Maryvale Solar Farm
Environmental Impact Statement

transport | community | environment | industrial | food & beverage | energy



Prepared for: Maryvale Solar Farm Pty Ltd

Client representative: Robert Ibrahim

Date: 12 November 2018
Rev02

pitt&sherry

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Revision History					
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01	Final Draft	D. Carberry	J. Berry	J. Berry	31/10/18
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Terms and acronyms used in the REF

Term / Acronym	Description
ABS	Australian Bureau of Statistics
AC	Alternating current
AHIMS	Aboriginal Heritage Information Management System
AHIP	Aboriginal heritage impact permit
APZ	Asset Protection Zone
AS	Australian Standard
ASS	Acid Sulphate Soils
AEMO	Australian Energy Market Operator
BCA	*Biodiversity Conservation Act* 2016, replaces the Threatened Species Conservation Act 1995 (TSC Act) as the key piece of legislation that identifies and protects threatened species, populations and ecological communities in NSW.
BDAR	Biodiversity development assessment report
BIA	Bushfire Impact Assessment
BoM	Bureau of Meteorology
BSAL	Biophysical strategic agricultural land
CECC	Critically Endangered Ecological Community
CEMP	Construction Environmental Management Plan
CNVG	Construction Noise and Vibration Guideline
CSEP	Community and Stakeholder Engagement Plan
DA	Development Application
DC	Direct current
DECC	Department of Environment and Climate Change
DoEE	Department of Environment and Energy
DP	Deposit plan
DP&E	Department of Planning and Environment
DPI	Department of Primary Industries
DEC	Department of Environment and Conservation
EC	Electrical Conductivity
EEC	Endangered Ecological Community
EIA	Environmental impact assessment
EIS	Environmental impact statement
ELF	Extremely Low Frequency
EMF	Electromagnetic field
EPA	Environment Protection Authority
EP&A Act	*Environmental Planning and Assessment Act 1979* (NSW). Provides the legislative framework for land use planning and development assessment in NSW
EP&A Regulations	*Environmental Planning and Assessment Regulation 2000.*
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999* (Commonwealth). Provides for the protection of the environment, especially matters of national environmental significance, and provides a national assessment and approvals process.
EPL	Environmental Protection Licence
ERP	Emergency Response Plan
ERSED	Erosion and Sediment

Term / Acronym	Description
ESD	Ecologically sustainable development. Development which uses, conserves and enhances the resources of the community so that ecological processes on which life depends, are maintained and the total quality of life, now and in the future, can be increased
EWP	Elevated Work Platforms
FM Act	*Fisheries Management Act* 1994
GDE	Groundwater Dependent Ecosystem'
GFDI	Grass fire danger index
GHG	Greenhouse gas
ICNIRP	International Commission on Non-Ionizing Radiation Protection
ICNG	Interim Construction Noise Guideline
IER	Index of Economic Resources
IEO	Index of Education and Occupation
INP	Industrial Noise Policy
IRSD	Index of Relative Socio-Economic Disadvantage
IRSAD	Index of Relative Socio-Economic Advantage and Disadvantage
ISEPP	State Environmental Planning Policy (Infrastructure) 2007
kV	Kilo-volts
LALC	Local Aboriginal Land Council
LEP	Local Environmental Plan. A type of planning instrument made under Part 3 of the EP&A Act.
LGA	Local Government Area
LGC	Large-scale generation certificates
LLS	Local Land Services
LRET	Large-scale Renewable Energy Target
LUCRA	Land use conflict risk assessment
MAC	Muller Acoustic Consulting
MNES	Matters of national environmental significance under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*.
MSF	Maryvale Solar Farm Pty Ltd This project will be co-owned by: • Canadian Solar Energy Holdings Singapore 4 Pte. Ltd.: 51% • Photon Energy NV: 24.99% • Polpo Investments Limited: 24.01%
MW	Megawatt
MWh	Megawatt hours
MWp	Megawatt peak
NCG	Noise Criteria Guideline
NEM	National Electricity Market
NEG	National Energy Guarantee
NML	Noise management level
NPI	Noise Policy for Industry
NPW Act	*National Parks and Wildlife Act 1974* (NSW)
OEH	Office of Environment and Heritage (formerly DECCW)
OEMP	Operational Environmental Management Plan
OOH	Out of Hours
OPGW	Optical Ground Wire
PASS	Potential Acid Sulphate Soils
PCT	Plant Community Types

Term / Acronym	Description
PEA	Preliminary Environmental Assessment
Photon Energy	Photon Energy NV
PNTL	Project Noise Trigger Levels
POEO Act	*Protection of the Environment Operations Act* 1997
The "Proposal"	Develop and operate a 125 megawatt (MW) AC solar photovoltaic (PV) facility including ancillary works and associated infrastructure at 121 Maryvale Road, Maryvale and 801 Cobbora Road, Maryvale NSW 2820.
PV	Photovoltaic
REAP	Renewable Energy Action Plan
REC	Renewable energy certificates
RET	Renewable Energy Target
RFS	Rural Fire Service
RNP	Road Noise Policy
Roads and Maritime	NSW Roads and Maritime Services
RRR	Residual risk rating
SEARS	Secretary's Environmental Assessment Requirements
SEIFA	Socio-Economic Indices for Areas
SEPP	State Environmental Planning Policy. A type of planning instrument made under Part 3 of the EP&A Act.
SSD	State significant development
SRD	State and Regional Development
SSDA	State Significant Development Application
Subject Land	Part of Lot 2 DP 573426, Lot 1 DP 1095725, Lot 2 DP 1095725, Lot 1 DP 1006557, part of Lot 182 and Lot 122 DP754318.
SWMP	Soil and Water Management Plan
TMP	Traffic Management Plan
VIA	Visual Impact Assessment
WARR Act	Waste Avoidance and Resource Recovery Act
WM Act	*Water Management Act 2000*
WMP	Waste Management Plan

