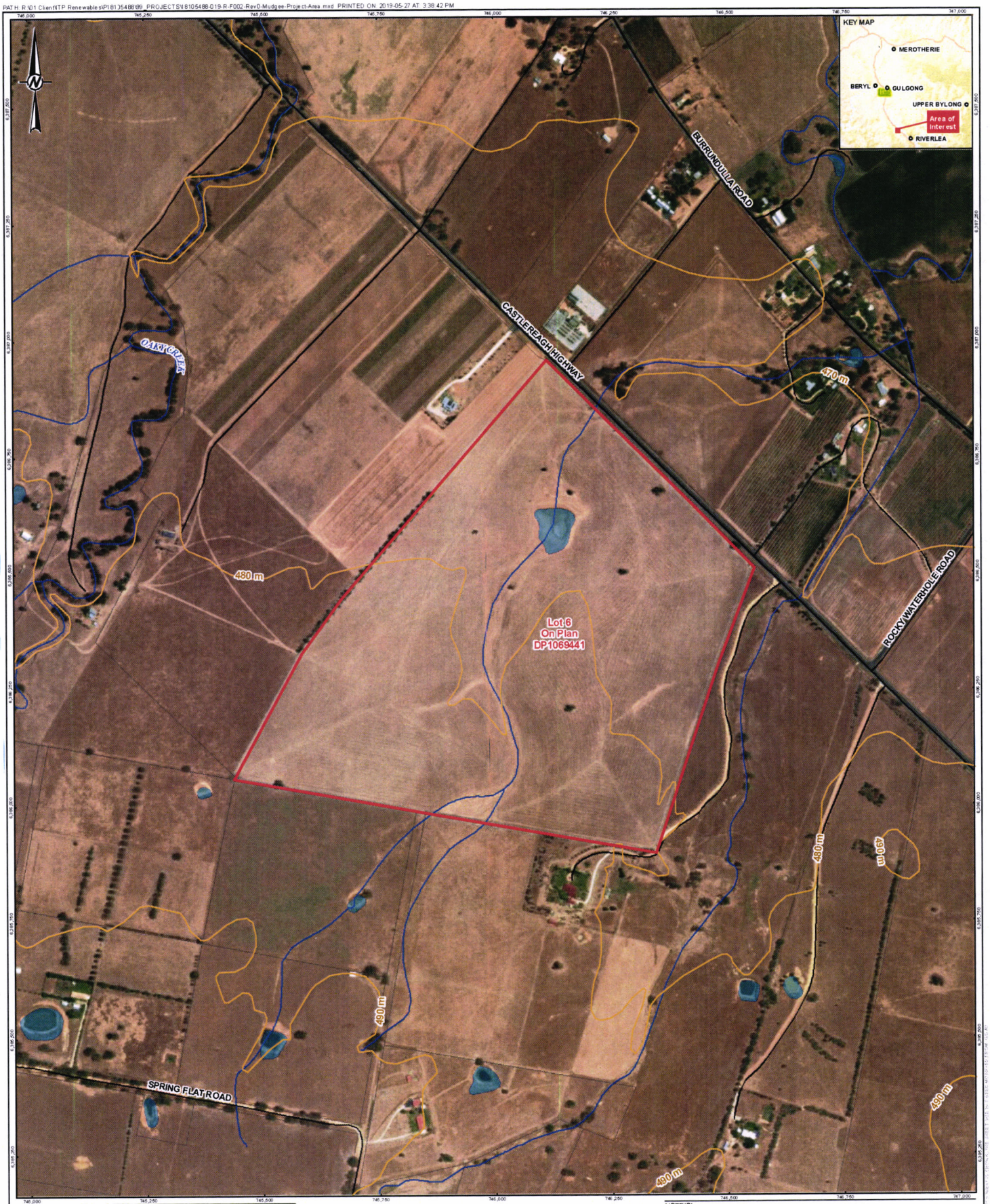

LEGEND

- 10 m surface elevation contours
- Hydrolines
- Roads
- Surface Water Features

Cadastre

- Lots/Plans of Interest
- Other Lots/Plans

Coordinate System: GDA 1994 MGA Zone 55
Projection: Transverse Mercator
Datum: GDA 1994

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NOTE(S)

Service Layer Credits: Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, MetI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community
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REFERENCE(S)

All data: © State of NSW (Spatial Services - Department of Finance, Services and Innovation) 2019

CLIENT
ITP RENEWABLES

PROJECT
BURRUNDALLA MINI SUSTAINABLE ENERGY PARK

CONSULTANT
GOLDER

DRAWN	27/05/2019
DESIGNED	BG
PREPARED	BG
REVIEWED	DP
APPROVED	JR

TITLE
PROJECT AREA

PROJECT NO.	CONTROL	REV.	FIGURE
18105488	019	0	2

3.0 LEGISLATIVE CONTEXT

NSW has a comprehensive legislative and policy framework for the management of floodplain risk and flood prone areas of the state with clear areas of responsibility as outlined below in Figure 3.

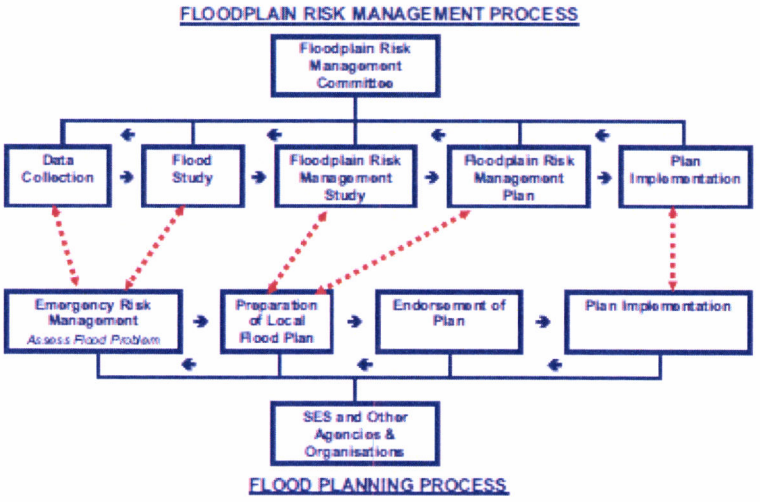

Figure 3: Floodplain risk management and planning process

3.1 Local Government Act 1993

This Act provides a legal framework for the NSW system of local government. The Floodplain Management Manual was gazetted in 2005 as the manual relating to the development of flood-liable land for the purposes of section 733. This section exempts councils from liability in relation to flood prone land provided they have undertaken assessments substantially in accordance with the latest manual.

The Floodplain Development Manual (NSW Government, 2005) is the approved Section 733 manual for flood prone land. The manual supports the NSW Government's Flood Prone Land Policy in providing for the development of sustainable strategies for the management of floodplains specifically in relation to human occupation. It provides a framework for councils to implement the policy and a process for managing floodplain risk.

3.2 Environmental Planning and Assessment Act 1979

This is an Act to institute an environmental planning system and assessment arrangements for NSW. In 2017 there were major amendments passed with a view to improving the planning system through simpler processes, improved strategic planning and community participation in order to enable more balanced and transparent decision making. Clause 3.43 makes provision for the preparation of development control plans by relevant authorities (outlined further in Section 3.4.1).

3.3 Water Management Act 2000

The Act provides for the sustainable and integrated management of the water sources of the State for the benefit of both present and future generations. Water management principles intended to guide decision making under the Act in relation to floodplain management require the existing and future risk to human life and property arising from occupation of the floodplain to be minimised.

3.3.1 Surface water sharing plan

The Water Management Act 2000 applies to areas of NSW that have a water sharing plan. The Project area 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 wells 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. As this plan relates to licencing and use of water resources under the Water Management Act 2000, it is not relevant for the Project (as no water extraction is proposed).

3.3.2 Groundwater sharing plan

The relevant groundwater sharing plan for the Project area is the Water Sharing Plan for the NSW Murray Darling Basin Fractured Rock Groundwater Sources 2011 under the Water Management Act 2000. The site is within the Lachlan Fold Belt (Mudgee) groundwater management area.

As this plan relates to licencing and use of water resources under the Water Management Act 2000, it is not relevant for the Project (as no water extraction is proposed).

3.4 Mid-Western Regional Local Environmental Plan 2012

The Mid-Western Regional Local Environmental Plan 2012 (hereby referred to as the Plan) aims to make local environmental planning provisions for land in Mid-Western Regional area in accordance with the relevant standard environmental planning instrument. The regional area includes towns of Mudgee, Gulgong, Kandos and Rylstone.

The Plan provides the prohibited and permitted types of development within the local area. Some types of development are also regulated by particular state environmental planning policies.

The Plan (Part 6.1) does provide specific management requirements for flood planning which applies to land at or below the flood planning level (1 in 100 ARI plus 0.5 m freeboard). It requires that development consent cannot be granted unless the proposed development is compatible with the flood hazard of the land, will not cause significantly adverse impacts to other developments, the environment and the community and incorporates measures to manage risk to life. According to the accompanying flood planning map, the site is not considered to be part of the flood planning area (see Figure 4 with the Project area marked in red and Appendix A for the full Flood Planning Map - Sheet CL1_006 from the Local Environmental Plan). The closest flood planning area is located 1.4 km to the north of the Project area, which is indicated by blue shading within the area of the Cudgegong River.

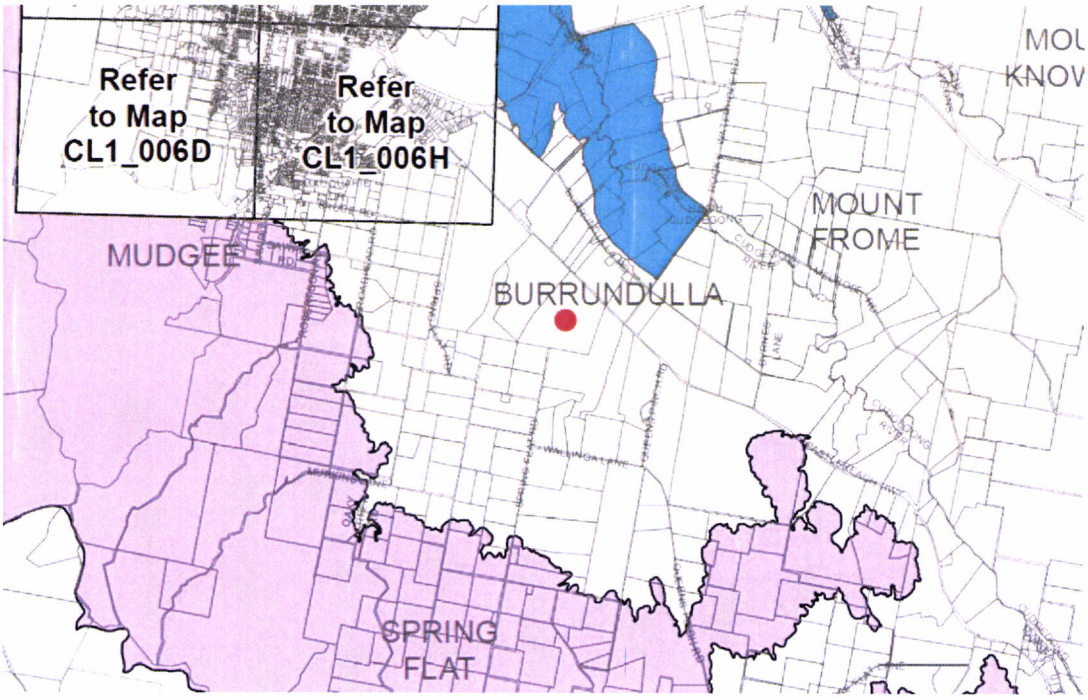

Figure 4: Flood planning area

Groundwater vulnerability mapping (Groundwater Vulnerability Map - Sheet GRV_006 within the Plan) (Figure 5) indicates that the Project area (indicated in red) is considered 'groundwater vulnerable' (blue shading). The plan requires that development consent cannot be granted unless the proposed development will be designed and managed to avoid significant environmental impact or if such impact is unavoidable the proposed development will be designed and managed to minimise the impacts or if such impact is unable to be mitigated the proposed developed will be managed to mitigate that impact.

The Plan provides additional provisions for earthworks 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.

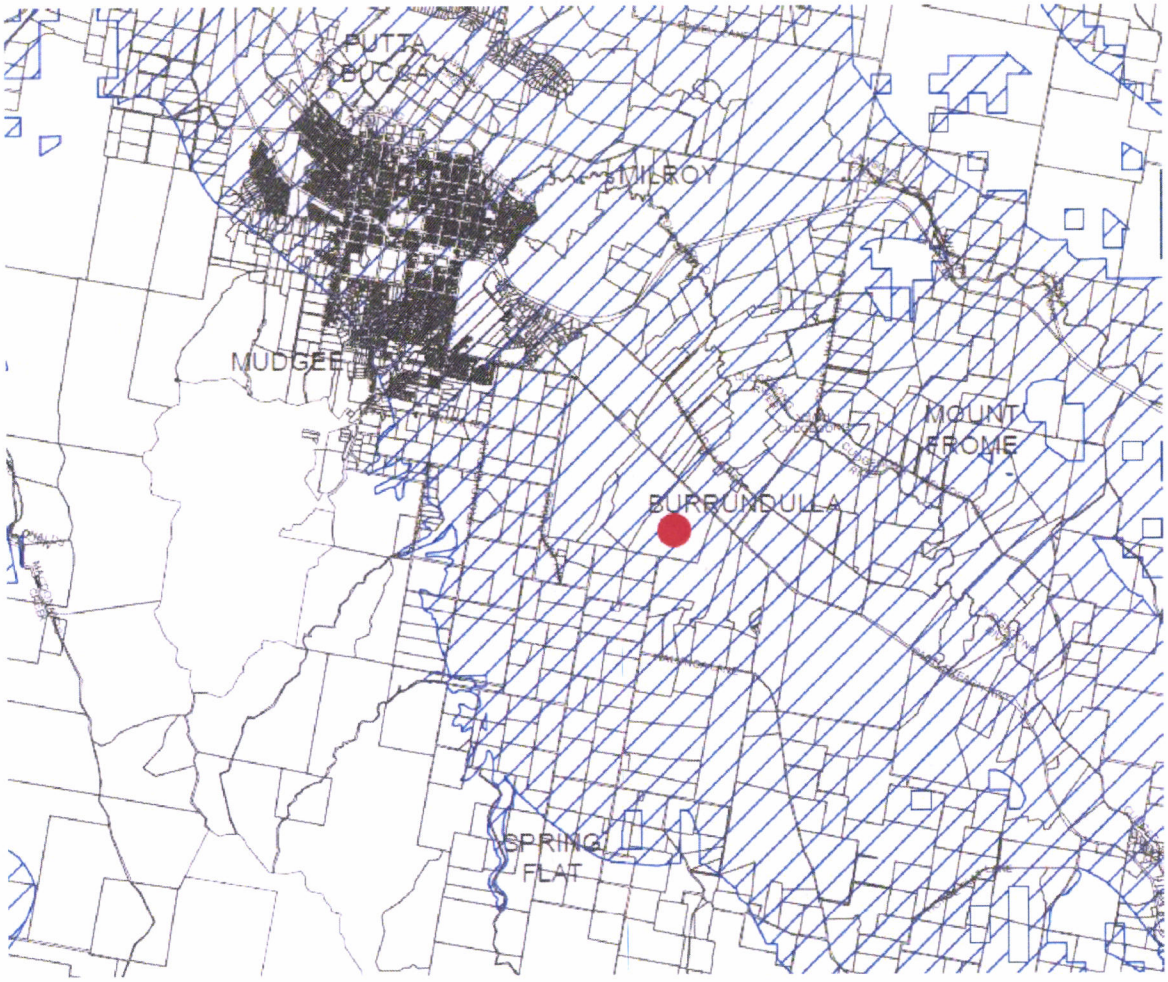

Figure 5: Vulnerable groundwater

3.4.1 Mid-Western Development Control Plan

The Mid-Western Development Control Plan 2013 (DCP) provides guidance for developments and supports the statutory planning controls of the Local Environmental Plan. The guidance provides proponents assistance with criteria to address in development applications, however this relates mostly to housing developments.

The DCP contains flood schedules which provides guidance on flood compatible building materials. The DCP recommends that a Soil and Water Management Plans are prepared in accordance with Landcom's Managing Urban Stormwater (2006).

There is a Mid-Western Regional Council DCP report – Managing flood risks (2007) specific to the former Mudgee Shire Local Government Area. However, this information mostly relates to flood compatible materials and is likely to have been superseded with the current DCP and LEP.

3.4.2 Mid-Western Regional Council Community Plan

The Mid-Western Community Plan is planned and executed under 5 key themes:

- Looking after our Community
- Protecting our Natural Environment
- Building a Strong Local Economy

- Connecting our Region
- Good Government

The themes do not contain specific flood or water management aspects. However, within the protect and enhance our environment theme, the strategies include minimising the impact on the environment from development, maintaining and managing water quantity and quality (keeping waterways clean).

3.5 State Environmental Planning Policy (Infrastructure) 2007

Division 4 of the State Environmental Planning Policy (Infrastructure) 2007 relates to 'Electricity generating works or solar energy systems'. The policy relates to the approval process for solar energy systems, and there are specific details required for flood liable land which means land that is susceptible to flooding by the probable maximum flood event. The policy states consultation with the relevant council is required if the proposal will alter flood patterns other than to a minor extent and their response must be taken into consideration.

The Project area is not in an area mapped as being within the flood planning area under the Local Environmental Plan.

3.6 Protection of the Environment Operations (POEO) Act 1997

The POEO Act aims to protect and restore and enhance the quality of the environment in NSW, while still having regard to ecologically sustainable development.

With relevance to the site, the Act aims to reduce risks to human health and to prevent degradation of the environment by promoting pollution prevention and the reduction in the use of materials and the re-use, recovery or recycling of materials. The Act contains the requirements for the management of water discharges and also the offences that relate to pollution. Section 148 requires that any pollution incidents or those that threaten material harm to the environment must be notified to the relevant authority (e.g., NSW Environment Protection Authority).

3.7 Soil Conservation Act 1938

This Act makes provision for the conservation of soil resources and for the mitigation of erosion. The act allows the Minister for Primary Industries[1] to issue soil conservation notices, declare areas to be sites of erosion hazard, proclaim works in catchment areas and outlines specific regulations regarding the Rural Assistance Act 1989.

Of general relevance to this project is the promotion of sustainable use and prevention of loss of soil resources from a site.

4.0 CATCHMENT AND FLOOD HISTORY

The Project is located in the Mid-Western Regional Council Area, 4.5 km south-east of Mudgee. The proposed facility is located 500 m east of Oaky Creek (Figure 2). A drainage line flows through the Project area towards the Cudgegong River located 1.3 km to the north. The Cudgegong River flows north towards the town of Mudgee.

The Project area is relatively flat, with the land sloping downwards approximately 6 m from west to east. The land in the south is 482 m AHD dropping to 472 m AHD in the north where a farm dam (0.5 ha) exists. The land is mostly cleared of native vegetation and is currently used for grazing (Figure 6).

[1] Except Parts 2A, 3 and 4, and sections 15 and 30A in so far as they relate to Parts 2A, 3 and 4, jointly with the Minister for the Environment

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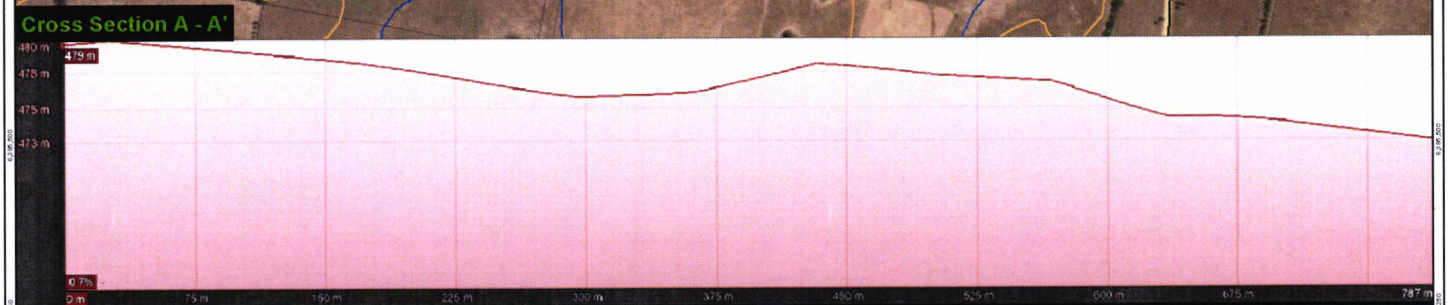

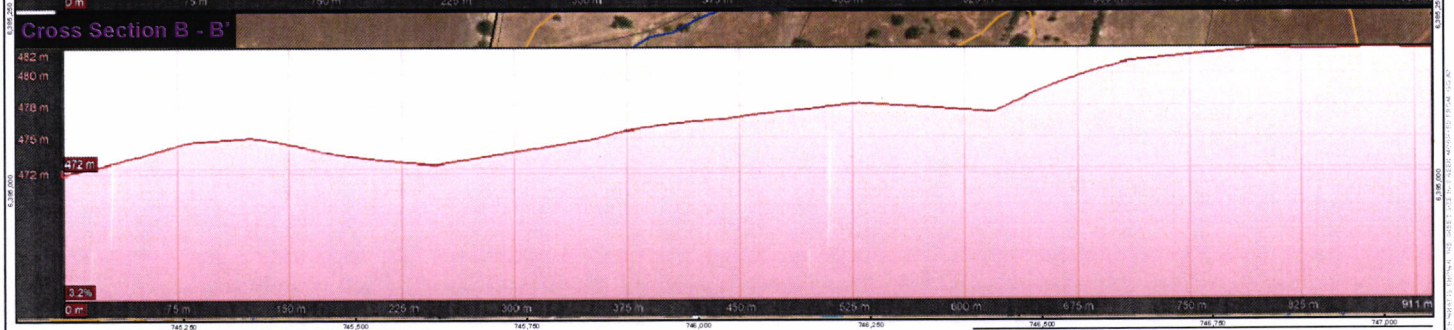

LEGEND

- East-west Cross Section Start and End Points
- North-south Cross Section Start and End Points
- East-west Cross Section Line
- North-south Cross Section Line
- 10 m surface elevation contours
- Hydrolines
- Roads
- Surface Water Features

Cadastre

- Lots/Plans of Interest
- Other Lots/Plans

Coordinate System: GDA 1994 MGA Zone 55
Projection: Transverse Mercator
Datum: GDA 1994

0 50 100 150 200 250
1:7,500 @A3 METRES

NOTE(S)

Service Layer Credits: Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, MetI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

REFERENCE(S)

All data: © State of NSW (Spatial Services - Department of Finance, Services and Innovation) 2019
Cross Section: Derived from Google Earth on 23rd May 2019

CLIENT
ITP RENEWABLES

PROJECT
BURRUNDALLA MINI SUSTAINABLE ENERGY PARK

CONSULTANT
GOLDER

DRAWN	27/05/2019
DESIGNED	BG
PREPARED	BG
REVIEWED	DP
APPROVED	JR

TITLE
SITE TOPOGRAPHY

PROJECT NO.	CONTROL	REV.	FIGURE
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4.1 Mudgee and Gulgong Stormwater Management Plan

Mudgee and Gulgong Stormwater Management Plan (SMP) 2001 (Hunter Water Australia Strategic Services, 2001) aimed to address stormwater management problems within the catchment area (particularly water quality issues). The plan describes the catchment and existing catchment conditions. The SMP discussed drainage studies undertaken that identified problem areas within the town that were prone to flooding.