Statement of Authorship

Submission of Environmental Impact Statement (EIS)

Part 4, Division 4.1 of Environmental Planning and Assessment Act 1979

EIS prepared by:

Name:	David Carberry Principal Environment and Infrastructure
Qualifications:	B App Sci (Hons), CEnvP (Impact Assessment), FEIANZ
Company:	Pitt & Sherry (Operations) Pty Ltd
Address:	Suite 902, Level 9, 1-5 Railway Street Chatswood NSW 2067

Development Application:

Proponent Name:	Maryvale Solar Farm Pty Ltd
Proponent Address:	204/55 Grafton Street Bondi Junction NSW 2022 Australia
Land to be Developed:	Lot 2 DP 573426, Lot 1 DP 1095725, Lot 2 DP 1095725, Lot 1 DP 1006557, Lot 182 and Lot 122 DP754318 Maryvale NSW, 2820 Dubbo Regional Council Local Government Area
Development Description:	Maryvale Solar Farm

Declaration:

I declare that:

1. The statement has been prepared in accordance with Schedule 2 of the *Environmental Planning and Assessment Regulation 2000*.
2. The statement contains all available information that is relevant to the environmental assessment of the development, activity or infrastructure to which the statement relates.
3. That the information contained in this statement is neither false or misleading.

Name: Pitt & Sherry (Operations) Pty Ltd

Signature:

Date: 31st October 2018

Executive Summary

This Environmental Impact Statement (EIS) has been prepared by pitt&sherry on behalf of Maryvale Solar Farm Pty Ltd (MSF) to identify and assess the environmental issues associated with the construction, operation, and decommissioning of an up 125-megawatt (MW) (AC) (approximately 160MW DC) photovoltaic (PV) solar farm located approximately 15 km north-east of the Wellington town centre (the 'Proposal').

The EIS has been prepared in accordance with Part 4 of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act) to support a Development Application (DA) for the Proposal. This EIS has been prepared pursuant to the Secretary's Environmental Assessment Requirements (SEARs) for the Proposal issued by the Department of Planning and Environment (DP&E) on 13 October 2017. A copy of the SEARs is included in **Appendix A** and a summary of where these have been addressed in the EIS is included in **Appendix B**.

The Proposal will be located at 121 Maryvale Road, Maryvale and 801 Cobbora Road, Maryvale within part of Lot 2 DP 573426, Lot 1 DP 1095725, Lot 2 DP 1095725, Lot 1 DP 1006557, part of Lot 182 and Lot 122 DP754318 (the "Subject Land"). The Site is zoned Primary Production (RU1) under the Wellington LEP 2012. The Site also includes Bakers Lane which is currently a gazetted Council road. An application for the closure and land disposal of Bakers Lane has been submitted to Dubbo Regional Council and Council are currently undertaking the road closure process. It is anticipated this process will be completed prior to construction of the Proposal and as such would form part of the Site.

The solar farm will cover an area of 375 hectares and is estimated to consist of up to 450,000 PV panels installed on a single axis tracking system which will follow the movement of the sun through the course of the day. The PV panels will be fixed on mounting structures which would extend approximately 2m below ground (potentially ranging from 1.6m to 4m depending on geotechnical conditions). The maximum height of panels during tracking movement is up to 4m.

In addition to the solar PV panels the Proposal will also include the construction of new access roads into the site from Seatonville Road (one to the construction and operation compound and another to the electrical substation), installation of electrical infrastructure and other ancillary works including the on-site substation, inverter stations, connection to overhead transmissions lines, fencing and landscaping works. The project will also include upgrades to:

- The intersection of Seatonville Road and Maryvale Road
- Sections of Maryvale Road and
- The intersection of Maryvale Road and Cobbora Road.

The Site and surrounding land is cleared agricultural land which is currently and has historically been used for grazing of livestock and cropping. It is low lying and gently undulating, has been subject to substantial disturbance and vegetation communities and fauna habitat are limited. One Threatened Ecological Community exists on the site and surrounds. This community has been reduced by clearing for agriculture to a 3.1 ha remnant of Yellow Box Woodland that would not be disturbed, 0.8 ha of derived native grassland and 109 scattered paddock trees (including 2 stags) that will be impacted by the project. There are several rural residential receivers located to the immediate north and east of the Site.

The proposed project is within the Macquarie – Bogan catchment within the Murray-Darling Basin. The closest major water course is the Macquarie River which is located approximately 3.5km to the south of the Site. The topography of the project area is generally flat with some gently undulating lower slopes intersected by shallow drainage depressions. The flowlines which drain the area run predominantly from the north to the south. In the northern section of the Site, two unnamed flowlines drain to the west where they intersect Maryvale Creek on the adjoining land. Bodangora Creek originates to the east of the subject land and flows though the south- eastern corner of the Site. Bodangora and Maryvale Creeks both flow away from

the Site to the south west where they form tributaries of the Macquarie River. The flowlines and creeks in this area are ephemeral in nature. Flow is very much dependant on rainfall and overland catchment of runoff water. The water courses can be reduced to small water holes in the drier months.