Lyall and Macoun Consulting Engineers (1998) divided the town into 7 sub-catchments (catchments A to F and Sawpit Gully). These catchments are the same as those more recently described in the Mudgee local creeks floodplain risk management study and plan 2008 (Section 4.3) (Lyall and Associates Consulting Water Engineers, 2008). Figure 7 is taken from the Mudgee local creeks floodplain risk management study and plan 2008 (Lyall and Associates Consulting Water Engineers, 2008).

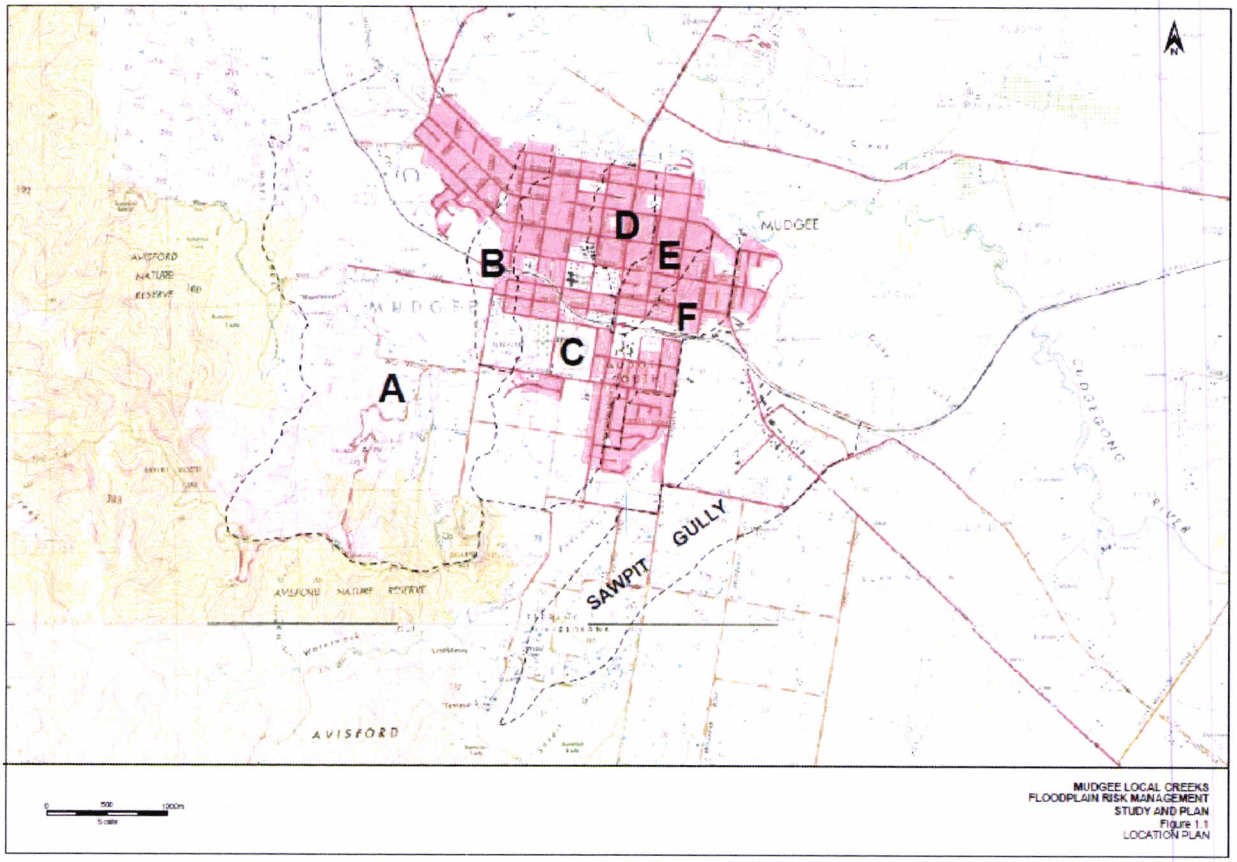

Figure 7: Mudgee town catchments

The SMP outlines stormwater management objectives for new developments to aid developers to minimise impacts on receiving waterways. Construction phase stormwater management objectives for new developments taken from the SMP are provide in Table 1.

Table 1: Construction phase stormwater management objectives for new developments

Pollutant / issue	Soil type	Management objective
Quantitative objectives – for subdivisions and medium-large scale developments		
Suspended solids and turbidity	Dispersible, Fine	Suspended solids concentration not to exceed 50 mg/L for all 5-day rainfall totals up to 75th percentile rainfall event.
	Coarse	Suspended solids concentration not to exceed 50 mg/L for all flow events up to 25% of the 1-year ARI flow.
Qualitative objectives – for all new developments including individual building lots		
Suspended solids (sediment)	-	Minimise soil erosion and the discharge of sediment by the appropriate design, construction and maintenance of erosion and sediment control measures. Employ all practical measures to minimise soil erosion and the discharge of sediment in storms specified under Quantitative Objectives above.
Motor fuels, oils and other chemicals	-	All motor fuels, oils and other chemicals are stored and used on site in a manner which ensures no contamination of stormwater
Litter	-	No litter in a position where it may blow or washed off-site.

4.2 Mudgee floodplain management study and plan 2002

The Mudgee floodplain management study and plan (2002, Bewsher Consulting) was developed for the Council to understand the risks to houses and buildings located within the lower lying areas of Mudgee from floods. The study aimed to investigate what could be done to minimise the effect of flooding. The Project area (indicated in red) is outside of the Mudgee floodplain management study area (the PMF area for Cudgegong River) (Figure 8).

The 2002 (Bewsher Consulting) report identified the following significant floods in the Mudgee area:

- February 1955 (believed to be the largest on record since 1870)
- March 1956
- November 1969
- February 1971
- January 1974
- August 1990

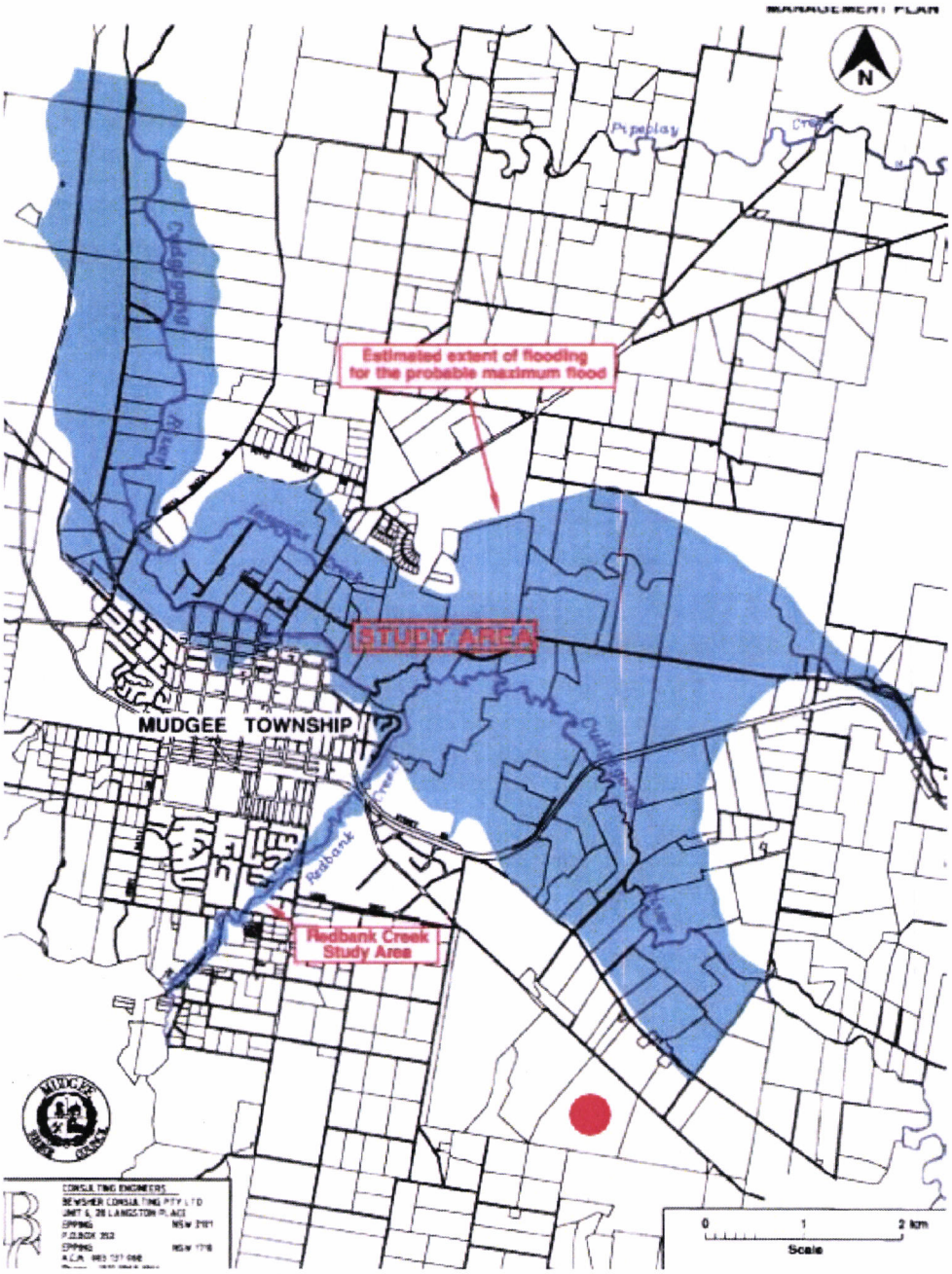

Figure 8: Probable maximum flood area for 2002 study

4.3 Mudgee local creeks flood study 2008

The Mudgee local creeks floodplain risk management study and plan 2008 (Lyall and Associates Consulting Water Engineers, 2008) aimed to assess the impacts of flooding, define flooding conditions, review policies and options for management of flood affected land and to develop a draft Floodplain Risk Management Plan (FRMP). It also aimed to identify properties with potential to flood.

The study identified seven (7) catchments for the flood study and assessed the 100-year design flood extent and the Probable Maximum Flood (PMF) extent for the Mudgee local creeks (including the Cudgegong River to the north of the Project area). The PMF is described as the limiting value of floods that could reasonably be expected to occur (Lyall and Associates Consulting Water Engineers, 2008).

The report notes the major flooding event which occurred at Mudgee on 22 February 2003. The Mudgee PO rain gauge recorded 178 mm of rain within a 24 hour period with rainfall occurring over the prior days. The rainfall event was resulted in flood peaks greater than the design 100-year average recurrence interval (ARI) event (Lyall and Associates Consulting Water Engineers, 2008).

The Project area is outside of the PMF extent for the Cudgegong River, as shown in Figure 9.

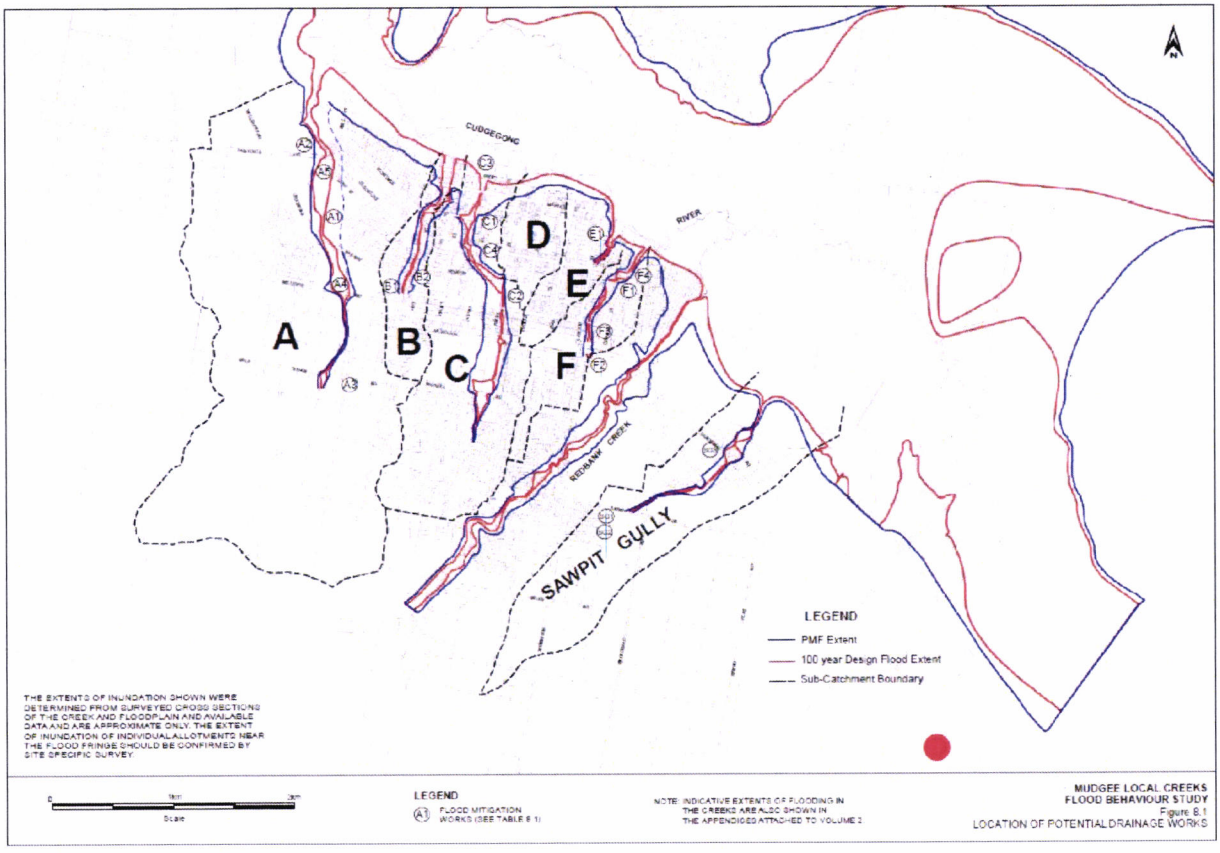

Figure 9: Mudgee local creeks - flood extents

5.0 AVAILABLE DATA

Climatic data and water quantity and quality monitoring information is available in the region as outlined in the following sections.

5.1 Rainfall

The Bureau of Meteorology (BOM) has one station within Mudgee, George Street (Figure 1). Another site is located 4.45 km to the north at Mudgee airport. Table 2 outlines the average annual, maximum annual, maximum daily and maximum monthly rainfall. Average monthly values for the two rainfall stations are in Table 3.

Table 2: Rainfall

Station Number	Station Name	Period of Record	Rainfall (mm)			
			Average Annual	Highest Annual	Maximum Daily	Highest Monthly
062021	Mudgee (George Street)	1870 - 2019	670.3	1442.5	169	303.2
062101	Mudgee airport	1994 - 2019	663.2	1152.4	174.2	241.6
062013	Gulgong post office	1881 - 2019	650.5	1411.7	134.4	354.3

Table 3: Average Monthly Rainfall

Station Number	Rainfall (mm)											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
062021	68.0	62.7	52.9	43.5	48.9	54.9	52.6	52.1	52.3	59.4	61.8	65.2
062101	67.6	63.1	58.9	33.2	37.9	45.0	43.4	35.2	54.6	51.1	75.4	80.7
062013	70.5	60.9	55.0	43.7	44.9	50.8	48.8	45.8	47.0	55.6	60.0	67.3

Flood producing weather systems across the region include inland troughs, cold fronts, and thunderstorms. Consequently, each rainfall event is a function of the prevailing meteorological conditions. Therefore, the rainfall data provides useful information about expected seasonal rainfall in the area.

5.2 Streamflow

There are two government surface water monitoring sites located within 20 km of the site. Streamflow records (Table 4) for these sites are available for various locations in the region from the WaterNSW portal.

Table 4: Stream Gauging Stations

Station Number	Station Name	Available/Relevant Data	Distance from project area
421150	Cudgegong River at Wilbertree Road	Level, discharge	16 km south
421019	Cudgegong River at Yamble Bridge	Level, discharge, EC, water temp	16 km north

Generally, data from the available stream gauges do not provide specific information on local site flooding but are more useful in the context of assessing major regional flooding events which may impact on site access. Information is publicly available from WaterNSW Real-time data portal and could be incorporated into site management plans.

5.3 Groundwater

The Project area falls 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 Project area falls within the Lachlan Fold Belt fractured rock groundwater management area. As indicated in Figure 10, the site (located 105 km south-east of Dubbo) is underlain by the fractured rock unit (DECCW, 2010).

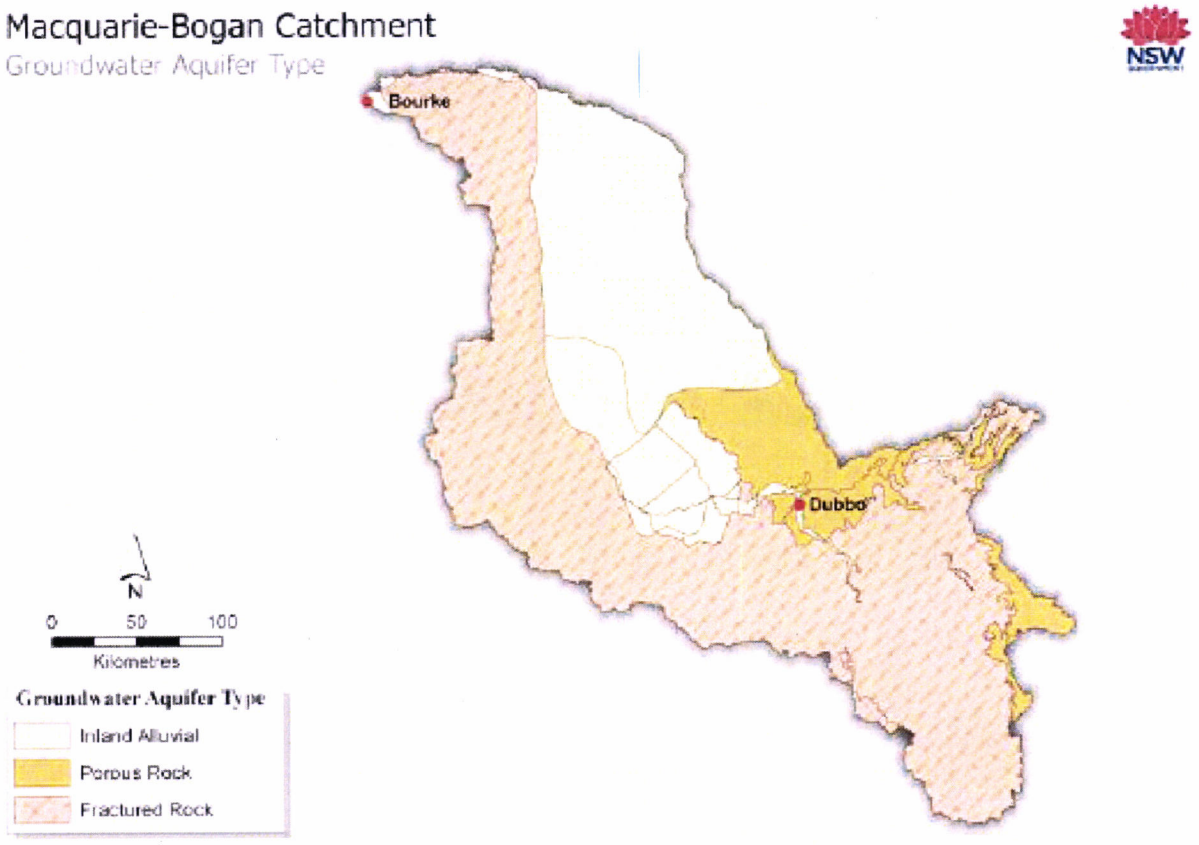

Figure 10: Macquarie-Bogan Catchment Groundwater Aquifer Type

The Murray Darling Basin Authority (MDBA) commissioned an independent assessment of approaches to achieve sustainable use and management of basin groundwater resources which includes the Lachlan Fold Belt (Anderson et al, 2013). The closest MDBA monitoring bore is GW096082 (Figure 11) Figure 12 indicates a relatively long term and stable water level in this government monitoring bore for the groundwater unit which confirms there is unlikely to be rising groundwater and salinization associated with groundwater from this geological unit (DPIW, 2017).

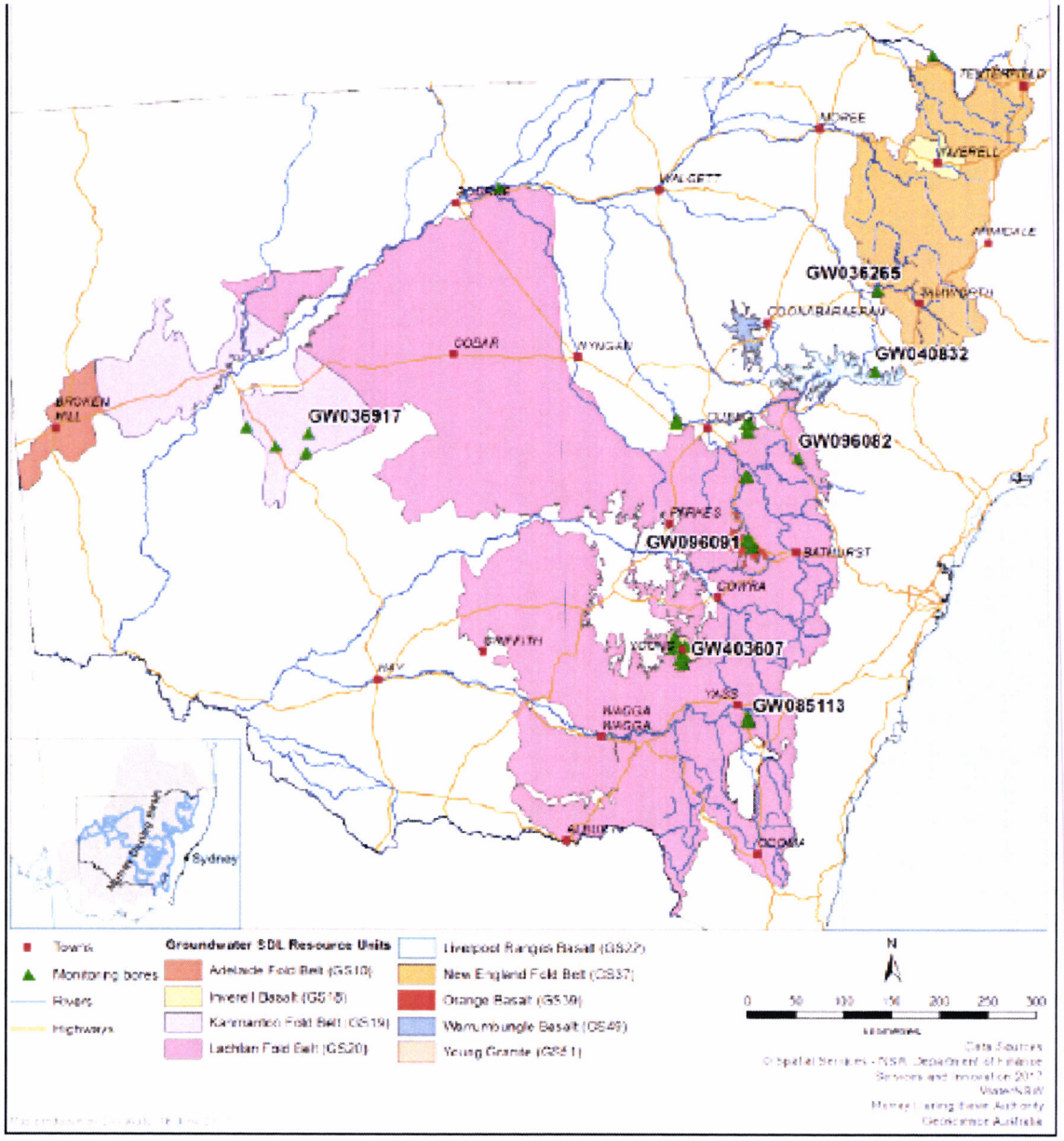

Figure 11: Location of monitoring bores used in the MDBA independent assessment

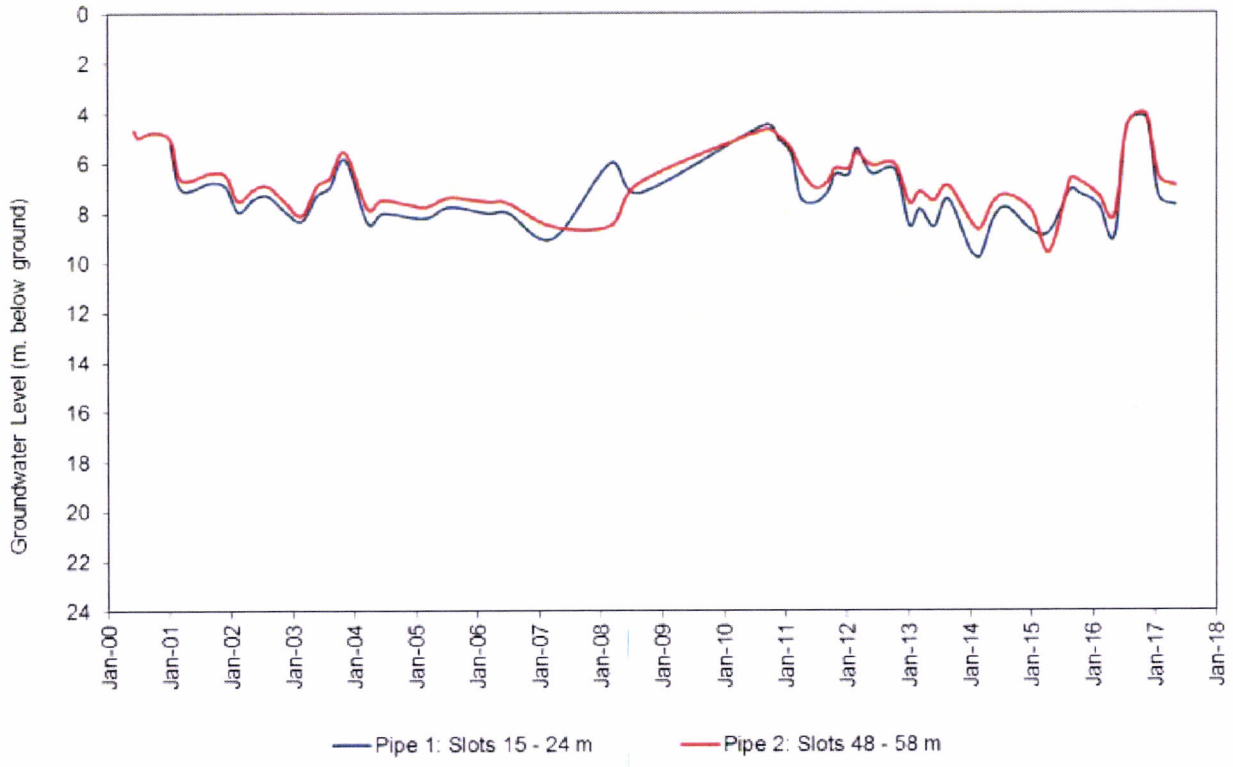

Figure 12: Lachlan Fold Belt groundwater level at GW096082

The nearest real time Groundwater Monitoring Site on the Water NSW database (WaterNSW 2019) is located 16 km north of Mudgee at Mudgee - Wilbertree Rd (Site no. GW096087.1.1). The levels recorded on 16 May 2019 indicated that the bore level below MP was 5.767 m and the ground water level 427.603 m AHD (Figure 13). The landholder of the Project site has reported that a bore drilled to 70 m depth did not reach groundwater.

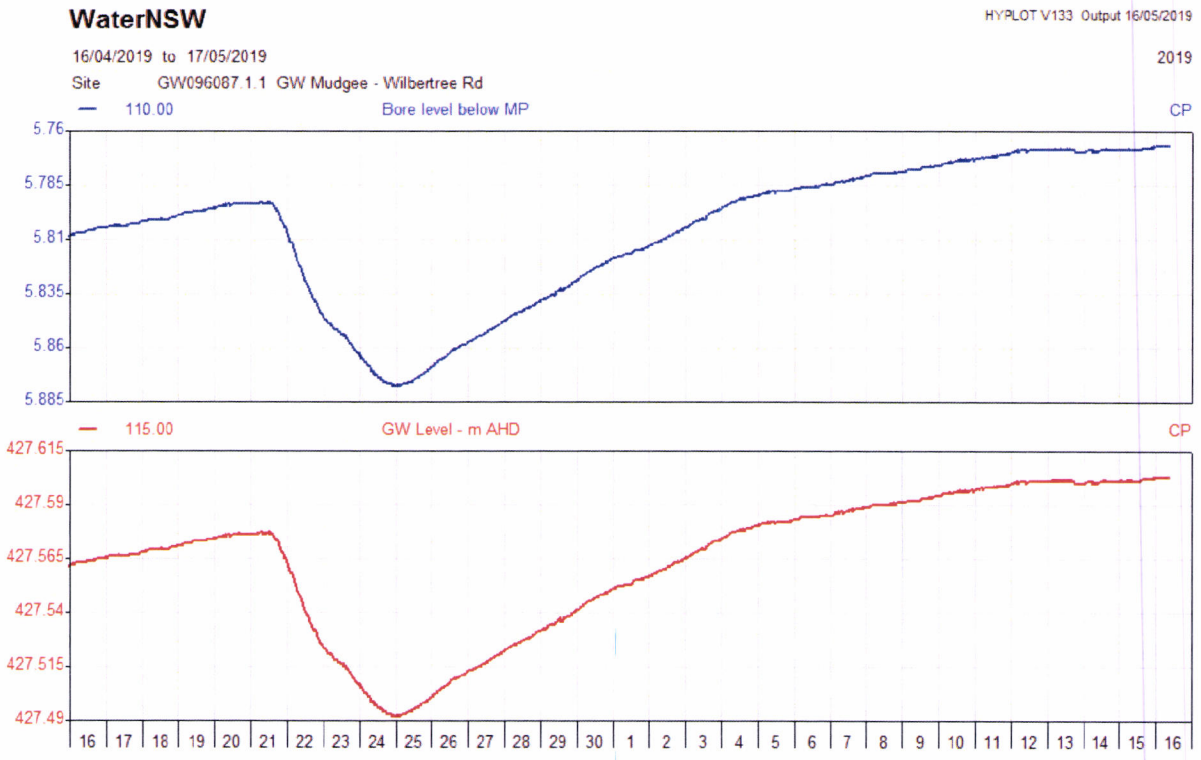

Figure 13: Mudgee - Wilbertree Rd groundwater levels (levels recorded on 16 May 2019)

6.0 POTENTIAL IMPACTS

Although the site is located within an area listed as groundwater vulnerable in accordance with the LEP, proposed on site activity is not expected to materially contribute to any regional groundwater issues particularly those associated with nearby irrigation districts. Proposed trenching would be to a maximum 1,200 mm deep and piling would extend to a maximum depth of 1.5 m, which is expected to be above the local groundwater level.

Based on the current available information, potential adverse surface water-related impacts to the site include:

- Site accessibility and inundation
- Managing downstream sedimentation.

As there will be no extraction of groundwater or interference with the groundwater table during project activities, potential for impacts have not been considered further.

6.1 Flooding

Flood planning maps refenced by the LEP indicate that site is not within an area likely to flood. However, heavy rainfall during storm events (or flash flooding) may cause disruption during construction activities or for material suppliers.

As a drainage line exists at the site between the two planned System A and System B solar panels there is potential for overland flow during rainfall. The water will flow into the existing dam and could overflow towards the Cudgegong River.

6.2 Water quality and erosion

The project 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 vegetation/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 (Cook & McCuen, 2013).

Furthermore, as the site has been historically used for grazing there is very little natural ground cover vegetation.

The Cudgegong alluvial soils are found along the alluvial plains and terraces of the river. The soils have moderate fertility and water holding capacity with weakly structured surface soils. The town of Mudgee is characterised by the Craigmore non-calcic brown soils. These soils have a moderate to high fertility, weakly structured surface soils and moderate to high water holding capacity. Craigmore soils have a moderate to high erosion hazard under cultivation (Hunter Water Australia Strategic Services, 2001).

There is the potential that site runoff will contain sediments and increase turbidity or other water quality parameters in downstream water ways. The existing farm dam should capture surface flow from the site and reduce sedimentation downstream.

7.0 PROPOSED MITIGATION MEASURES

7.1 Site accessibility and inundation

The site accessibility and potential for inundation issues may be managed in the project's risk management register(s) owing to the regional nature of the events and the potential to impact whole of site works. There should be procedures in place to halt construction during heavy rainfall to reduce impacts to the project construction and also to increase sedimentation downstream.

7.2 Downstream sedimentation

Impacts associated with erosion and sedimentation resulting from construction activities can be minimised by undertaking works in accordance with provisions of the NSW government's best practice sediment and erosion control series Managing Urban Stormwater: Soils and Construction (DECC, 2008).

Proposed mitigation measures associated with managing downstream actionable nuisance (sedimentation) are outlined in Table 5.

Table 5: Proposed Mitigation Measures

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 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.

Stage	Measure	Activities/Approach
		■ 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[2] 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 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.

[2] A dilute solution of chemical resulting from washing the container and equipment with water, as defined by NSW EPA accessed 20 December 2018 https://www.epa.nsw.gov.au/licensing-and-regulation/licensing/environment-protection-licences/authorised-officers/glossary#r

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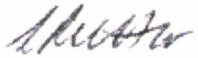
Signature Page

Golder Associates Pty Ltd



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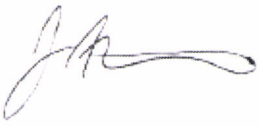

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APPENDIX A

Mudgee LEP Maps

Mid-Western Regional Local Environmental Plan 2012

Flood Planning Map
Active Street Frontages Map
Visually Sensitive Land Map
Sheet CL1_006

Flood Planning Land

Flood Planning Area

Active Street Frontage

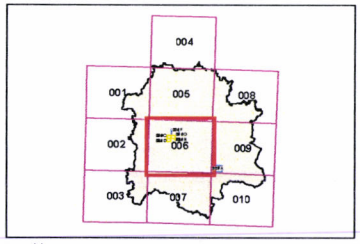
Active Street Frontage

Visually Sensitive Land

Visually Sensitive Land

Cadastre

Cadastre 15/12/2010 Land and Property Information (LPI)



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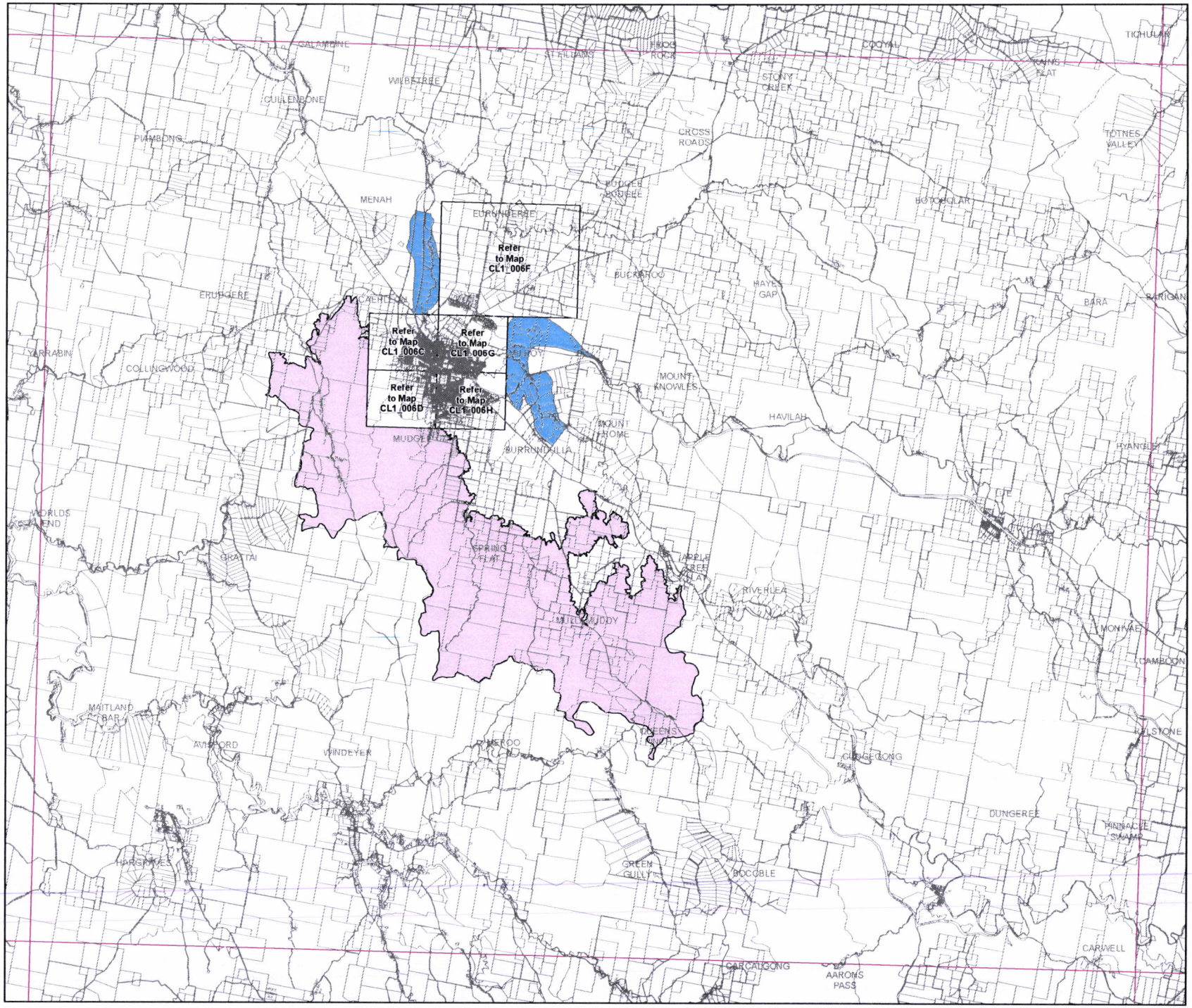


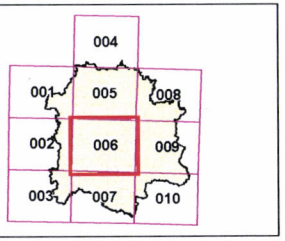
Mid-Western Regional Local Environmental Plan 2012

Groundwater Vulnerability Map - Sheet GRV_006

Groundwater Vulnerable

Cadastre

Cadastre 15/12/2010 Land and Property Information (LPI)



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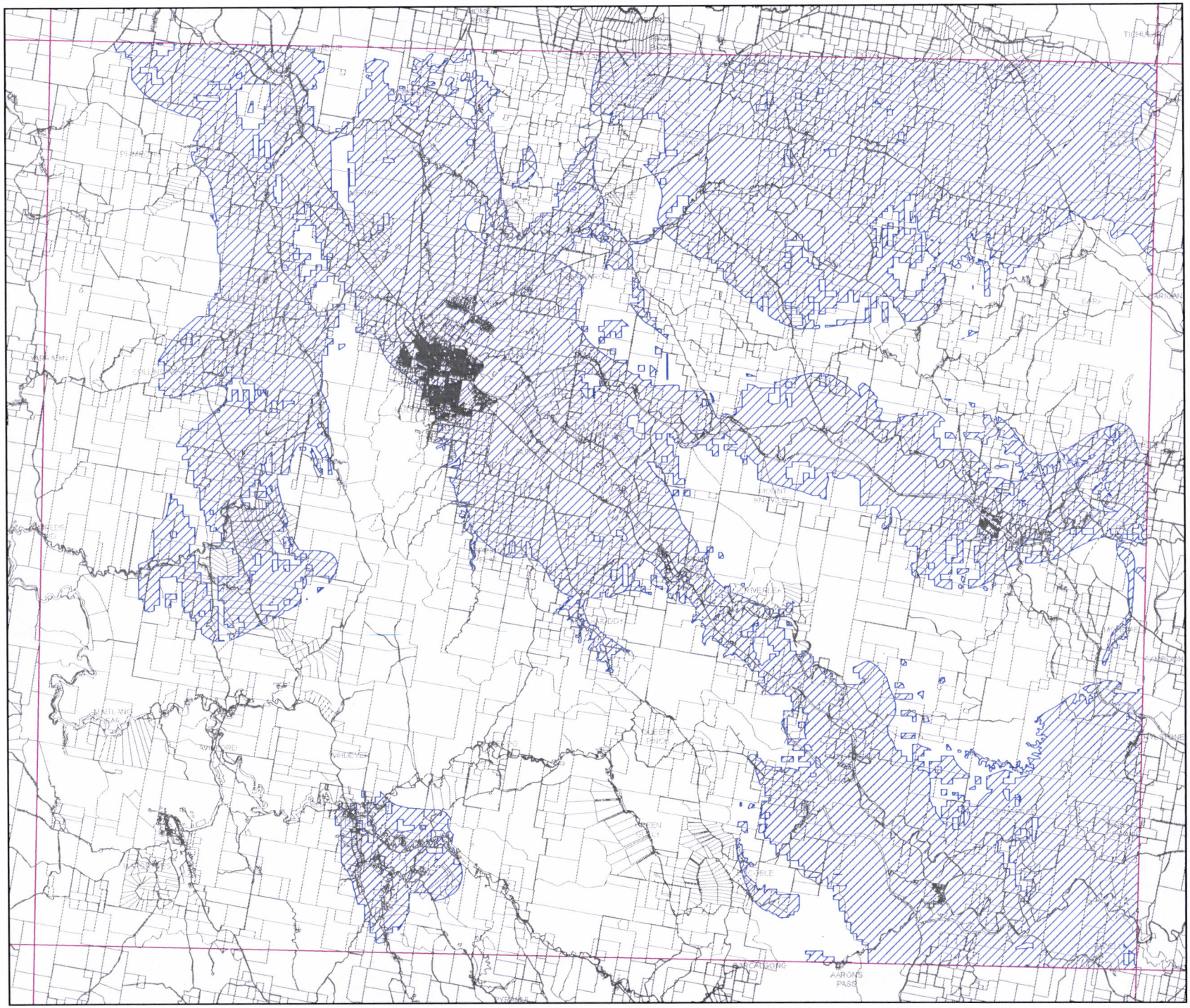

APPENDIX B

Important Information Relating to this Report

The document ("Report") to which this page is attached and which this page forms a part of, has been issued by Golder Associates Pty Ltd ("Golder") subject to the important limitations and other qualifications set out below.