The key benefit of the Proposal is the production of renewable electricity reducing greenhouse gas emissions and reliance on fossil fuels. The Proposal will contribute to renewable energy generation targets in NSW and nationally, as well as contributing to various international agreements which Australia is a signatory, such as the United Nations Framework Convention on Climate Change and the Paris Agreement. Demand for electricity is increasing and reliable energy supplies are often limited by inadequate energy supply infrastructure. Solar Farms are scalable and can be installed regionally, making this type of infrastructure suitable for assisting in managing the predicted uncertain energy climate and provide added security to the energy supply sector.

The Proposal will also provide socio-economic benefits by generating up to 150 construction jobs during peak construction periods and will support six to ten operational jobs during the 25 year life of the solar farm. It will encourage regional development through expenditure by personnel in the Wellington region during construction.

This EIS describes the key environmental risks related to the Proposal and provides a comprehensive assessment of these risks. The key potential environmental impacts have been identified through assessment of the Proposal scope, review of the SEARs issued by the DP&E and consultation with relevant stakeholders and the community.

An environmental risk assessment was undertaken as part of this EIS which identified key environmental risks of the Proposal these being:

- Biodiversity
- Traffic and Transport
- Aboriginal Heritage
- Visual amenity
- Soils and
- Bush Fire.

A number of features of the Proposal help to mitigate key environmental risks including:

Suitability of the Site

- The land is largely cleared of native vegetation
- There are few elevated viewpoints on the Site
- There are no major watercourses on the Site and
- The Site does not possess suitable habitat for any threatened species.

Implementing buffers including

- A 1km buffer from the nearest residence
- A 20m buffer around areas of retained vegetation
- An asset protection zone (APZ) of 15 m around the entire perimeter of the solar farm footprint and 20 m around the substation and
- 40m buffer between infrastructure and waterway 2 (See Figure 6-22) on site.

Preparation and implementation of appropriate management plans including:

- A Construction Environmental Management Plan (CEMP)
- An Operations Environmental Management Plan (OEMP).

The Proposal footprint has also been adapted within the Subject Land to avoid or minimise the potential environmental impacts.

Key environmental risks are summarised below:

Biodiversity
A biodiversity assessment was undertaken by flora and fauna specialists to assess the impacts of the development on biodiversity. Surveys of the site concluded that no threatened ecological communities, populations, flora or fauna species meet the criteria for Serious and Irreversible Impacts as a result of the Project. The Site has largely been cleared previously however the project will require the clearing of isolated paddock trees, none of these are representative of any threatened ecological community. None of the remnant Yellow Box Woodland community on site will be impacted by the Proposal, however, a buffer around this community is recommended. A number of threatened bird species are considered to have a moderate likelihood of foraging on site however none are considered likely to breed on site. Habitat features on site are limited and some hollow bearing trees will be removed to allow construction. To minimise unnecessary loss of hollows and the potential habitats they offer, roadside vegetation containing old growth eucalypts will be protected during construction. Vegetation clearance and construction protocols will be implemented to minimise impacts on native fauna.

Aboriginal Heritage
An Aboriginal Cultural Heritage Assessment was undertaken to assess the impacts on aboriginal heritage and to determine the archaeological potential of the Site. Consultation with Aboriginal stakeholders was undertaken in accordance with the Proposal SEARs.

Thirteen sites of Aboriginal archaeological significance have been previously identified within the study area but outside the proposed footprint of the development. Field survey within the study area identified seven sites, surface artefacts and artefact scatters and a culturally modified tree, however, these were all located outside the development area. The remainder of the study area was assessed as exhibiting low archaeological potential due to combinations of archaeologically unfavourable topography, agricultural activity, previous road construction activities and contemporary disturbance of the land.

No further Aboriginal cultural heritage assessment is warranted for the Proposal and an unexpected Aboriginal heritage finds procedure will be developed prior to construction.

Traffic
A traffic impact assessment was completed to assess traffic impacts and this recognised that during the construction phase of the project there will be an increase in the number of heavy vehicle movements along local roads and major transport networks. Maryvale Road and Seatonville Road are minor local roads with low levels of traffic. Cobbora Road provides a link between the Mitchell and Golden Highways and carries approximately 1,000 vehicles per day. The Mitchell Highway in turn carries a higher volume of traffic with a significant portion of this being heavy vehicles. The current road network was found to be operating very well with minimal delays or congestion with the only delays along the proposed routes being associated with heavy vehicles in the township of Wellington.

It is expected that the total traffic flows on the regional road network will remain well within acceptable limits and will continue to operate to a good level of service for all road users. It is considered the additional traffic movements will have a minimal and acceptable impact upon the operation of the local roads and the heavy vehicle route can safely accommodate the additional traffic movements.

Visual Amenity

The Proposal would be visible to 47 potentially affected private viewpoints as well as five public viewpoints located on the Mitchell Highway, Combo Road, Cobbora Road, Tarwong Lane and Phillipsons/Twiggs Roads. A Visual Impact Assessment was prepared and concluded that one private viewpoint had a moderate-high impact and 20 private viewpoints had a moderate impact. Impacts from public viewpoints were moderate-low and low. The VIA concluded that these impacts could be reduced through the implementation of mitigation strategies, such as landscape screening so that four private viewpoints were moderately impacted and 30 rated moderate-low.