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This Report has been prepared in the context of the circumstances and purposes referred to in, or derived from, the Contract and Golder accepts no responsibility for use of the Report, in whole or in part, in any other context or circumstance or for any other purpose.

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At any location relevant to the Services conditions may exist which were not detected by Golder, in particular due to the specific scope of the investigation Golder has been engaged to undertake. Conditions can only be verified at the exact location of any tests undertaken. Variations in conditions may occur between tested locations and there may be conditions which have not been revealed by the investigation and which have not therefore been taken into account in this Report.

Golder accepts no responsibility for and makes no representation as to the accuracy or completeness of the information provided to it by or on behalf of the Client or sourced from any third party. Golder has assumed that such information is correct unless otherwise stated and no responsibility is accepted by Golder for incomplete or inaccurate data supplied by its Client or any other person for whom Golder is not responsible. Golder has not taken account of matters that may have existed when the Report was prepared but which were only later disclosed to Golder.

Having regard to the matters referred to in the previous paragraphs on this page in particular, carrying out the Services has allowed Golder to form no more than an opinion as to the actual conditions at any relevant location. That opinion is necessarily constrained by the extent of the information collected by Golder or otherwise made available to Golder. Further, the passage of time may affect the accuracy, applicability or usefulness of the opinions, assessments or other information in this Report. This Report is based upon the information and other circumstances that existed and were known to Golder when the Services were performed and this Report was prepared. Golder has not considered the effect of any possible future developments including physical changes to any relevant location or changes to any laws or regulations relevant to such location.

Where permitted by the Contract, Golder may have retained subconsultants affiliated with Golder to provide some or all of the Services. However, it is Golder which remains solely responsible for the Services and there is no legal recourse against any of Golder's affiliated companies or the employees, officers or directors of any of them.

By date, or revision, the Report supersedes any prior report or other document issued by Golder dealing with any matter that is addressed in the Report.

Any uncertainty as to the extent to which this Report can be used or relied upon in any respect should be referred to Golder for clarification

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Noise Assessment

Burrundulla Mini Sustainable Energy Park
Mudgee, NSW.

Prepared for: IT Power (Australia) Pty Ltd
May 2019
MAC180781-04RP1

MAC
Muller Acoustic Consulting

Document Information

NOISE ASSESSMENT

Burrundulla Mini Sustainable Energy Park

Mudgee, NSW.

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MAC180781-04RP1	Final	22 May 2019	Rod Linnett		Oliver Muller	

CONTENTS

1 Introduction

Muller Acoustic Consulting Pty Ltd (MAC) has been engaged by IT Power (Australia) Pty Ltd (ITP) to complete a Noise Assessment (NA) for the proposed Burrundulla Mini Sustainable Energy Park (also referred to as Mudgee 1C3C Solar Farm) near Mudgee, NSW (the 'project'). This report presents the methodology and findings of the NA for the construction and operation of the project.

1.1 Purpose and Objectives

A NA is required as part of the Statement of Environmental Effects (SEE) to be submitted to Mid-Western Regional Council as part of the Development Application (DA). The purpose of the NA is to quantify potential environmental noise emissions associated with the construction and operation of the project. Where impacts are identified, the assessment includes recommendations for potential noise mitigation and management measures.

1.2 Scope of the Assessment

The NA 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 receivers 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 receivers;
- 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.

A glossary of terms, definitions and abbreviations used in this report is provided in **Appendix A.**

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2 Project Description

2.1 Background

ITP propose to construct and operate a 10 Megawatt (MW) solar farm using photovoltaic (PV) technology at Lot 6 DP1069441, near Mudgee, NSW. The site is on the Castlereagh Highway approximately 5 km southeast of Mudgee.

2.2 Description of Proposed Construction Works

The project includes installation of groups of north facing PV modules (approximately 2m x 1m) on mounting structures up to approximately 2.5m in height. An estimated 31,416 PV panels will be installed using a single axis tracking system, tilted +/- 60° along the north-south axis. The PV mounting structure would comprise steel posts driven up to approximately 1.6-3.5m below ground using a small pile driver. Additional support structures would be attached to the piles, which would then support the PV panels.

Earthworks will primarily involve trenching which is required for cabling of each PV array/module to inverters and a substation. Other minor earthworks would be completed for the preparation of the site and in most cases a concrete slab would be required to support the ancillary infrastructure. Most of the infrastructure would be pre-fabricated off-site, delivered and assembled on-site.

It is anticipated that the solar farm would be constructed in one-hectare stages, with up to 10 stages in construction at any one time over a six month period during standard construction hours.

All vehicles would access the project via Sydney Road (Castlereagh Highway B55) during construction and operational phases.

During construction, traffic generated by the project would include employee and delivery vehicles. During the peak construction period, the daily traffic volume is expected to be up to four heavy vehicles (semi-trailers or b-doubles) per hour and 20 light commercial vehicles or equivalent mini buses for worker transport during the morning and afternoon peaks.

2.3 Description of Proposed Operation

PV infrastructure on site will comprise of groups of PV panels installed in rows running north to south. Each row of PV modules will rotate to track the sun across the sky from east to west each day. There is approximately 6m spacing between each row. The hub height of each tracker is 1.6m with the peak of the modules reaching a height of 2.5m when the array is fully tilted.

Electrical cabling would be attached beneath the modules and would connect the individual PV modules to each other. Inverters will be located centrally to groups of PV panels and connected to each other by underground cables. The PV modules will be on a single axis tracker system which will follow the sun and move in an east to west direction.

The project will be contained solely within the site as shown in **Figure 1** and **Drawing MUD3C-G-210**.

The project would operate 24 hours a day, 7 days a week, with no permanent staff on site. During operation, the PV panels would generate electricity which would be fed into the power grid via the substation. Key noise emissions from the operation of the project are associated with the inverter and transformer(s). It is noted that emissions from these sources are anticipated to be acoustically insignificant compared to ambient background noise levels at assessed receivers.

When required, maintenance activities will occur during standard working hours (except for emergencies) and are expected to include:

- panel cleaning;
- repairs or replacement of infrastructure, as required; and
- land management including mowing to control vegetation as required.

Typical noise sources associated with maintenance activities would include light vehicle movements on site and maintenance of equipment.

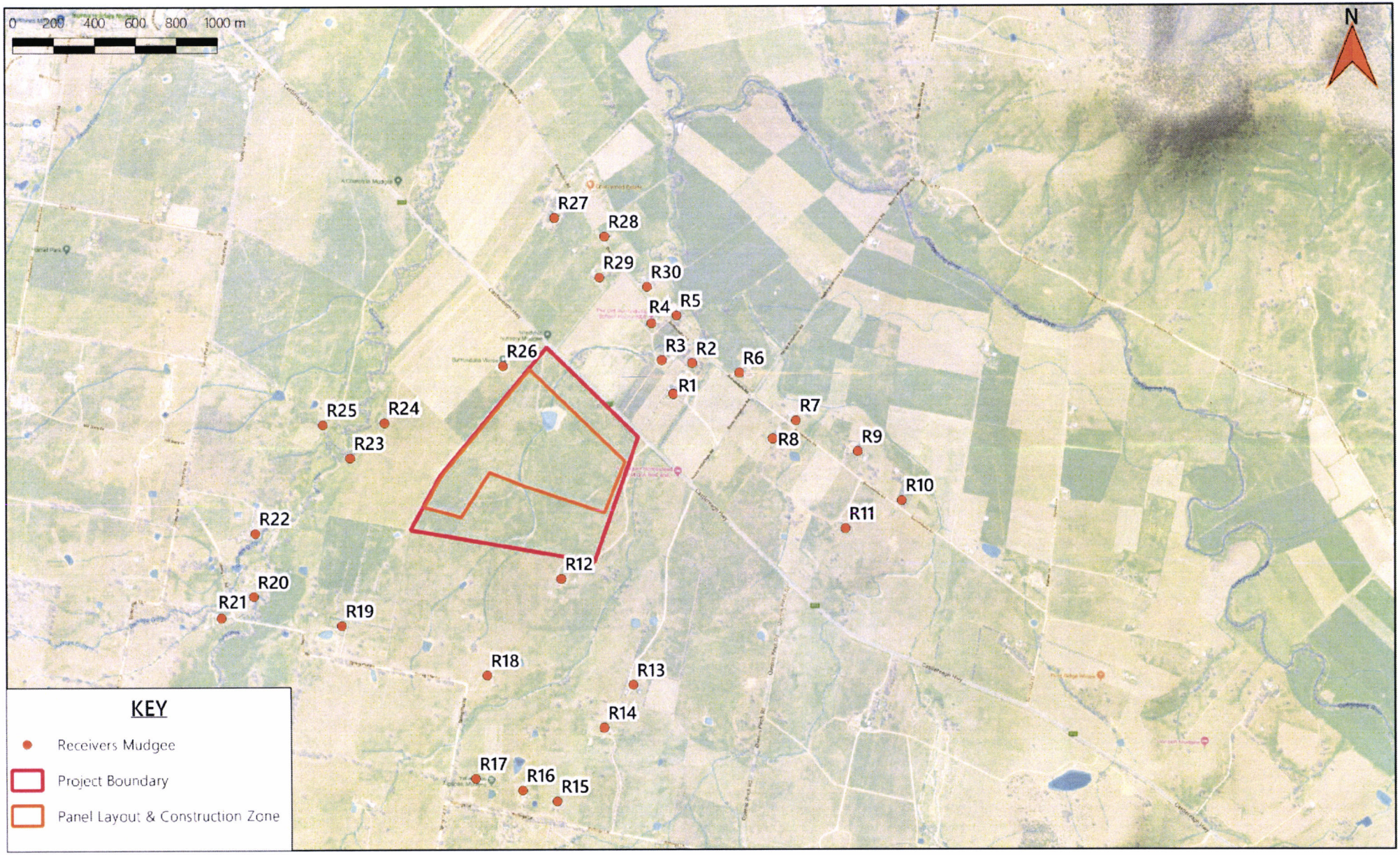
2.4 Potentially Sensitive Receivers

Using aerial photography, geospatial information and other project information, MAC has identified the following potentially sensitive receivers that may be affected by noise from operation or construction activities and project related road traffic. **Table 1** presents a summary of receiver identification address and coordinates. These are reproduced graphically in **Figure 1.**

Table 1 Noise Sensitive Receivers

ID	Description/Address	Coordinates (MGA 55)	
		Easting	Northing
R1	446 Rocky Waterhole Road	746734	6386721
R2	354 Burrundulla Road	746828	6386871
R3	328 Burrundulla Road	746678	6386886
R4	322 Burrundulla Road	746628	6387068
R5	327 Burrundulla Road	746752	6387106
R6	371 Burrundulla Road	747060	6386824
R7	447 Burrundulla Road	747336	6386590
R8	404 Burrundulla Road	747222	6386502
R9	447 Burrundulla Road	747638	6386439
R10	473 Burrundulla Road	747853	6386198
R11	452 Burrundulla Road	747577	6386062
R12	312 Castlereagh Highway	746180	6385816
R13	344 Castlereagh Highway	746533	6385296
R14	83 Wallinga Lane	746390	6385086
R15	55 Wallinga Lane	746157	6384726
R16	39 Wallinga Lane	745988	6384779
R17	13 Wallinga Lane	745757	6384837
R18	411 Spring Flat Road	745815	6385343
R19	345 Spring Flat Road	745103	6385588
R20	281 Spring Flat Road	744673	6385731
R21	282 Spring Flat Road	744514	6385628
R22	217 Spring Flat Road	744681	6386041
R23[1]	3B Sydney Road	745146	6386409
R24[1]	3B Sydney Road	745315	6386582
R25[1]	3B Sydney Road	745012	6386573
R26[1]	3B Sydney Road	745897	6386859
R27	252 Burrundulla Road	746152	6387586
R28	275 Burrundulla Road	746398	6387494
R29	243 Castlereagh Highway	746373	6387293
R30	297 Burrundulla Road	746607	6387247

Note 1: Project related receiver.



MAC
Muller Acoustic Consulting

FIGURE 1

PROJECT LAYOUT

REF: MAC180781-04

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3 Noise Policy and Guidelines

This Noise Assessment has been conducted in accordance with the following key policy and guidelines:

- 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; and
- NSW Department of Environment, Climate Change and Water (DECCW), NSW Road Noise Policy (RNP), 2011.

The assessment has also considered and applied the following additional policy, guidelines and standards where relevant:

- 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 /NZS IEC 61672.1–2019 (AS 61672) – Electro Acoustics - Sound Level Meters Specifications Monitoring; and
- Australian Standard AS IEC 60942-2004 (AS 60942) – Electroacoustics – Sound Calibrators.

3.1 Interim Construction Noise Guideline

The assessment and management of noise from construction work is completed with reference to the Interim Construction Noise Guideline (ICNG). The ICNG is specifically aimed at managing noise from construction work regulated by the EPA and is used to assist in setting statutory conditions in licences or other regulatory instruments. The types of construction regulated by the EPA under the POEO Act (1997), include construction, maintenance and renewal activities carried out by a public authority, such as road upgrades as described in Schedule 1 of the POEO Act.

The ICNG sets out procedures to identify and address the impact of construction noise on residences and other sensitive land uses. This section provides a summary of noise objectives that are applicable to the assessment.

The ICNG provides two methodologies for the assessment of construction noise emissions:

- Quantitative, which is suited to major construction projects with typical durations of more than three weeks; or
- Qualitative, which is suited to short term infrastructure maintenance (for projects with a typical duration of less than three weeks).

The methodology for a quantitative assessment requires a more complex approach, involving noise emission predictions from construction activities to the nearest relevant receivers. The qualitative assessment methodology is a more simplified approach that relies more on noise management strategies. This study has adopted a quantitative assessment approach.

The quantitative approach includes identification of potentially affected receivers, description of activities involved in the project, derivation of the construction noise management levels, quantification of potential noise impact at receivers and, provides management and mitigation recommendations. **Table 2** summarises the ICNG recommended standard hours for construction.

Table 2 Recommended Standard Hours for Construction

Period	Preferred Construction Hours
Day (Standard construction hours)	Monday to Friday - 7am to 6pm Saturdays - 8am to 1pm Sundays or Public Holidays - No construction

The recommended hours do not apply in the event of direction from police, or other relevant authorities, for safety reasons or where required in an emergency to avoid the loss of lives, property and/or to prevent environmental harm. Work conducted outside of standard hours are considered out of hours work (OOH). OOH periods are divided into two categories representing evening and night periods and cover the hours listed below:

Period 1 (evening/low risk period): Monday to Friday – 6pm to 10pm, Saturdays – 1pm to 6pm, Sundays – 8am to 6pm.

Period 2 (night/medium to high risk period): Monday to Friday – 10pm to 7am, Saturdays/Sundays – 6pm to 7am (8am on Sunday mornings).

There are no out of hours work proposed for this project.

3.1.1 Construction Noise Management Levels

Section 4 of the ICNG details the quantitative assessment method involving predicting noise levels and comparing them with the Noise Management Level (NML) and are important indicators of the potential level of construction noise impact. **Table 3** provides the ICNG recommended $L_{Aeq(15min)}$ NMLs and how they are to be applied.

Table 3 Noise Management Levels

Time of Day	Management Level $LA_{eq(15min)}$[1]	How to Apply
Recommended standard hours: Monday to Friday 7am to 6pm Saturday 8am to 1pm No work on Sundays or public holidays.	Noise affected RBL + 10dB.	The noise affected level represents the point above which there may be some community reaction to noise. Where the predicted or measured $LA_{eq(15min)}$ is greater than the noise affected level, the proponent should apply all feasible and reasonable work practices to meet the noise affected level. The proponent should also inform all potentially impacted residents of the nature of work to be carried out, the expected noise levels and duration, as well as contact details.
	Highly noise affected 75dBA.	The highly noise affected level represents the point above which there may be strong community reaction to noise. Where noise is above this level, the relevant authority (consent, determining or regulatory) may require respite periods by restricting the hours that the very noisy activities can occur, taking into account times identified by the community when they are less sensitive to noise (such as before and after school for work near schools, or mid-morning or mid-afternoon for work near residences; and if the community is prepared to accept a longer period of construction in exchange for restrictions on construction times.
Outside recommended standard hours.	Noise affected RBL + 5dB.	A strong justification would typically be required for work outside the recommended standard hours. The proponent should apply all feasible and reasonable work practices to meet the noise affected level. Where all feasible and reasonable practices have been applied and noise is more than 5dBA above the noise affected level, the proponent should negotiate with the community.
Commercial	70dBA	Offices, retail outlets
Hospital	45dBA (internal) 55dBA (external)	Assuming 10dB loss through open window

Note 1: The Rating Background Level (RBL) is an overall single figure background level representing each assessment period over the whole monitoring period. The RBL is used to determine the construction noise management levels for noise assessment purposes and is the median of the ABL's.

3.1.2 Construction Sleep Disturbance

Section 4.3 of the ICNG (DECC, 2009) states that a sleep disturbance assessment is required where construction activities are planned to occur for more than two consecutive nights. Given that construction activities are anticipated to occur during standard construction hours, sleep disturbance has not been considered in this assessment.

3.2 Noise Policy for Industry

The EPA released the Noise Policy for Industry (NPI) in October 2017 which provides a process for establishing operational noise criteria for development consents and/or licenses where the EPA regulate noise emissions from scheduled premises under the Protection of the Environment Operations Act 1997. The objectives of the NPI are to:

- provide noise criteria to assess the change in both short term and long term noise levels;
- provide a clear and consistent framework for assessing environmental noise impacts from industrial premises and industrial development proposals;
- promote the use of best-practice noise mitigation measures that are feasible and reasonable where potential impacts have been identified; and
- support a process to guide the determination of achievable noise limits for planning approvals and/or licences, considering the matters under the relevant legislation (such as the economic and social benefits and impacts of industrial development).

The policy sets out a process for industrial noise management during operation, including:

1. Determine the Project Noise Trigger Levels (PNTLs) (ie criteria) for a development. These are the levels, above which noise management measures are required to be considered. They are derived by considering two factors: shorter-term intrusiveness due to changes in the noise environment; and maintaining the noise amenity of an area.
2. Predict or measure the noise levels produced by the development with regard to the presence of annoying noise characteristics and meteorological effects such as temperature inversions and wind.
3. Compare the predicted or measured noise level with the PNTLs, assessing impacts and the need for noise mitigation and management measures.
4. Consider residual noise impacts, where noise levels exceed the PNTLs after the application of feasible and reasonable noise mitigation measures. This may involve balancing economic, social and environmental costs and benefits from the proposed development against the noise impacts, including consultation with the affected community where impacts are expected to be significant.

5. Set statutory compliance levels that reflect the best achievable and agreed noise limits for the development.

6. Monitor and report environmental noise levels from the development.

3.2.1 Project Noise Trigger Levels

The policy sets out the procedure to determine the PNTLs for an industrial development. The PNTL is the lower (ie, the more stringent) value of the **Project Intrusiveness Noise Level** (PINL) and **Project Amenity Noise Level** (PANL) determined in accordance with Section 2.3 and Section 2.4 of the NPI.

3.2.2 Project Intrusiveness Noise Level

The PINL ($L_{Aeq(15min)}$) is the RBL + 5dB and seeks to limit the degree of change a new noise source introduces to an existing environment. When assessing intrusiveness, background noise levels needs to be measured, from which RBLs are determined.

3.2.3 Project Amenity Noise Level

PANL is relevant to a specific land use or locality. To limit continuing increases in intrusiveness levels, the ambient noise level within an area from all combined industrial sources should remain below the recommended amenity noise levels specified in Table 2.2 (of the NPI) and are reproduced in **Table 4**. The NPI defines two categories of amenity noise levels:

- **Amenity Noise Levels (ANL)** – are determined considering all current and future industrial noise within a receiver area.
- **Project Amenity Noise Levels (PANL)** – is the recommended levels for a receiver area, specifically focusing the project being assessed.

Additionally, Section 2.4 of the NPI states: "*to ensure that industrial noise levels (existing plus new) remain within the recommended amenity noise levels for an area, a project amenity noise levels applies for each new source of industrial noise as follows*":

- areas with high traffic noise levels;
- proposed developments in major industrial clusters;
- existing industrial noise and cumulative industrial noise effects; and
- greenfield sites.

Notwithstanding, where the PANL is applicable and can be satisfied, the assessment of cumulative industrial noise is not required.