Erosion and Sediment Control

The construction phase has the potential to increase dust levels from the Site and potentially impact on surface water quality. The use of appropriate land management techniques during construction and the implementation of the specified mitigation measures will reduce potential dust impacts. Buffers required between watercourses and construction activity, to reduce visual impacts, will have the additional benefit of ensuring an appropriate vegetated buffer to assist with natural filtration of surface flows. A Soil and Water Management Plan (SWMP) will be developed as part of the CEMP.

Bushfire

A Bushfire risk assessment was completed and concluded that potential ignition sources from construction and decommissioning of the proposal were generally consistent with the existing environment apart from any electrical faults. Similarly, ignitions from electrical equipment is theoretically possible during operation. Solar farms also present unusual risks to fire fighters such as electrocution and inhalation of fumes. The land is not mapped as fire prone land and it has been concluded that these risks can be managed by the specified mitigation measures.

1. Introduction

1.1 Project Overview

Maryvale Solar Farm Pty Ltd (MSF) is owned by Photon Energy NV (Photon Energy), Canadian Solar Energy Holdings Singapore 4 Pte Ltd (Canadian Solar) and Polpo Investments Ltd (Polpo) (referred to herein as MSF). MSF propose to develop and operate a 125-megawatt (MW) (AC) (160MW DC) solar photovoltaic (PV) facility including ancillary works and associated infrastructure at 121 Maryvale Road, Maryvale and 801 Cobbora Road, Maryvale NSW 2820 (Figure 1-1) ("the Proposal").

The facility would operate for a duration of approximately 25 years following which MSF would reassess the viability and subject to agreement with the landowner either continue operations, upgrade the infrastructure or undertake decommissioning of the facility. Decommissioning would include removal of all ancillary works, associated infrastructure and remediation of the land as close as possible to its existing condition (as required) to enable continued agricultural use. However, the substation may remain following decommissioning of the solar farm to continue to service the region.

MSF will manage the development and operation of the Proposal. Canadian Solar have acquired a 51% shareholding, Photon Energy have retained approximately 25% and Polpo hold the balance of the shares.

The Proposal is a State Significant Development (SSD) under *the State Environmental Planning Policy (State and Regional Development) 2011* (SRD SEPP). A development application (DA) for the Proposal is required to be submitted under Part 4, Division 4.7 of the *Environmental Planning and Assessment Act 1979* (EP&A Act).

1.2 The Proponent

The proponent is MSF (ABN 98 620 146 778) and an overview of MSF shareholders follows.

Photon Energy
Photon Energy is a highly experienced global solar energy solutions and services company covering the entire lifecycle of solar power systems. Photon Energy was founded in 2008 in Prague, Czech Republic and was co-founded by an Australian citizen. The headquarters of Photon Energy are located in Amsterdam, Netherlands and the company has offices in Australia, Hungary and Czech Republic. Photon Energy operates in Australia through wholly owned local subsidiaries. Photon Energy has been a publicly listed company since June 2013 on the NewConnect stock exchange in Warsaw, Poland and in the Free Market on the Prague Stock Exchange, Czech Republic.

Photon Energy is active across the globe and have a proven track record of developing PV projects and building and commissioning solar power plants. Photon Energy provides operations and maintenance services to hundreds of Megawatts peak (MWp) solar power plants worldwide. Photon Energy also manages its' own proprietary portfolio of 26 solar power plants in three countries across two continents.

Photon Energy has several projects under construction or completed in Australia including:

- Leeton Solar Farm, NSW – Photon is currently in the process of constructing a 25 megawatt (MW) capacity solar farm in Leeton, NSW
- Leeton Sewage Treatment Plant PV – Photon have constructed a 99-kilowatt peak (kWp) PV facility to power the Leeton Sewage Treatment Plant. The PV system is now in operation and managed by Leeton Shire Council

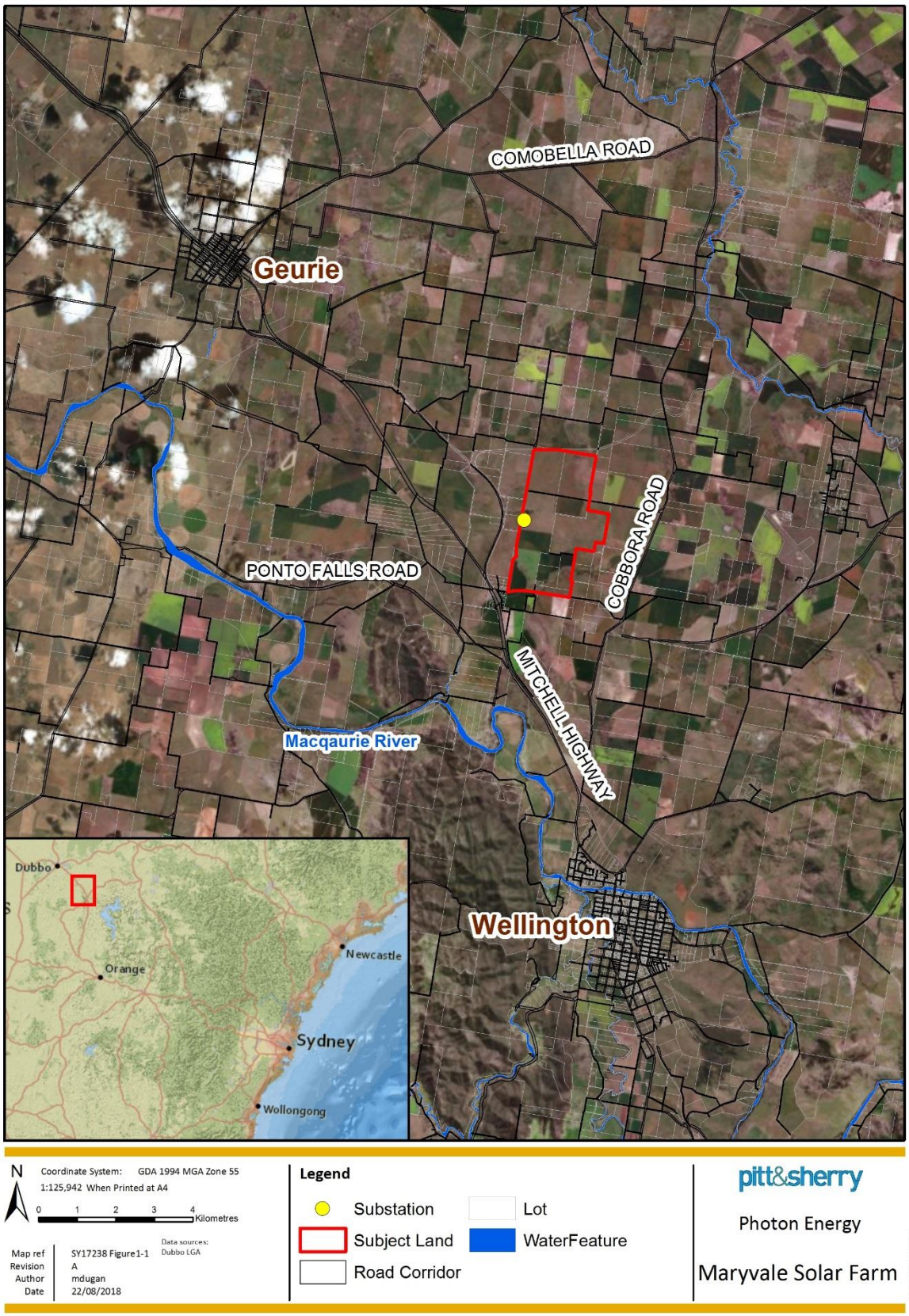

Figure 1-1: Locality Map

- Sydney Post Australia – Photon have installed one of the largest rooftop power plants in Australia at the Sydney headquarters of Australia Post. The rooftop power plant has an annual production capacity of 371, 500 Kilowatt hours (KWh), and
- BAI Communications (BAI) Muswellbrook – Photon has installed a solar PV system to power one of BAI's television and radio broadcast antennas, located in Muswellbrook NSW

Canadian Solar
Canadian Solar Inc. is a global energy provider and leading manufacturer of solar PV modules and solar energy solutions. Canadian Solar was founded in 2001 in Ontario, Canada. The headquarters of Canadian Solar are located in Ontario and the company has business subsidiaries in 20 countries on six continents. Canadian Solar Inc. became a publicly listed company on NASDAQ in 2006 and has grown into one of the largest photovoltaic solar product manufacturers and solar power project developers in the world.

Canadian Solar has several projects under construction or completed in Australia including:

- International Convention Centre (ICC) Sydney – Canadian Solar have installed a large rooftop power plant at the ICC which has an annual production capacity of 545,000 KWh
- Oakley Solar Farm – Canadian Solar is in the process of constructing a 100 MW capacity solar farm in Oakey QLD
- Longreach Solar Farm – Canadian Solar has constructed a 17 MW capacity solar farm in Longreach, QLD, and
- Normanton Solar Farm – Canadian Solar constructed a 5MW capacity solar farm in Normanton QLD

Polpo
Polpo Investments is an investments company focused on early stage and renewable energy investments. Polpo's founders have decades of experience in developing through to operating renewable energy projects in Europe, including wind and solar. Polpo targets markets where traditional electricity generators are aging and likely to be decommissioned in the short term. Polpo seek to identify renewable energy project sites and partner with other local developers to leverage each other's skills to bring projects from greenfield to operating. Polpo Investments was founded in London, United Kingdom (UK) and the headquarters are located in London.

1.3 Location

MSF is proposing to construct and operate a 125-MW solar farm using PV technology at 121 Maryvale Road, Maryvale and 801 Cobbora Road, Maryvale NSW 2820, located approximately 15 km north-east of the Wellington town centre within the Dubbo Regional Council Local Government Area (LGA).

The Proposal would be located at "Waroona" 121 Maryvale Road, Maryvale and "Scarborough House", 801 Cobbora Road, Maryvale, NSW and contained within part of Lot 2 DP 573426, Lot 1 DP 1095725, Lot 2 DP 1095725, Lot 1 DP 1006557, part of Lot 182 and Lot 122 DP754318 (the "Subject Land"). The Subject Land is currently used for agriculture. The solar farm would occupy approximately 375 hectares (the "Site") with the remaining land retained as agricultural land. Figure 1-2 outlines the solar farm footprint with the Subject Land.

There is an existing Essential Energy 132kV easement which runs through Lot 2 DP 573426 in a north – west to south-east direction and this easement contains an existing 132 kV powerline on wooden pole structures (Figure 1-3) which connects with the Wellington substation some 12 km to the south. The Wellington substation is located approximately 3.5km to the north of Wellington.