Table 4 Amenity Criteria

Receiver Type	Noise Amenity Area	Time of day	Recommended amenity noise level dB LAeq
Residential	Rural	Day	50
		Evening	45
		Night	40
	Suburban	Day	55
		Evening	45
		Night	40
	Urban	Day	60
		Evening	50
		Night	45
Hotels, motels, caretakers' quarters, holiday accommodation, permanent resident caravan parks	See column 4	See column 4	5dBA above the recommended amenity noise level for a residence for the relevant noise amenity area and time of day
School classroom – internal	All	Noisiest 1-hour period when in use	35
Hospital ward - internal - external	All	Noisiest 1 hour Noisiest 1 hour	35 50
Place of worship – internal	All	When in use	40
Area specifically reserved for passive recreation (e.g. national park)	All	When in use	50
Active recreation area (e.g. school playground, golf course)	All	When in use	55
Commercial premises	All	When in use	65
Industrial premises	All	When in use	70
Industrial interface (applicable only to residential noise amenity areas)	All	All	Add 5dBA to recommended noise amenity area

Notes: The recommended amenity noise levels refer only to noise from industrial noise sources. However, they refer to noise from all such sources at the receiver location, and not only noise due to a specific project under consideration. The levels represent outdoor levels except where otherwise stated.

Types of receivers are defined as rural residential; suburban residential; urban residential; industrial interface; commercial; industrial – see Table 2.3 and Section 2.7.

Time of day is defined as follows: (These periods may be varied where appropriate, for example, see A3 in Fact Sheet A.)

- day – the period from 7am to 6pm Monday to Saturday or 8am to 6pm on Sundays and public holidays;
- evening – the period from 6pm to 10pm;
- night – the remaining periods.

In the case where existing schools are affected by noise from existing industrial noise sources, the acceptable LAeq noise level may be increased to 40dB LAeq(1hr).

3.2.4 Maximum Noise Level Assessment

The potential for sleep disturbance from maximum noise level events from a project during the night-time period needs to be considered. The NPI considers sleep disturbance to be both awakenings and disturbance to sleep stages.

Where night-time noise levels from a development/premises at a residential location exceed:

- $L_{Aeq(15min)}$ 40dBA or the prevailing RBL plus 5dB, whichever is the greater, and/or
- L_{Amax} 52dBA or the prevailing RBL plus 15dB, whichever is the greater,

a detailed maximum noise level event assessment should be undertaken.

A detailed assessment should cover the maximum noise level, the extent to which the maximum noise level exceeds the rating background noise level, and the number of times this happens during the night-time period.

Other factors that may be important in assessing the impacts on sleep disturbance include:

- how often the events would occur;
- the distribution of likely events across the night-time period and the existing ambient maximum events in the absence of the development;
- whether there are times of day when there is a clear change in the noise environment (such as during early morning shoulder periods); and
- current understanding of effects of maximum noise level events at night.

3.3 Road Noise Policy

The road traffic noise criteria are provided in the Department of Environment, Climate Change and Water NSW (DECCW), Road Noise Policy (RNP), 2011. The policy sets out noise criteria applicable to different road classifications for the purpose of quantifying traffic noise impacts. Road noise criteria relevant to this assessment are presented in detail in **Section 6**.

4 Assessment Criteria

Background noise monitoring has not been conducted for this project and hence, the minimum applicable Rating Background Levels (RBL) of 35dBA for the daytime period and 30dBA for the evening and night time periods have been adopted in accordance with NPI methodology.

4.1 Construction Noise Management Levels

Noise Management Levels (NMLs) for construction activities at all residential receivers are 45dB $L_{Aeq(15min)}$ (RBL +10dB). Construction activities are planned for standard hours, however the relevant NML standard construction hours and out of hours periods are summarised in **Table 5**.

Table 5 Construction Noise Management Levels

Location	Assessment Period[1]	RBL, dBA	NML dB $L_{Aeq(15min)}$
All Residential Receivers	Day (Standard Hours)	35	45 (RBL+10dBA)
	Evening (OOH Period 1)	30	35 (RBL+5dBA)
	Night (OOH Period 2)	30	35 (RBL+5dBA)
Commercial	When in Use	N/A	70
Hospital	When in Use	N/A	55

Note 1: See table 2 for Recommended Standard Hours for Construction.

4.2 Operational Noise Criteria

4.2.1 Project Intrusiveness Noise Levels

The PINLs for the project are presented in **Table 6** and have been determined based on the RBLs +5dBA.

Table 6 Project Intrusiveness Noise Levels

Receiver	Period[1]	Adopted RBL dB L_{A90}	PINL dB $L_{Aeq(15min)}$
All Residential Receivers	Day	35	40
	Evening	30	35
	Night	30	35

Note 1: Day - the period from 7am to 6pm Monday to Saturday or 8am to 6pm on Sundays and public holidays; Evening - the period from 6pm to 10pm; Night - the remaining periods.

4.2.2 Project Amenity Noise Levels

The PANLs for receivers potentially affected by the project are presented in **Table 7.**

Table 7 Project Amenity Noise Levels

Receiver Type	Noise Amenity Area	Assessment Period[1]	Recommended ANL dB LAeq(period)[2]	PANL dB LAeq(period)[3]	PANL dB LAeq(15min)[4]
Residential	Rural	Day	50	50	53
		Evening	45	45	48
		Night	40	40	43
Industrial		When In Use	70	70	73

Note 1: Day - the period from 7am to 6pm Monday to Saturday or 8am to 6pm on Sundays and public holidays; Evening - the period from 6pm to 10pm; Night - the remaining periods.

Note 2: Recommended amenity noise levels as per Table 2.2 of the NPI.

Note 3: Project Amenity Noise Level equals the amenity noise level as there is no other industry in the area.

Note 4: Includes a +3dB adjustment to the amenity period level to convert to a fifteen-minute assessment period as per Section 2.2 of the NPI.

4.2.3 Project Noise Trigger Levels

The PNTLs are the lower of either the PINLs or the PANLs. **Table 8** presents the derivation of the PNTLs in accordance with the methodologies outlined in the NPI. For this assessment the night time PNTL of 35dB LAeq(15min) is the limiting criteria for residential receivers.

Table 8 Project Noise Trigger Levels

Catchment	Assessment Period[1]	PINL dB LAeq(15min)	PANL dB LAeq(15min)	PNTL dB LAeq(15min)
Residential Receivers (Rural)	Day	40	53	40
	Evening	35	48	35
	Night	35	43	35
Industrial	When In Use	N/A	73	73

Note 1: Day - the period from 7am to 6pm Monday to Saturday or 8am to 6pm on Sundays and public holidays; Evening - the period from 6pm to 10pm; Night - the remaining periods.

4.2.4 Maximum Noise Level Screening Criterion

The maximum noise level screening criterion shown in **Table 9** is based on night time RBLs and trigger values as per Section 2.5 of the NPI.

Table 9 Maximum Noise Assessment Trigger Levels

Residential Receivers			
LAeq(15min)		LAmax	
40dB LAeq(15min) or RBL + 5dB		52dB LAmax or RBL + 15dB	
Trigger	40	Trigger	52
RBL +5dB	35	RBL +15dB	45
Highest	**40**	**Highest**	**52**

Note: As per Section 2.5 of the NPI, the highest of the two criteria are adopted as the screening criteria.

4.3 Road Traffic Noise Criteria

The road traffic noise criteria are provided in the RNP and are presented in **Table 10** for residential receivers.

Table 10 Road Traffic Noise Assessment Criteria for Residential Land Uses

Road category	Road Name	Type of Project/Development	Assessment Criteria - dBA	
			Day (7am to 10pm)	Night (10pm to 7am)
Freeway/arterial/sub -arterial road	Castlereagh Highway	Existing residences affected by additional traffic on existing freeways/arterial/sub-arterial roads generated by land use developments	60dBA LAeq(15hr) external	55dBA LAeq(9hr) external

Note: For road noise assessments, the day period is from 7am to 10pm (ie there is no evening assessment period as there is with operational noise). Night is from 10pm to 7am.

Additionally, the RNP states where existing road traffic noise criteria are already exceeded, any additional increase in total traffic noise level should be limited to 2dB, which is generally accepted as the threshold of perceptibility to a change in noise level.

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5 Modelling Methodology

A computer model was developed to quantify project noise emissions to neighbouring receivers for typical construction activities and operations. DGMR's iNoise (Version 2019) noise modelling software was used to assess potential noise impacts associated with the project. A three-dimensional digital terrain map giving all relevant topographic information was used in the modelling process. Additionally, the model uses relevant noise source data, ground type, shielding such as barriers and/or adjacent buildings and atmospheric information to predict noise levels at the nearest potentially affected receivers. Plant and equipment were modelled at various locations and heights, representative of realistic construction and operational conditions for assessed scenarios.

The model calculation method used to predict noise levels was in accordance with ISO 9613-1 'Acoustics - Attenuation of sound during propagation outdoors. Part 1: Calculation of the absorption of sound by the atmosphere' and ISO 9613-2 'Acoustics - Attenuation of sound during propagation outdoors. Part 2: General method of calculation'.

5.1 Construction Assessment Methodology

Construction activities are proposed to be progressive (trenching, piling and assembly) and will occur at several locations simultaneously. Noise emissions were modelled for the following four scenarios:

- earthworks for internal road and compound construction including the stripping of topsoil and unsuitable soil and the placement and compaction of road base;
- earthworks involving trenching for cabling;
- piling of panel supports; and
- assembly of the panels.

It is envisaged that all four construction scenarios have the potential to occur simultaneously at up to two locations across the site. Noise emission data and assumptions used in this assessment are summarised in **Table 11**. All significant noise generating construction activities will be limited to standard construction hours. Where low intensity construction activities are required to be undertaken outside standard construction hours, such as cabling, minor assembly, use of hand tools etc, they will be managed such that they are not audible at any residential receivers.

Table 11 Construction Equipment Sound Power Levels, Lw dBA re 10^{-12} W				
Noise Source/Item	Utilisation %	Quantity	Lw/Item	Total Lw
Trenching & Earthworks				
Backhoe	80	1	104	103
Light vehicle	25	2	76	73
Total – Trenching & Earthworks				**103**
Piling				
Piling Rig (hydraulic)	80	1	113	112
Tele-handler	75	1	106	105
Light vehicle	25	2	76	73
Total – Piling				**113**
Assembly				
Mobile Crane/HIAB	75	1	104	103
Tele-handler	75	1	106	105
Light vehicle	25	2	76	73
Hand tools/Power tools	50	1	102	99
Welder	50	1	105	102
Total – Assembly				**109**
Transport (on site)				
Heavy vehicle	40	1	104	101
Tele-handler	50	1	106	103
Total – Transport				**105**

5.2 Operational Assessment Methodology

5.2.1 Operational Noise Modelling Scenarios

For this assessment, noise predictions were modelled for a typical worst-case operational scenario over a 15-minute assessment period based on the assumptions and sound power levels in **Table 12.** Plant noise emission data used in modelling for this assessment were obtained from manufacturers data or the MAC database. Where relevant, modifying factors in accordance with Section 3.3 and Fact Sheet D of the NPI have been applied to calculations.

Table 12 Operational Equipment Sound Power Levels, Lw dBA re 10^{-12} W

Noise Source/Item	Activity	Quantity	Lw/Item	Total Lw
PV Panel Tracking Motor[1, 2]	All tracking motors in operation 1 minute per 15-minute period	300-400	78	87
2.5MW Inverter[2]	Constant	4	81	97
5MVA Transformer[2]	Constant	2	77	90

Note 1: Tracking motor is situated underneath the PV panel, -5dB attenuation applied to account for shielding provided by the panel.

Note 2: Modifying factor penalty of +5dB added for low frequency and +5dB added for tonality.

5.2.2 Meteorological Analysis

Noise emissions from industry can be significantly influenced by prevailing weather conditions. Light stable winds (<3m/s) and temperature inversions have the potential to increase noise at a receiver.

Fact Sheet D of the NPI provide two options when considering meteorological effects:

- adopt the noise enhancing conditions for all assessment periods without an assessment of how often the conditions occur, this is conservative approach that considers a source to receiver winds for all receivers and F class temperature inversions with wind speeds up to 2m/s at night; or
- determine the significance of noise enhancing conditions. This requires assessing the significance of temperature inversions (F and G Class stability categories) for the night time period and the significance of light winds up to 3m/s for all assessment periods during stability categories other than E, F or G.

This assessment has adopted default noise enhancing conditions with the meteorological conditions adopted in the noise modelling assessment summarised in **Table 13**.

Table 13 Modelled Site Specific Meteorological Parameters

Assessment Condition[1]	Temperature	Wind Speed / Direction	Relative Humidity	Stability Class
Day - Calm	20°C	3m/s all directions	50%	D
Evening - Calm	10°C	3m/s all directions	50%	D
Night - Calm	10°C	2m/s all directions	50%	F

Note 1: Day 7am to 6pm Monday to Saturday or 8am to 6pm on Sundays and public holidays; Evening 6pm to 10pm; Night - the remaining periods.

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6 Results

6.1 Construction Noise Results

Noise levels were predicted to each assessed receptor assuming receiver heights of 1.5m above ground level for typical construction activities during noise enhancing meteorological conditions. **Table 14** summarises the maximum predicted noise level from each of the construction scenarios (trenching, piling and assembly) at identified residential receivers.

Table 14 Predicted Construction Noise Levels

Receiver ID	Description/Address	Predicted Noise Level Range dB $L_{Aeq(15min)}$[1]	Highest Predicted Noise Level dB $L_{Aeq(15min)}$	NML Standard Hours dB $L_{Aeq(15min)}$	Compliance
R1	446 Rocky Waterhole Road	43-52	**48**	45	No[2]
R2	354 Burrundulla Road	39-49	**46**	45	No[2]
R3	328 Burrundulla Road	40-51	**47**	45	No[2]
R4	322 Burrundulla Road	37-49	**47**	45	No[2]
R5	327 Burrundulla Road	35-47	45	45	No[2]
R6	371 Burrundulla Road	35-46	44	45	No[2]
R7	447 Burrundulla Road	32-43	42	45	Yes
R8	404 Burrundulla Road	34-45	43	45	Yes
R9	447 Burrundulla Road	28-40	38	45	Yes
R10	473 Burrundulla Road	22-36	34	45	Yes
R11	452 Burrundulla Road	28-40	39	45	Yes
R12	312 Castlereagh Highway	30-57	**51**	45	No[2]
R13	344 Castlereagh Highway	27-45	43	45	Yes
R14	83 Wallinga Lane	22-42	41	45	Yes
R15	55 Wallinga Lane	19-38	37	45	Yes
R16	39 Wallinga Lane	19-39	38	45	Yes
R17	13 Wallinga Lane	19-37	36	45	Yes
R18	411 Spring Flat Road	23-44	43	45	Yes
R19	345 Spring Flat Road	20-43	40	45	Yes
R20	281 Spring Flat Road	18-40	37	45	Yes
R21	282 Spring Flat Road	16-36	35	45	Yes
R22	217 Spring Flat Road	18-41	41	45	Yes
R23	3B Sydney Road	23-48	48	45	Yes[2,3]
R24	3B Sydney Road	24-49	50	45	Yes[2,3]
R25	3B Sydney Road	21-45	45	45	Yes[2,3]
R26	3B Sydney Road	31-56	57	45	Yes[2,3]

Table 14 Predicted Construction Noise Levels

Receiver ID	Description/Address	Predicted Noise Level Range dB $L_{Aeq(15min)}$[1]	Highest Predicted Noise Level dB $L_{Aeq(15min)}$	NML Standard Hours dB $L_{Aeq(15min)}$	Compliance
R27	252 Burrundulla Road	28-44	43	45	Yes
R28	275 Burrundulla Road	30-45	43	45	Yes
R29	243 Castlereagh Highway	33-48	**46**	45	No[2]
R30	297 Burrundulla Road	34-47	45	45	No[2]

Note 1: Noise levels from construction activities vary due to their location across the project site.

Note 2: Noise levels exceed NMLs when construction activities are at their nearest point to receivers.

Note 3: Project related receiver.

Noise levels at six receivers are expected to exceed the NMLs when works are nearest to those locations. 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.

6.2 Operational Noise Results

Noise levels were predicted at each assessed receptor assuming receiver heights of 1.5m above ground level during worst case noise enhancing meteorological conditions. **Table 15** summarises the predicted operational noise levels which are demonstrated to comply with the PNTLs at all residential receivers.

Table 15 Predicted Operational Noise Levels

Receiver ID	Address	Predicted Noise Level dB $L_{Aeq(15min)}$	Limiting Night PNTL dB $L_{Aeq(15min)}$	Compliance
R1	446 Rocky Waterhole Road	20	35	Yes
R2	354 Burrundulla Road	<20	35	Yes
R3	328 Burrundulla Road	<20	35	Yes
R4	322 Burrundulla Road	<20	35	Yes
R5	327 Burrundulla Road	<20	35	Yes
R6	371 Burrundulla Road	<20	35	Yes
R7	447 Burrundulla Road	<20	35	Yes
R8	404 Burrundulla Road	<20	35	Yes
R9	447 Burrundulla Road	<20	35	Yes
R10	473 Burrundulla Road	<20	35	Yes
R11	452 Burrundulla Road	<20	35	Yes
R12	312 Castlereagh Highway	23	35	Yes
R13	344 Castlereagh Highway	<20	35	Yes

Table 15 Predicted Operational Noise Levels

Receiver ID	Address	Predicted Noise Level dB $L_{Aeq(15min)}$	Limiting Night PNTL dB $L_{Aeq(15min)}$	Compliance
R14	83 Wallinga Lane	<20	35	Yes
R15	55 Wallinga Lane	<20	35	Yes
R16	39 Wallinga Lane	<20	35	Yes
R17	13 Wallinga Lane	<20	35	Yes
R18	411 Spring Flat Road	<20	35	Yes
R19	345 Spring Flat Road	<20	35	Yes
R20	281 Spring Flat Road	<20	35	Yes
R21	282 Spring Flat Road	<20	35	Yes
R22	217 Spring Flat Road	<20	35	Yes
R23	3B Sydney Road	<20	35	Yes
R24	3B Sydney Road	<20	35	Yes
R25	3B Sydney Road	<20	35	Yes
R26	3B Sydney Road	23	35	Yes
R27	252 Burrundulla Road	<20	35	Yes
R28	275 Burrundulla Road	<20	35	Yes
R29	243 Castlereagh Highway	<20	35	Yes
R30	297 Burrundulla Road	<20	35	Yes

6.3 Maximum Noise Level Assessment - Operations

A detailed maximum noise level assessment is not required as predicted noise levels for night time operations do not exceed the maximum noise level screening criterion of 40dB $L_{Aeq(15min)}$ and/or 52dB L_{Amax}.

6.4 Road Traffic Noise Assessment

The route via Castlereagh Highway would be the major transport route for all vehicles to the project site. During construction, traffic generated by the project include employee/subcontractor and delivery vehicles. The traffic volume over a typical day for standard construction hours is expected to be up to four heavy vehicles (semi-trailers or B-doubles) per hour and 20 light commercial vehicles or equivalent mini buses for worker transport during the morning and afternoon peak hour periods.

Predicted $L_{Aeq(1hr)}$ noise levels from project related construction traffic at the closest receiver (80m from the road) situated along Sydney Road (Castlereagh Highway B55) to the site access has been completed using the United States (US) Environment Protection Agency's road traffic calculation method is presented in **Table 16**.

Table 16 Predicted Construction Road Traffic Noise Levels

Road Name	Nearest Offset Distance to Receiver	Predicted Noise Level	RTN Criteria	Comply
Sydney Road (B55)	80m	<40dB $L_{Aeq(15hr)}$	60dB $L_{Aeq(15hr)}$	Yes

Results demonstrate that project construction traffic noise levels would comply with the relevant RNP criteria.

7 Recommendations

7.1 Construction Noise Recommendations

It is noted that construction noise emissions are expected to exceed the relevant NMLs depending on proximity of activities to receivers. Recommendations for consideration during construction activities to reduce emissions to the surrounding community for this project may include:

- 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 (eg 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.

7.2 Operational Noise Recommendations

Operational noise predictions identify that relevant noise criteria would be satisfied at all receivers. Notwithstanding, it is recommended that the proponent actively minimise potential noise emissions from the project. To assist in noise management for the project it is recommended that a one-off noise validation monitoring assessment be completed to quantify emissions from site and to confirm emissions meet relevant criteria.

8 Conclusion

Muller Acoustic Consulting Pty Ltd (MAC) has been engaged by IT Power (Australia) Pty Ltd (ITP) to complete a Noise Assessment (NA) for the proposed Burrundulla Mini Sustainable Energy Park near Mudgee, NSW. The assessment has quantified potential noise emissions associated with the construction and operation of the project.

The results of the NA demonstrate that construction noise levels have potential to exceed relevant construction NMLs at six receiver locations. However the effect is likely to be over estimated at five of those receivers as masking noise from the Castlereagh Highway has not been assessed and the effect at the remaining location would be when activities are in close proximity to the receiver Recommendations have been provided to minimise the potential noise impacts from construction, albeit of a temporary nature during the daytime over a three month construction period.

Operational noise levels satisfy the NPI PNTLs for assessed receivers. However, recommendations to ensure noise levels are verified have been provided in this report.

Additionally, the NA demonstrates that the road noise criteria as specified in the RNP will be satisfied at all receivers on the proposed transport route.

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

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Appendix A – Glossary of Terms

A number of technical terms have been used in this report and are explained in Table A1.