Ancillary works would also occur in the road reserve along Maryvale and Seatonville Road to facilitate safe access to the Site and within the existing 132 kV powerline between the Site and Wellington Substation.

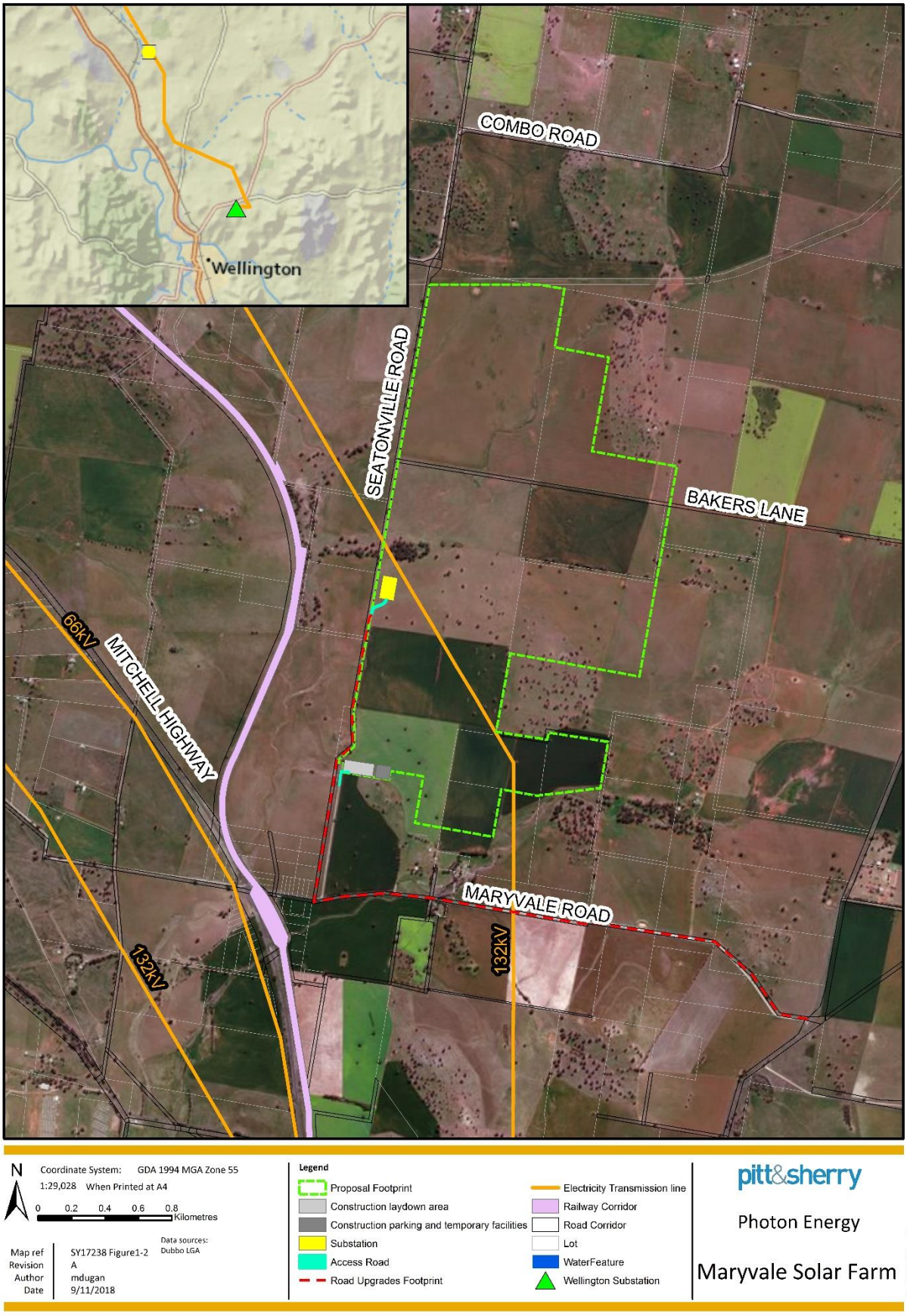

Figure 1-2: Maryvale Solar Farm Footprint

Figure 1-3: Existing Electrical Infrastructure in the Area

Maryvale is a rural area and is part of the NSW Central West wheat-sheep zone. It is typical of the undulating, agricultural, broadacre farming areas within the mid-western region. The locality of Maryvale is home to 159 residents and there are 63 dwellings. Two main roads - the Mitchell Highway (the main vehicular route between Dubbo and Sydney) and Cobbora Road (which connects Wellington to the Golden Highway) - provide access for Maryvale residents to Wellington.

Maryvale is also traversed by the Main Western Railway line which connects western regions of NSW to Sydney. The Mitchell Highway and the Main Western Railway line are both west of the Site. Cobbora Road lies east of the Site (Figure 1-2).

Land in the Maryvale area has been developed for agricultural purposes such as crops (lucerne, wheat and canola) and grazing (sheep and cattle). Large paddocks of improved pastures, rural residences, farm sheds, water tanks, trucks and harvesters are typical features of the area. During harvesting, dust plumes are common. West of the Mitchell Highway properties are smaller in size and there is a higher density of rural lifestyle lots.

The Site is comprised of several large fenced paddocks that are predominantly used for the grazing of livestock (sheep) and occasional sowing of fodder crops such as lucerne. The only infrastructure present is agricultural related structures including hay and machinery sheds and water management structures such as stock watering dams of various capacities. The Site is mostly cleared with scattered mature shade trees remaining and one larger clump of mature trees on the western boundary which continues in to the adjoining property.