Table A1 Glossary of Terms

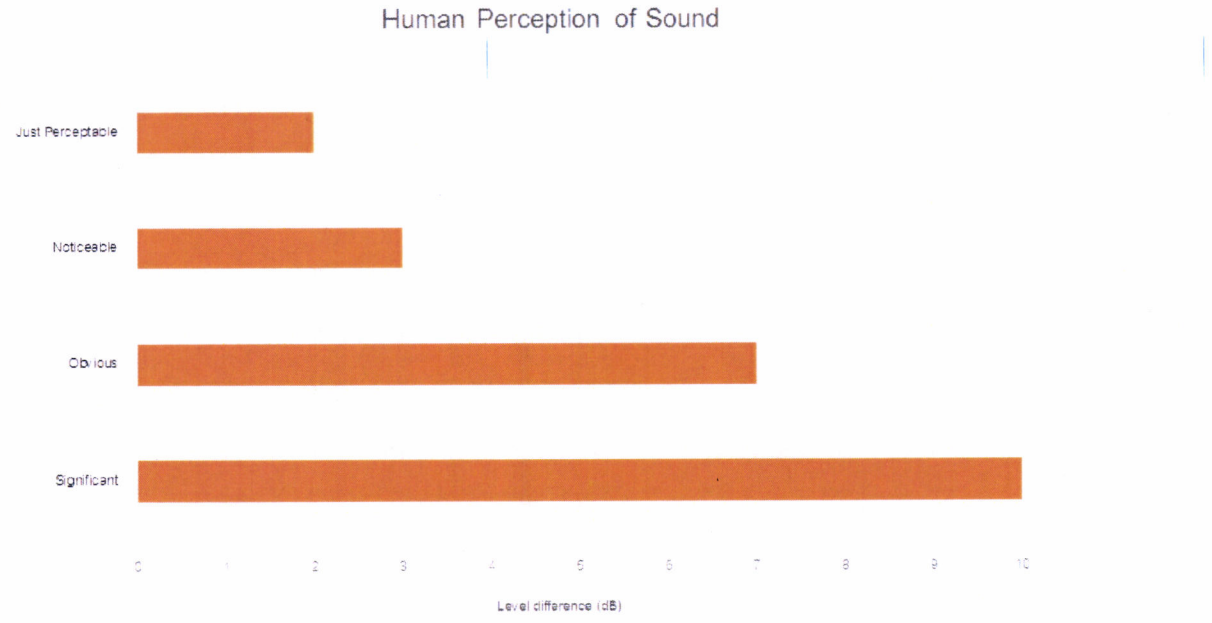
Term	Description
1/3 Octave	Single octave bands divided into three parts
Octave	A division of the frequency range into bands, the upper frequency limit of each band being twice the lower frequency limit.
ABL	Assessment Background Level (ABL) is defined in the NPI as a single figure background level for each assessment period (day, evening and night). It is the tenth percentile of the measured L90 statistical noise levels.
Ambient Noise	The noise associated with a given environment. Typically, a composite of sounds from many sources located both near and far where no particular sound is dominant.
A Weighting	A standard weighting of the audible frequencies designed to reflect the response of the human ear to noise.
dBA	Noise is measured in units called decibels (dB). There are several scales for describing noise, the most common being the 'A-weighted' scale. This attempts to closely approximate the frequency response of the human ear.
dB(Z), dB(L)	Decibels Linear or decibels Z-weighted.
Hertz (Hz)	The measure of frequency of sound wave oscillations per second - 1 oscillation per second equals 1 hertz.
LA10	A noise level which is exceeded 10 % of the time. It is approximately equivalent to the average of maximum noise levels.
LA90	Commonly referred to as the background noise, this is the level exceeded 90 % of the time.
LAeq	The summation of noise over a selected period of time. It is the energy average noise from a source, and is the equivalent continuous sound pressure level over a given period.
LAmax	The maximum root mean squared (rms) sound pressure level received at the microphone during a measuring interval.
RBL	The Rating Background Level (RBL) is an overall single figure background level representing each assessment period over the whole monitoring period. The RBL is used to determine the intrusiveness criteria for noise assessment purposes and is the median of the ABL's.
Sound power level (LW)	This is a measure of the total power radiated by a source. The sound power of a source is a fundamental location of the source and is independent of the surrounding environment. Or a measure of the energy emitted from a source as sound and is given by : = 10.log10 (W/Wo) Where: W is the sound power in watts and Wo is the sound reference power at 10-12 watts.

Table A2 provides a list of common noise sources and their typical sound level.

Table A2 Common Noise Sources and Their Typical Sound Pressure Levels (SPL), dBA

Source	Typical Sound Level
Threshold of pain	140
Jet engine	130
Hydraulic hammer	120
Chainsaw	110
Industrial workshop	100
Lawn-mower (operator position)	90
Heavy traffic (footpath)	80
Elevated speech	70
Typical conversation	60
Ambient suburban environment	40
Ambient rural environment	30
Bedroom (night with windows closed)	20
Threshold of hearing	0

Figure A1 – Human Perception of Sound



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P: +61 2 4920 1833
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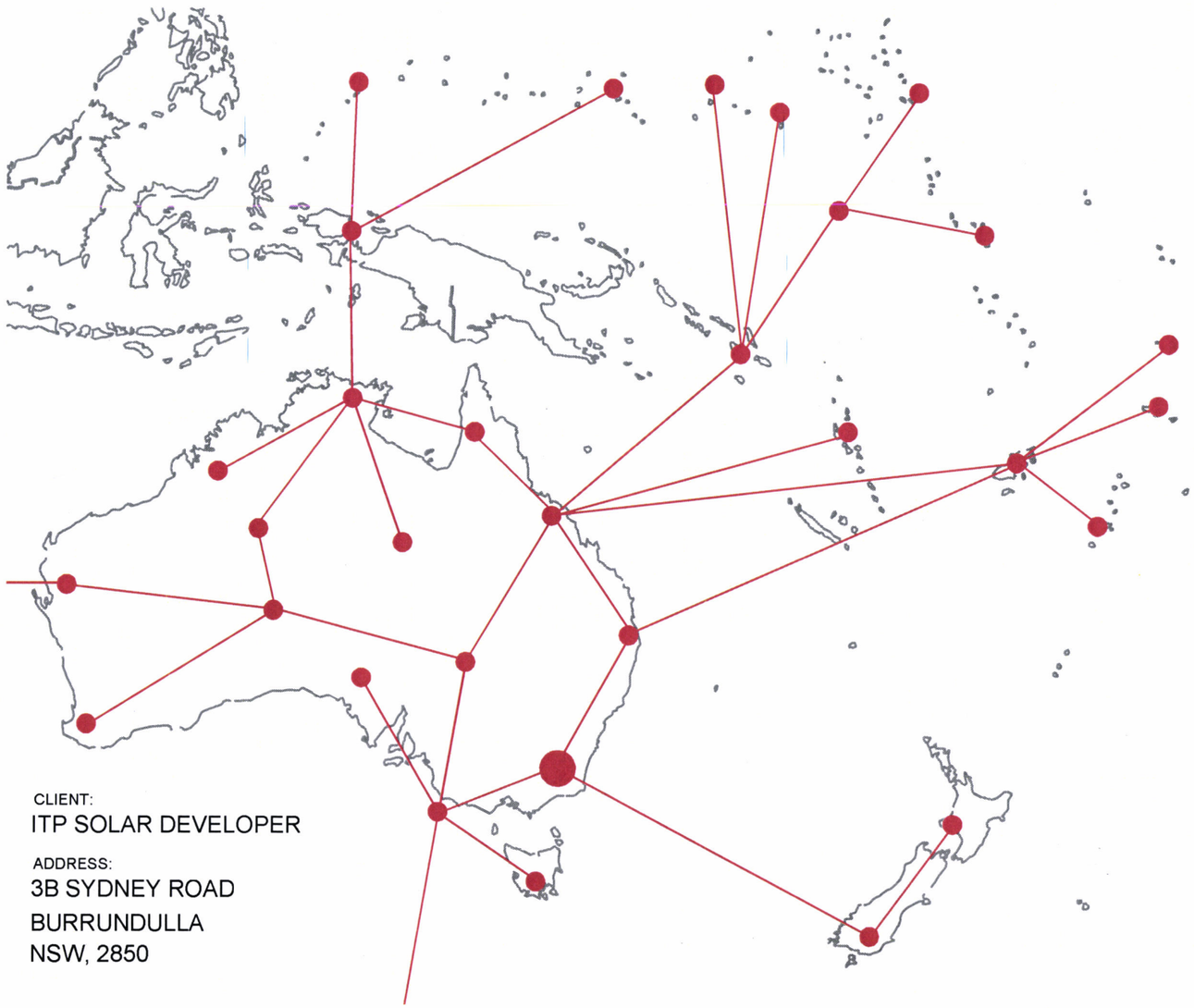
MAC
Muller Acoustic Consulting

BURRUNDULLA MINI SUSTAINABLE ENERGY PARK

MUD3C - **DEVELOPMENT APPLICATION**



CLIENT:
ITP SOLAR DEVELOPER

ADDRESS:
3B SYDNEY ROAD
BURRUNDULLA
NSW, 2850

SHEET LIST

SHEET NUMBER	SHEET NAME
G-010	TITLE SHEET
G-040	LOCATION PLAN
G-210	GENERAL ARRANGEMENT PLAN
C-130	SITE ELEVATION
C-430	TYPICAL INVERTER FOOTINGS DETAIL
C-530	TYPICAL FENCE DETAIL
C-630	TYPICAL ROAD DETAIL
E-341	TYPICAL NEXTRACKER ARRAY DETAIL
E-430	TYPICAL INVERTER STATION DETAIL

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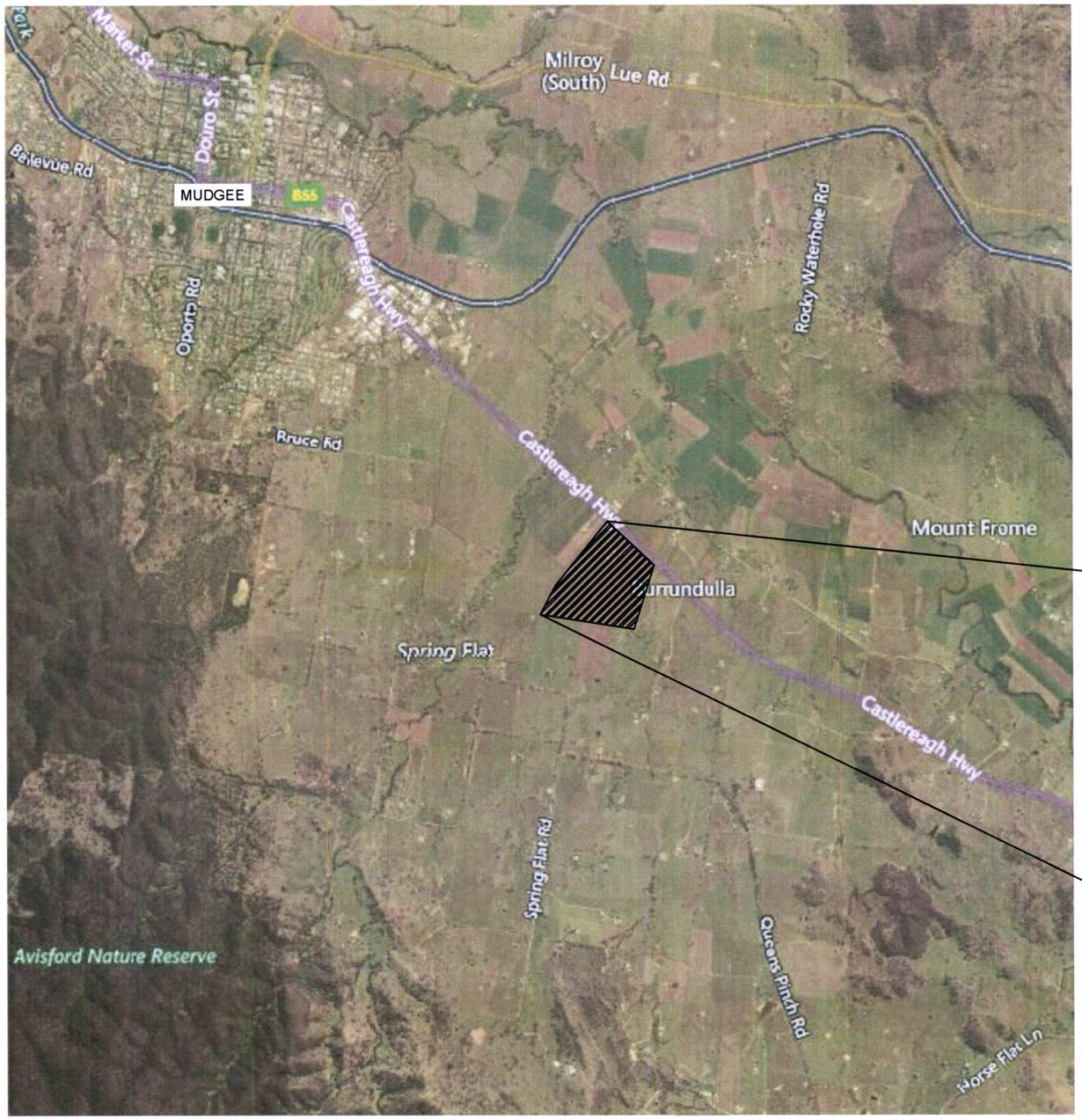
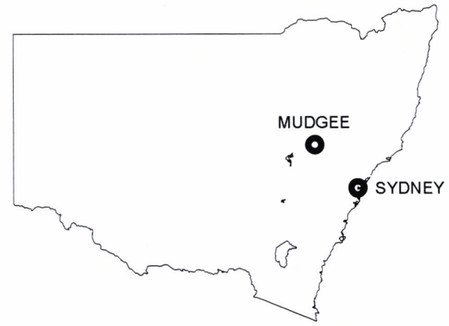
IT Power (Australia)



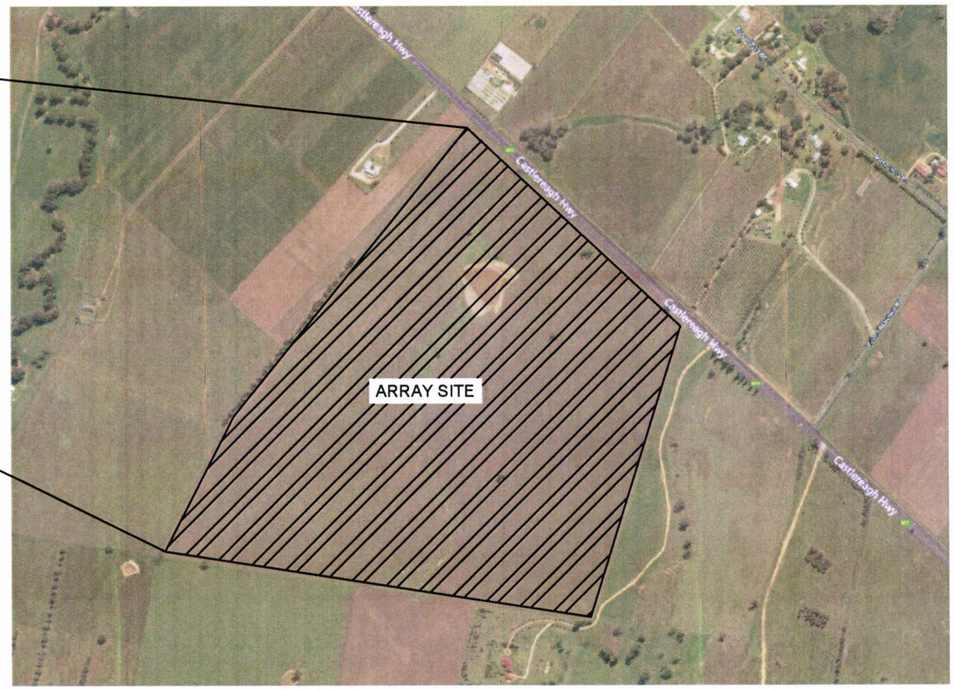
1 - LOCATION MAP

SCALE: 1:100,000



2 - NSW STATE MAP

SCALE: N.T.S.



3 - LOCATION PLAN

SCALE: 1:12,500

DEVELOPMENT APPLICATION

NO.	STAGE	DATE
1	---	---
2	---	---
3	---	---
4	---	---
5	---	---
6	---	---

NOTES

PARTNERS

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O'CONNOR, ACT 2602
AUSTRALIA

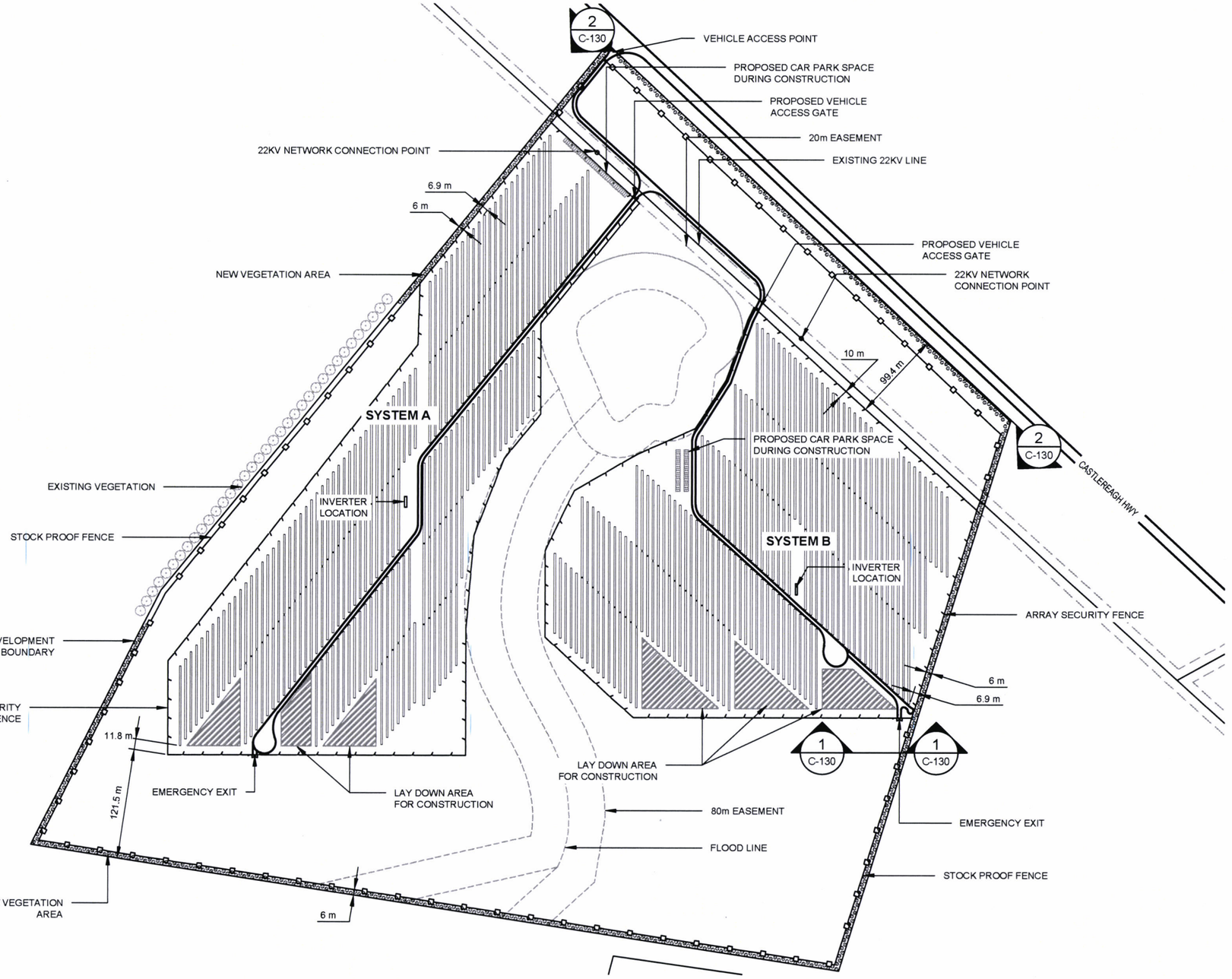
DRAWN	NAL
CHECKED	LF
APPROVED	KB

DO NOT SCALE.
ALL MEASUREMENTS IN MM UNLESS OTHERWISE STATED

DRAWING	**LOCATION PLAN**

PROJECT	BURRUNDULLA MINI SUSTAINABLE ENERGY PARK
CLIENT	ITP SOLAR DEVELOPER
ADDRESS	3B SYDNEY ROAD BURRUNDULLA, NSW, 2850
DRAWING NO.	**MUD3C-G-040**

SCALE	AS NOTED
SHEET SIZE	A3
ORIG. DATE	22/5/19
REV. DATE	13/6/19
REV NO.	1



SITE INFORMATION

LOT / DP	6 / 1069441
ADDRESS	3B SYDNEY ROAD, BURRUNDULLA, NSW, 2850
LGA	MID-WESTERN REGIONAL COUNCIL
LAT / LONG	-32.6337, 149.625628
ELEVATION	454 m
LOT AREA	63.8 ha
FENCED AREA	27 ha (A:12.7 ha, B: 14.2 ha)
DNSP	ESSENTIAL ENERGY

SYSTEM INFORMATION

DC CAPACITY	6.048 MW
AC CAPACITY	5.0 MW
DC/AC RATIO	1.21
INVERTERS	1 INVERTER STATION WITH 2 X 2.5 MW PER SYSTEM
MOUNTING	SINGLE AXIS TRACKER (1V)
MODULE CAPACITY	385 W - 72 CELL MONO (1500 V)
STRING CONFIGURATION	28 MODULES PER STRING
TRACKER	3 STRINGS, 88 m
NO. TRACKERS	187 TRACKERS
TRACKER SPACING (N-S)	1 m
ARRAY PITCH	6 m
SPECIFIC YIELD	2146 kWh/kWp/year
ANNUAL GENERATION	12.97 GWh
CONNECTION VOLTAGE	22 kV
CONNECTION FEEDER	ESSENTIAL ENERGY MUD62
CONNECTION SUBSTATION	ESSENTIAL ENERGY MUDGEE
SECURITY FENCE SETBACK	MIN. 6 m FROM DEVELOPMENT AREA BOUNDARY
ARRAY SETBACK	MIN. 7 m FROM SECURITY FENCE
ACCESS ROAD WIDTH	6 m

NOTE: SYSTEM INFORMATION IS THE SAME FOR SYSTEM A AND SYSTEM B.

1 / - GENERAL ARRANGEMENT PLAN

SCALE: 1:5000

DEVELOPMENT APPLICATION

NO.	STAGE	DATE
1	---	--
2	---	---
3	---	---
4	---	---
5	---	---
6	---	---

NOTES

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DRAWN: WJ, NAL
CHECKED: LF
APPROVED: KB

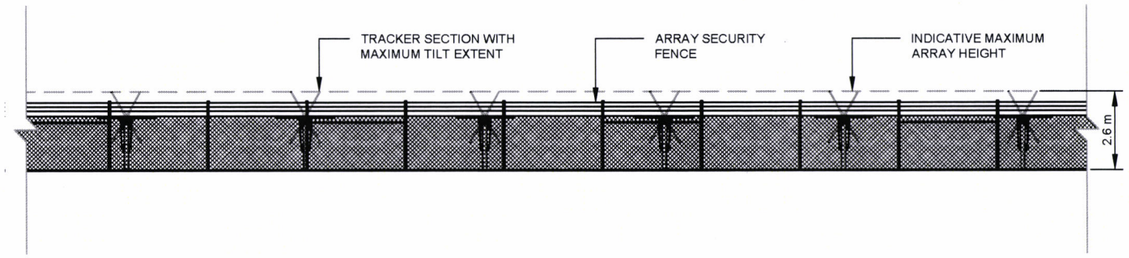
DO NOT SCALE.
ALL MEASUREMENTS IN MM UNLESS OTHERWISE STATED.

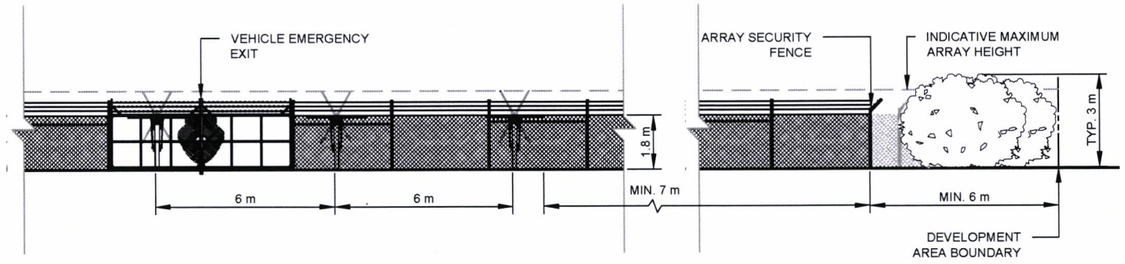
DRAWING: **GENERAL ARRANGEMENT**

PROJECT: BURRUNDULLA MINI SUSTAINABLE ENERGY PARK
CLIENT: ITP SOLAR DEVELOPER
ADDRESS: 3B SYDNEY ROAD BURRUNDULLA, NSW, 2850

SCALE: AS NOTED
SHEET SIZE: A3
ORIG. DATE: 17/5/19
REV. DATE: 13/6/19

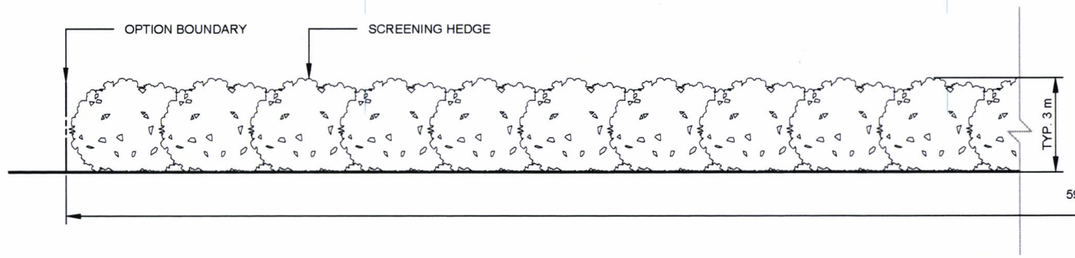
DRAWING NO: **MUD3C-G-210**
REV NO: **3**

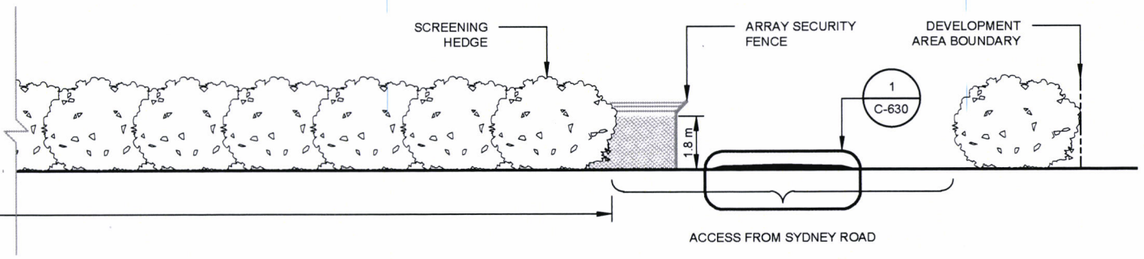




1 / C-130 SITE ELEVATION - INSIDE SOUTH BOUNDARY

SCALE: 1:200





2 / C-130 SITE ELEVATION - SYDNEY ROAD FRONTAGE

SCALE: 1:200

DEVELOPMENT APPLICATION

NO.	STAGE	DATE
1	----	----
2	----	----
3	----	----
4	----	----
5	----	----
6	----	----

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DRAWN NAL
CHECKED LF
APPROVED KB

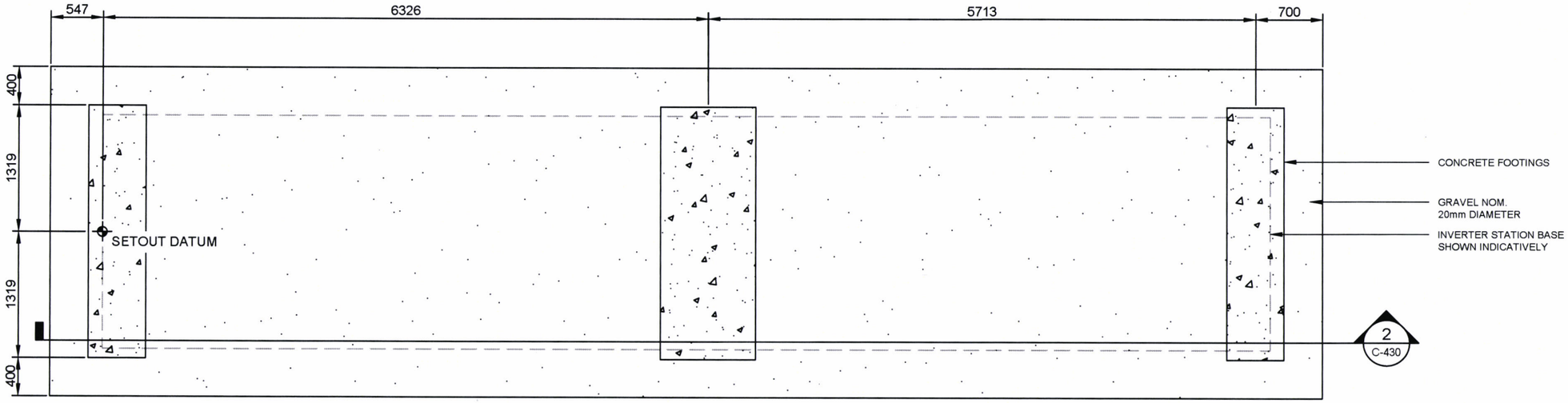
DO NOT SCALE.
ALL MEASUREMENTS IN MM UNLESS OTHERWISE STATED.

DRAWING: SITE ELEVATION

PROJECT: BURRUNDULLA MINI SUSTAINABLE ENERGY PARK
CLIENT: ITP SOLAR DEVELOPER
ADDRESS: 3B SYDNEY ROAD BURRUNDULLA, NSW, 2850

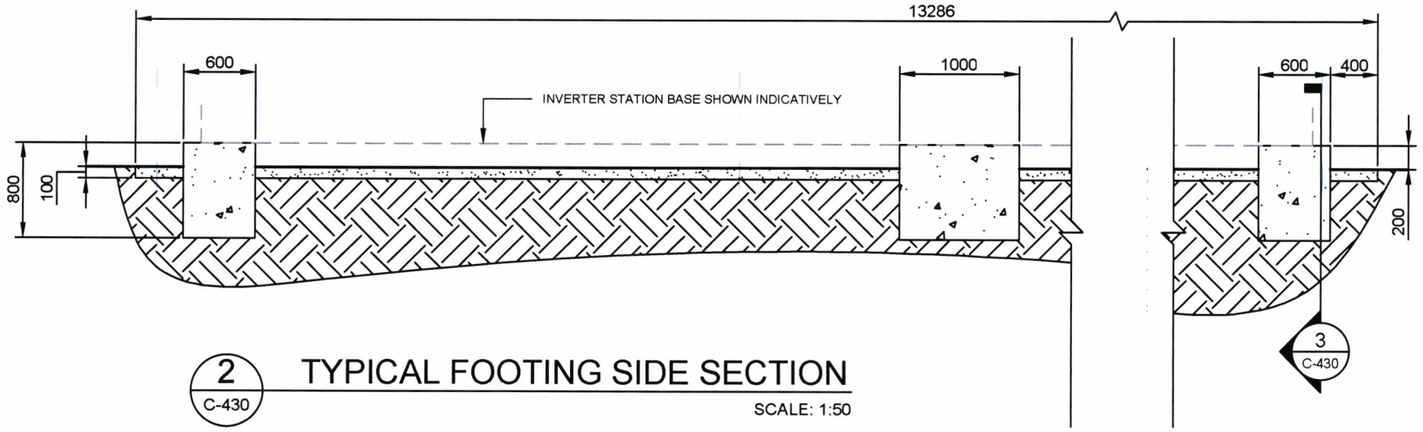
DRAWING NO: MUD3C-C-130

SCALE: AS NOTED
SHEET SIZE: A3
ORIG. DATE: 23/5/19
REV. DATE: 13/6/19
REV NO: 1.2



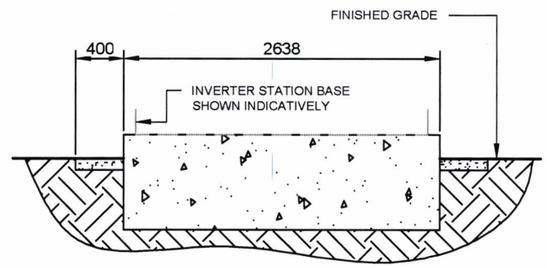
1 C-430 **TYPICAL FOOTING PLAN**

SCALE: 1:50



2 C-430 **TYPICAL FOOTING SIDE SECTION**

SCALE: 1:50



3 C-430 **TYPICAL FOOTING END SECTION**

SCALE: 1:50

DEVELOPMENT APPLICATION

NO.	STAGE	DATE
1	---	---
2	---	---
3	---	---
4	---	---
5	---	---
6	---	---

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CHECKED LF
APPROVED LF

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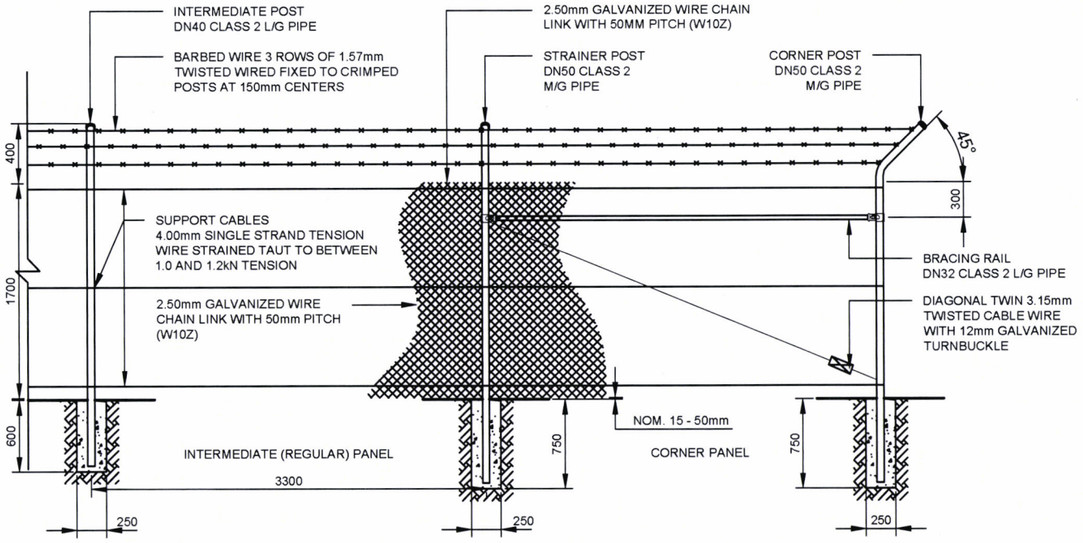
DRAWING **TYPICAL INVERTER FOOTINGS DETAIL**

PROJECT BURRUNDULLA MINI SUSTAINABLE ENERGY PARK
CLIENT ITP SOLAR DEVELOPER
ADDRESS 3B SYDNEY ROAD
BURRUNDULLA, NSW, 2850

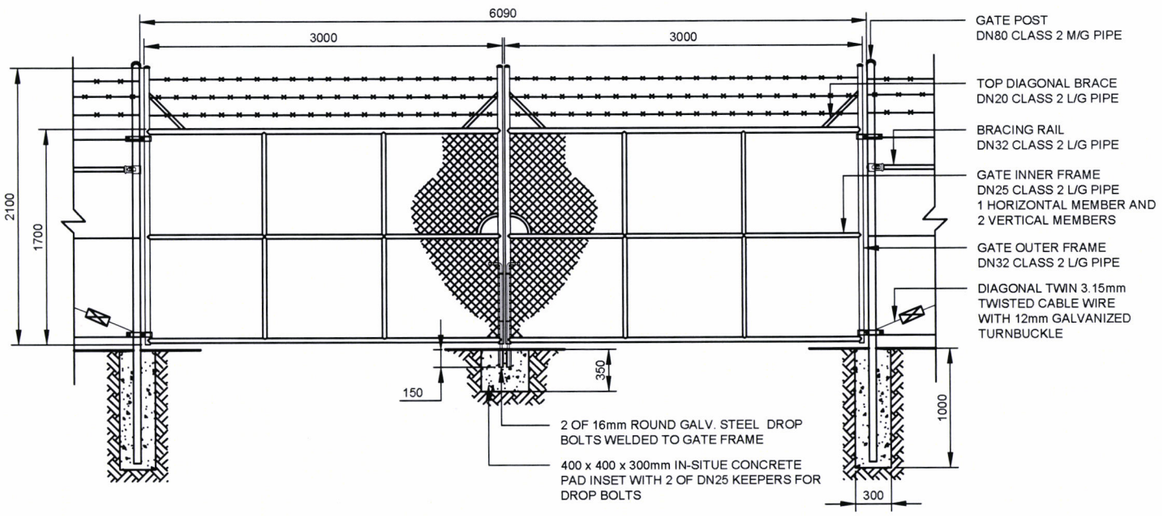
DRAWING NO. **MUD3C-C-430**

SCALE AS NOTED
SHEET SIZE A3
ORIG. DATE 22/5/19
REV. DATE 12/6/19
REV NO. 1



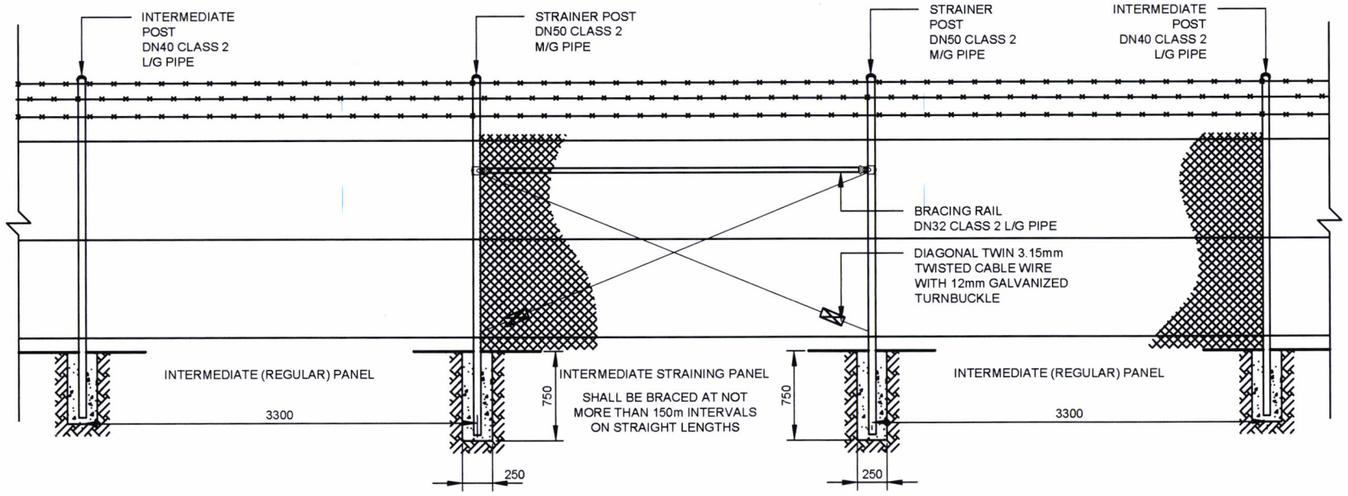
1 - TYPICAL FENCE SECTION

SCALE: 1:50



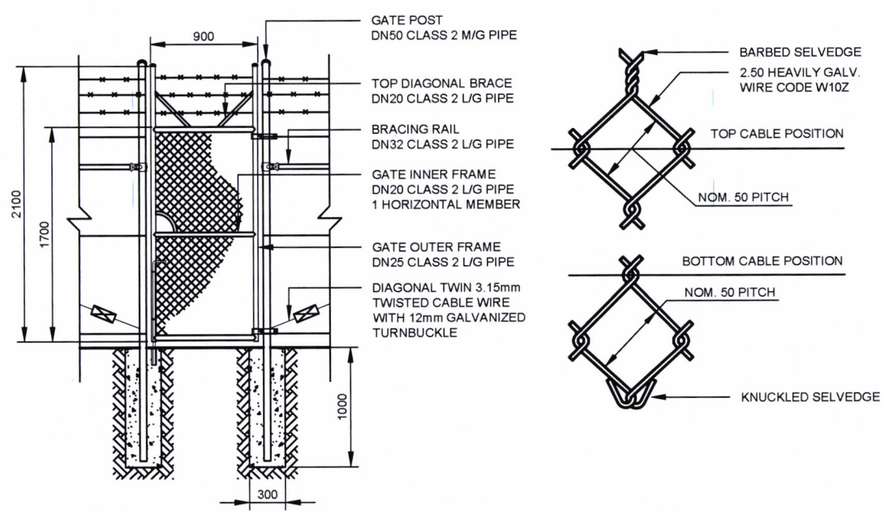
3 - DOUBLE LEAF 6 METER GATE SECTION

SCALE: 1:50



2 - INTERMEDIATE STRAINING PANEL FENCE SECTION

SCALE: 1:50



4 - SINGLE LEAF GATE SECTION

SCALE: 1:50

DEVELOPMENT APPLICATION

NO	STAGE	DATE
1	----	----
2	----	----
3	----	----
4	----	----
5	----	----
6	----	----

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DRAWN	NAL
CHECKED	LF
APPROVED	LF

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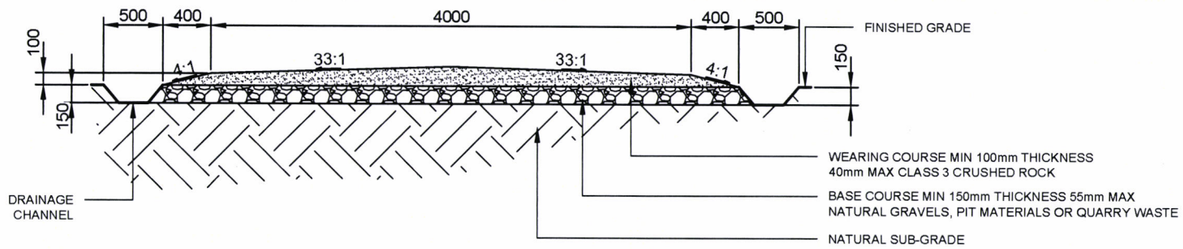
DRAWING	**TYPICAL FENCING DETAIL**

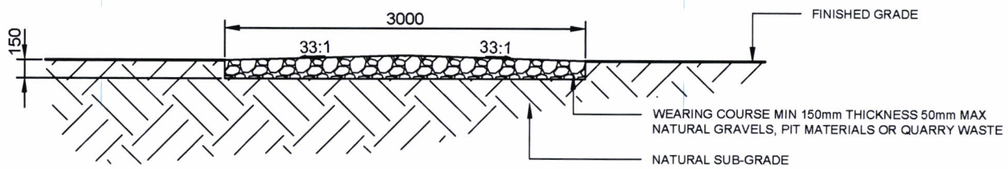
PROJECT	BURRUNDULLA MINI SUSTAINABLE ENERGY PARK
CLIENT	ITP SOLAR DEVELOPER
ADDRESS	3B SYDNEY ROAD BURRUNDULLA, NSW, 2850
DRAWING NO.	**MUD3C-C-530**