Existing 132KV transmission lines traverse the property. There are also fences, agricultural sheds and farm equipment located at the property.

There is an existing homestead within the southern portion of the property (not within the proposed solar farm footprint) that is associated with the Proposal. The nearest neighbour is located along Combo Road, approximately 1km north-west of the Site (469 Combo Road). There are four other residences within 1.5km of the Site: one to the west of the Site (1148 Mitchell Highway), and three located to the south and south-east of the Site along Maryvale Road (112, 121 and 265 Maryvale Road) (Figure 6-12: Photomontage Viewpoint Locations).

Another 10 residences are within 2km of the Site, most being located west of the Mitchell Highway. Twenty-seven further rural residential lots are sited west of the Mitchell Highway, within 5km of the Site, along Twiggs Road, Phillipsons Lane, Ponto Falls Road, Tarwong Lane and Whiteleys Lane (Figure 6-14).

1.3.1 Land Ownership

The land required for the solar farm will be contained within part of Lot 2 DP 573426, Lot 1 DP 1095725, Lot 2 DP 1095725, Lot 1 DP 1006557, part of Lot 182 and Lot 122 DP754318 (Figure 1-4).

The land is privately owned and would be subject to a 25 year lease agreement with an option for a further 25 year extension between MSF and the landowners.

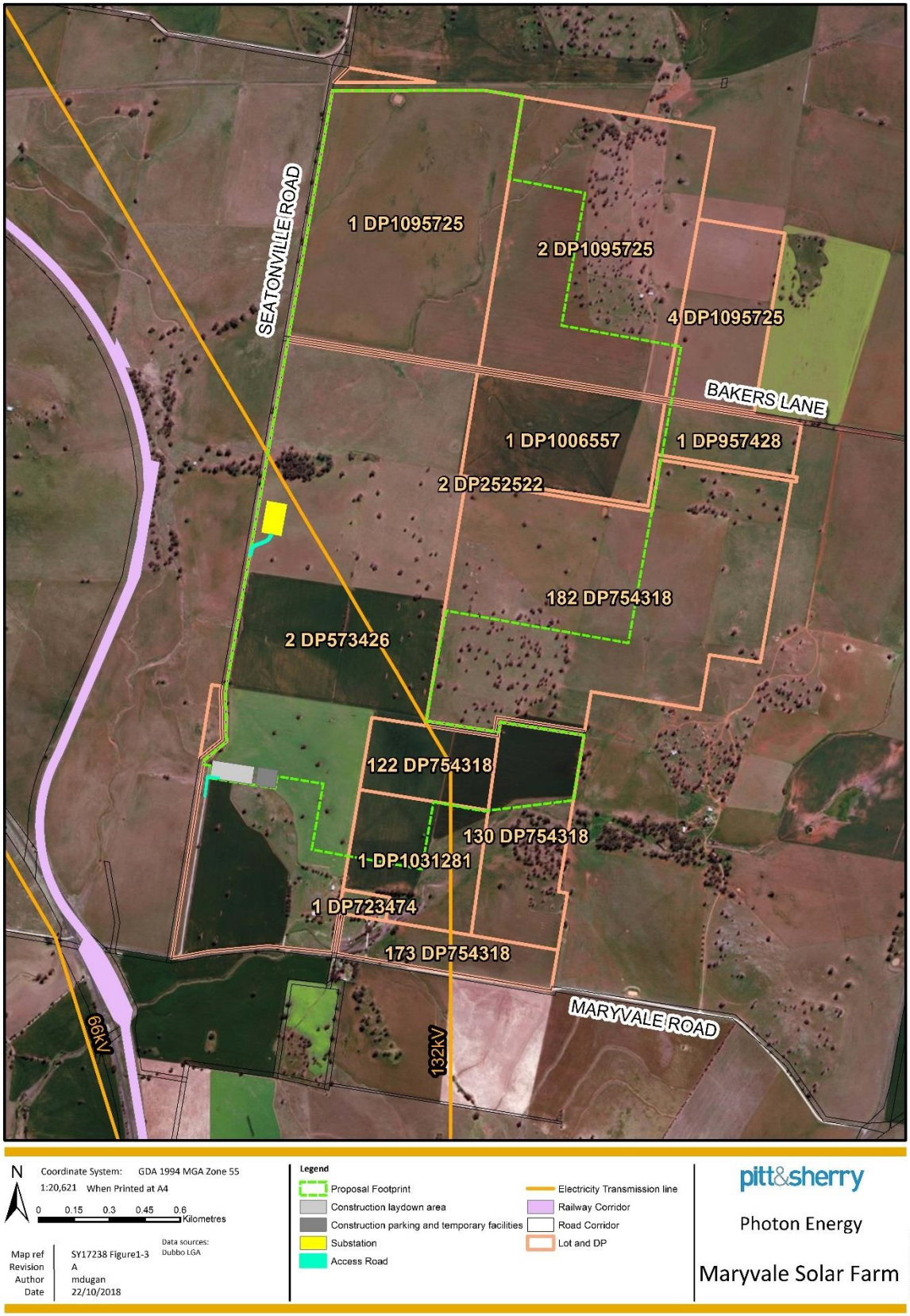

Figure 1-4: Maryvale Solar Farm Lot and Deposited Plan Locations

1.3.2 Landform

The Site is low lying and gently undulating. The highest ridges within the property are shown on Figure 6-20. The elevation of the property ranges from 320 to 360m ASL (above sea level).