SCALE	AS NOTED
SHEET SIZE	A3
ORIG. DATE	22/5/19
REV. DATE	28/5/19
REV NO.	1



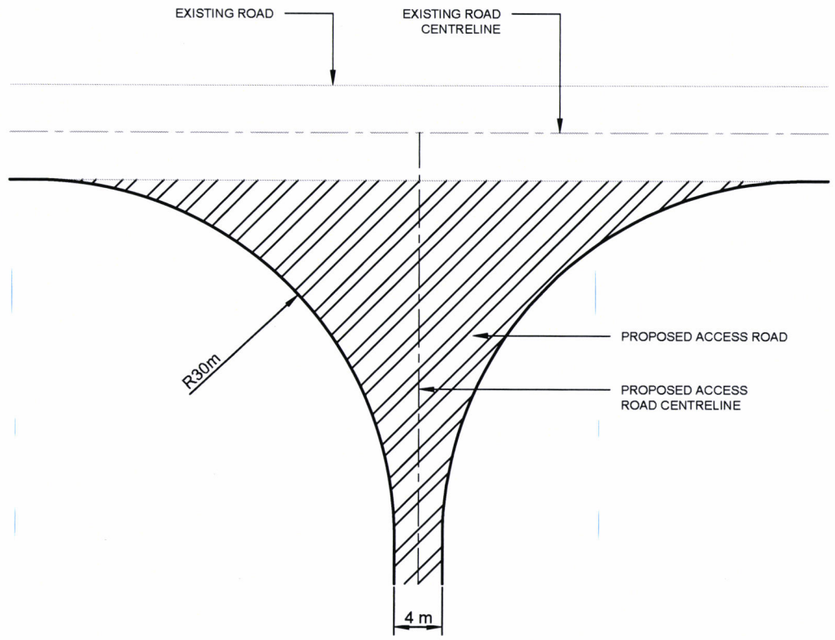
1 - CROSS SECTION - PRIMARY ROAD

SCALE: 1:50



2 - CROSS SECTION - SECONDARY ROAD

SCALE: 1:50



3 - TYPICAL TURNING DETAIL PLAN

SCALE: 1:500

DEVELOPMENT APPLICATION

NO.	STAGE	DATE
1	----	----
2	----	----
3	----	----
4	----	----
5	----	----
6	----	----

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DRAWN: NAL
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APPROVED: LF

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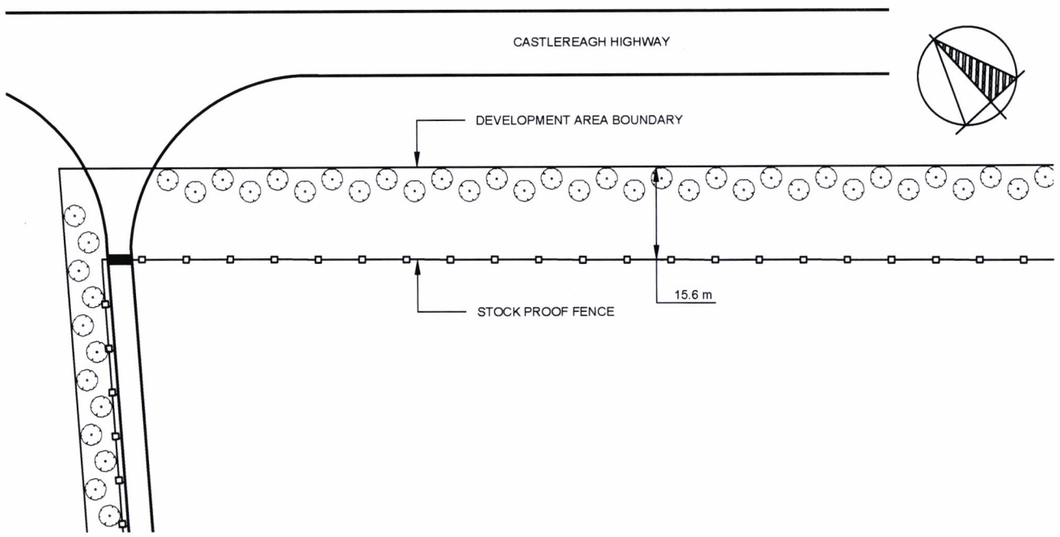
DRAWING: **TYPICAL ROAD DETAIL**

PROJECT: BURRUNDULLA MINI SUSTAINABLE ENERGY PARK
CLIENT: ITP SOLAR DEVELOPER
ADDRESS: 3B SYDNEY ROAD
BURRUNDULLA, NSW, 2850

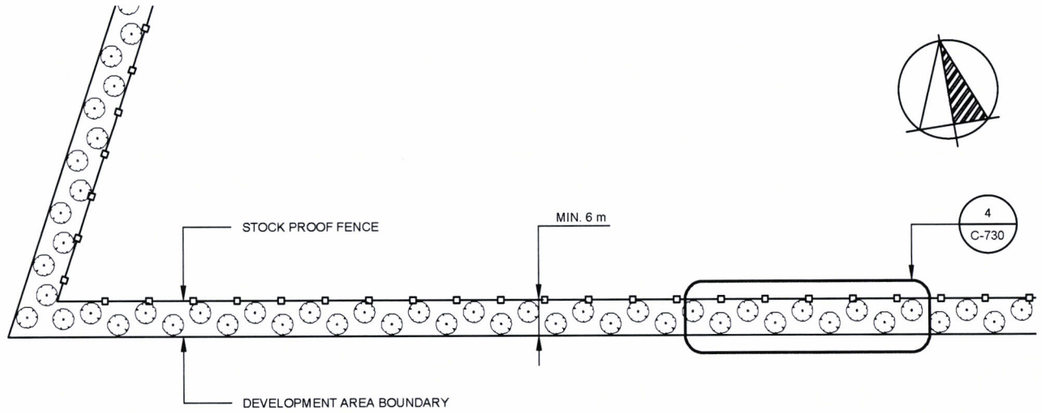
SCALE: AS NOTED
SHEET SIZE: A3
ORIG. DATE: 22/5/19
REV. DATE: 12/6/19

DRAWING NO: **MUD3C-C-630**
REV NO: **1**



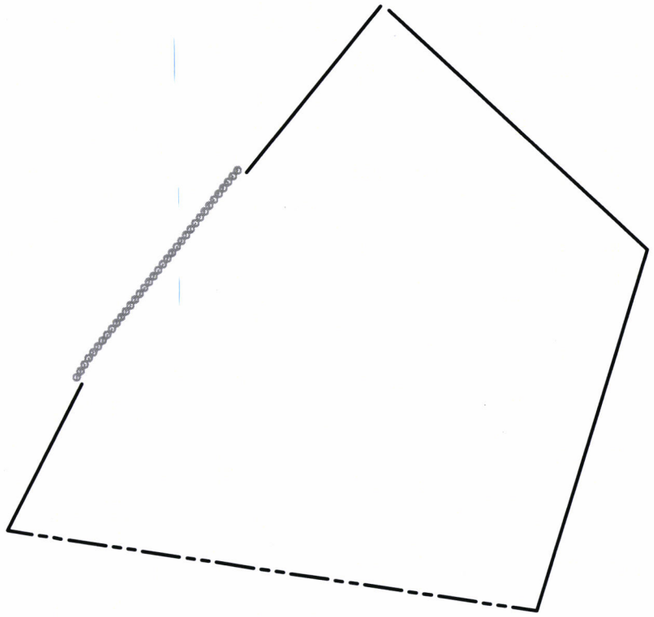
1 C-730 PARTIAL LANDSCAPE PLAN - NORTH BOUNDARY

SCALE: 1:1000



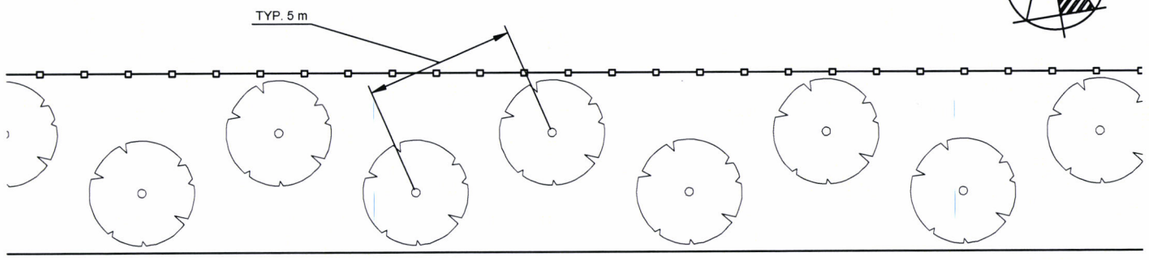
3 C-730 PARTIAL LANDSCAPE PLAN - SOUTH BOUNDARY

SCALE: 1:1000



2 C-730 KEY PLAN

SCALE: 1:10,000



PLANTING SCHEDULE

KEY PLAN SYMBOL	INDICATIVE VEGETATION TYPE	PLANT SPACING	MAX. HEIGHT	NO. PLANTS
	EXISTING	-	-	-
	ACACIA AND GREVILLEAS	5 m	3 m	405
	YELLOW BOX AND WHITE BOX EUCALYPTS	5 m	15 m	195

4 C-730 LANDSCAPE DETAIL

SCALE: 1:200

DEVELOPMENT APPLICATION

NO.	STAGE	DATE
1	---	---
2	---	---
3	---	---
4	---	---
5	---	---
6	---	---

NOTES

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DRAWN NAL
CHECKED LF
APPROVED KB

DO NOT SCALE.
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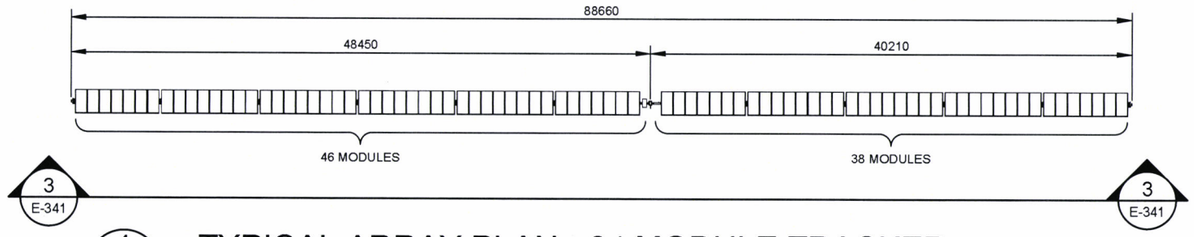
DRAWING **LANDSCAPE PLAN**

PROJECT BURRUNDULLA MINI SUSTAINABLE ENERGY PARK
CLIENT ITP SOLAR DEVELOPER
ADDRESS 3B SYDNEY ROAD BURRUNDULLA, NSW, 2850

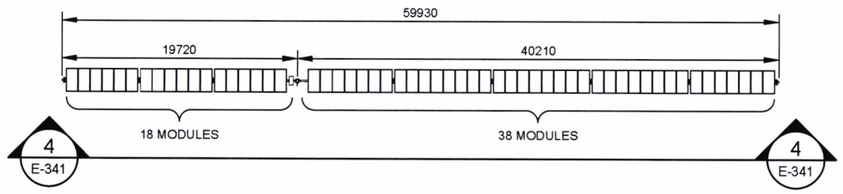
DRAWING NO. **MUD3C-C-730**

SCALE AS NOTED
SHEET SIZE A3
ORIG. DATE 12/6/19
REV. DATE 13/6/19
REV NO. 1



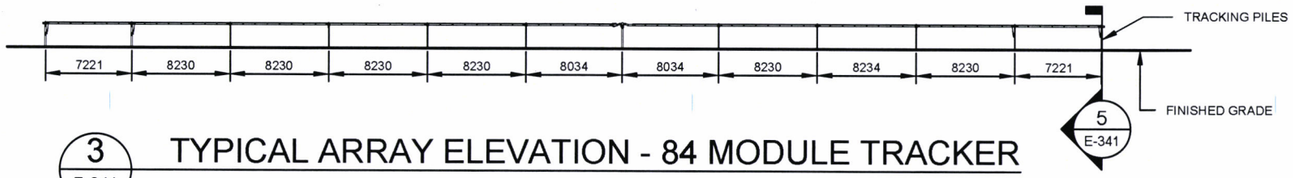
1 E-341 TYPICAL ARRAY PLAN - 84 MODULE TRACKER

SCALE: 1:500



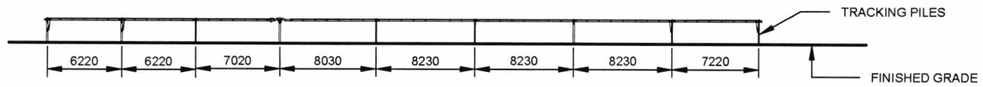
2 E-341 TYPICAL ARRAY PLAN - 56 MODULE TRACKER

SCALE: 1:500



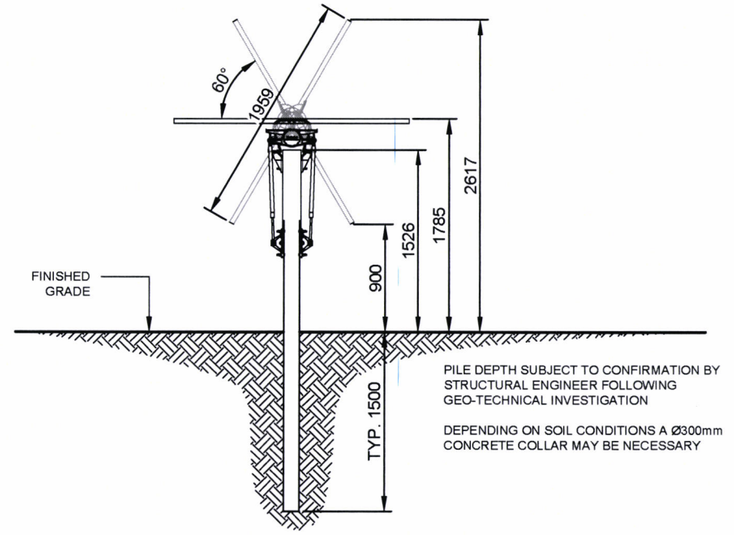
3 E-341 TYPICAL ARRAY ELEVATION - 84 MODULE TRACKER

SCALE: 1:500



4 E-341 TYPICAL ARRAY ELEVATION - 56 MODULE TRACKER

SCALE: 1:500



5 E-341 TYPICAL ARRAY SECTION

SCALE: 1:50

DEVELOPMENT APPLICATION

NO.	STAGE	DATE
1	----	----
2	----	----
3	----	----
4	----	----
5	----	----
6	----	----

NOTES:

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DRAWN: NAL
CHECKED: LF
APPROVED: LF

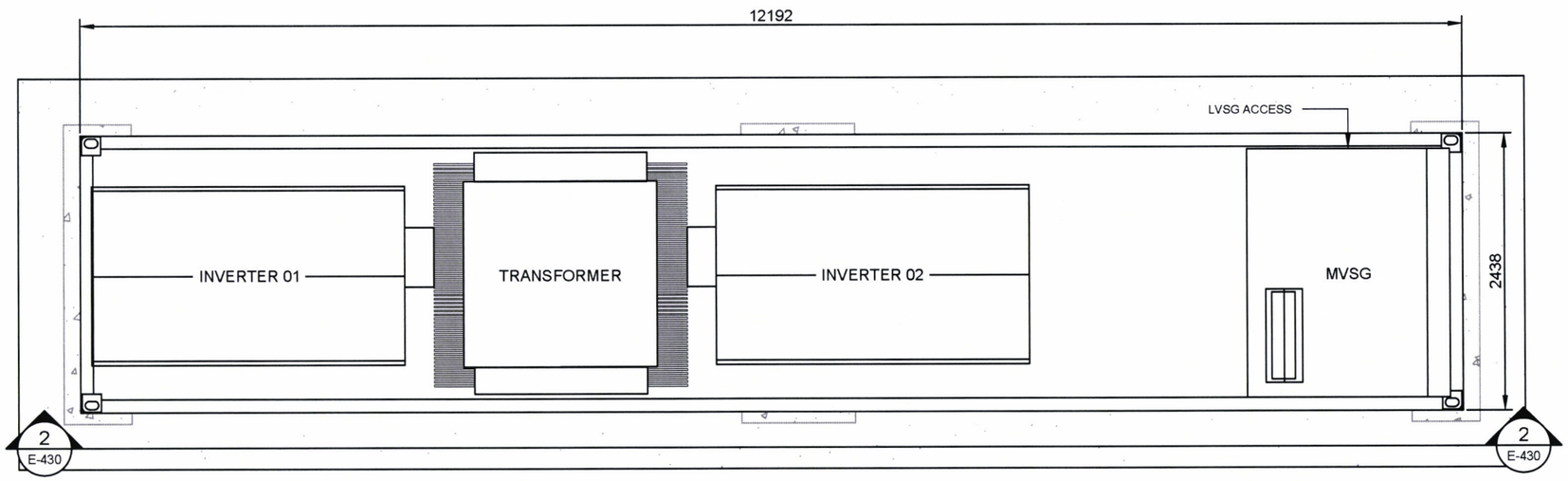
DO NOT SCALE.
ALL MEASUREMENTS IN MM UNLESS OTHERWISE STATED

DRAWING: **TYPICAL NEXTRACKER ARRAY DETAIL**

PROJECT: BURRUNDULLA MINI SUSTAINABLE ENERGY PARK
CLIENT: ITP SOLAR DEVELOPER
ADDRESS: 3B SYDNEY ROAD BURRUNDULLA, NSW, 2850

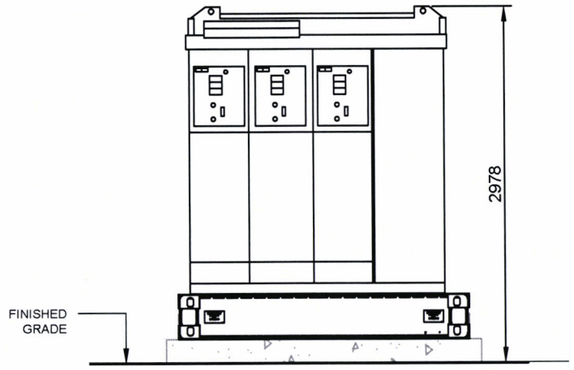
DRAWING NO.: **MUD3C-E-341**

SCALE: AS NOTED
SHEET SIZE: A3
ORIG. DATE: 22/5/19
REV. DATE: 31/5/19
REV NO.: 1



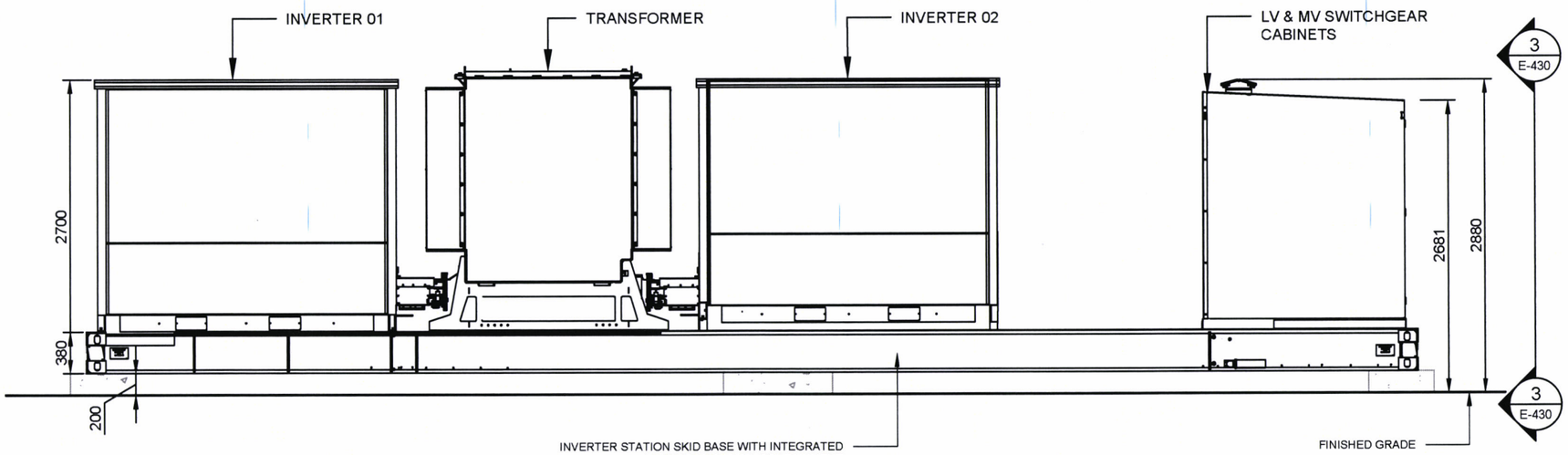
1 E-430 **PLAN VIEW**

SCALE: 1:50



3 E-430 **END ELEVATION**

SCALE: 1:50



2 E-430 **SIDE ELEVATION**

SCALE: 1:50

DEVELOPMENT APPLICATION

NO.	STAGE	DATE
1	----	----
2	----	----
3	----	----
4	----	----
5	----	----
6	----	----

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DRAWN NAL
CHECKED LF
APPROVED LF

DO NOT SCALE.
ALL MEASUREMENTS IN MM UNLESS OTHERWISE STATED.

DRAWING **TYPICAL INVERTER STATION DETAIL**

PROJECT BURRUNDULLA MINI SUSTAINABLE ENERGY PARK
CLIENT ITP SOLAR DEVELOPER
ADDRESS 3B SYDNEY ROAD
BURRUNDULLA, NSW, 2850

DRAWING NO **MUD3C-E-430**

SCALE	AS NOTED
SHEET SIZE	A3
ORIG. DATE	22/5/19
REV. DATE	13/6/19
REV NO.	1