There are numerous, ephemeral, small creeks across the site which flow to the Macquarie River, approximately 3.5km south of the Site (Figure 6-22: Topography and Hydrology Map).

1.3.3 Catchment Description

The proposed project is within the Macquarie – Bogan catchment within the Murray-Darling Basin. The catchment covers an area of more than 74,000km^2 with the headwaters of the Macquarie River originating in the Great Dividing Range south of Bathurst and flows in a north-westerly direction for 960 km until it joins the Barwon River near Brewarrina. The Bogan River originates in the Harvey Ranges near Peak Hill and flows roughly parallel to the Macquarie across the north-western plains before joining the Barwon River downstream of Brewarrina. The Macquarie River at Wellington has a catchment area of approximately 14,130km^2 and a mean daily flow of 2,712 megalitres (ML).

Today the Macquarie-Bogan catchment supports around 180,000 people. Over half of this population lives within the regional cities of Dubbo, Orange and Bathurst (all with populations of around 30,000 people) or the town of Mudgee (with around 8,200 people). Most of the major cities and towns in the catchment rely on the rivers in the catchment for their water supply including Bathurst, Orange and Oberon upstream of Burrendong Dam, and Dubbo, Wellington, and Nyngan on the Macquarie River below Burrendong Dam.

Burrendong Dam is the largest storage in the catchment and supplies water for irrigation, stock and domestic needs along the Macquarie River and the lower Bogan River as well as providing significant flood mitigation capability to reduce downstream flooding. It also stores water for environmental requirements in the Macquarie Marshes, an extensive wetland complex that is a significant natural feature of the lower valley.

Much of the upper Macquarie catchment and the Bogan catchment is underlain by fractured rock which yields very little groundwater. The groundwater quality in this area is generally fresh to moderately fresh. (The above information is summarised from *Water resources and management overview: Macquarie-Bogan catchment*, NSW Office of Water, 2011).

The topography of the project area is generally flat with some gently undulating lower slopes intersected by shallow drainage depressions (Figure 6-22: Topography and Hydrology Map). The flowlines which drain the area run predominantly from the north to the south. In the northern section of the Site, two unnamed flowlines drain to the west where they intersect Maryvale Creek on the adjoining land. Bodangora Creek originates to the east of the subject land and flows though the south- eastern corner of the Site. Bodangora and Maryvale Creeks both flow away from the Site to the south west where they form tributaries of the Macquarie River. The flowlines and creeks in this area are ephemeral in nature. Flow is very much dependant on rainfall and overland catchment of runoff water. The water courses can be reduced to small water holes in the drier months.

1.3.4 Biodiversity

The Site has been subject to substantial disturbance and vegetation communities and fauna habitat are limited as a result of the previous disturbance caused by agricultural use. One Threatened Ecological Community exists on the site and surrounds. This community has been reduced by clearing for agriculture to a 3.1 ha remnant of Yellow Box Woodland that would not be disturbed, 0.8 ha of derived native grassland and 109 scattered paddock trees (including 2 stags) that will be impacted by the project.

1.3.5 Climate

Meteorological data recorded at Wellington (D&J Rural) weather station (Site number 065034) is outlined in Table 1-1. The Wellington weather station is located about 15km south-east of the Site.

Table 1-1: Average Meteorological Data (Source: Wellington (D&J Rural) site, BOM, 2018).

Statistic	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Mean Solar Exposure (MJ m^{-2})	26.8	23.6	20.1	15.4	11.5	9.1	10.1	13.3	17.7	22.1	24.6	26.8
Mean rainfall (mm)	59.2	51.1	50.7	45.0	47.2	51.2	49.3	48.8	44.8	55.7	57.9	56.6
Mean number of days of rain ≥ 1mm	4.6	4.3	4.3	3.9	4.9	6.3	6.3	6.0	5.2	5.5	5.2	5.1
Mean Max Temperature (°C)	33.0	32.1	29.3	24.5	19.8	16.0	15.2	17.0	20.8	24.9	28.5	31.5
Mean Min Temperature (°C)	17.0	16.7	14.0	9.4	5.7	3.5	2.2	2.9	5.3	8.6	12.2	15.1

1.4 Key Features of the Proposal

The Proposal would comprise the installation of a solar farm with an upper capacity of 125MW AC that would supply electricity to the National Electricity Market (NEM). The power generated would be transmitted via existing overhead powerlines within an existing Essential Energy easement to the existing Wellington substation.

The proposal would comprise the installation of an array of solar panels, a 132kV substation, and related infrastructure as follows:

- PV panels mounted on a horizontal single axis tracking structure
- An onsite substation
- A transmission kiosk
- Inverter stations (inverters within containers within blocks of solar PV rows)
- A temporary construction compound
- A storage maintenance container
- A site access road from Seatonville Road to the construction compound
- A site access road from Seatonville Road to the Substation
- Perimeter security fencing
- Upgrade of the intersection of Seatonville Road and Maryvale Road
- Upgrades to Maryvale Road
- Upgrade of the intersection of Maryvale Road and Cobbora Road and

- Communications path from the Maryvale Substation to the Wellington Substation via an underslung fibre optic cable along the existing electrical infrastructure.

In order to commission the new communications cable, electrical modification works at Wellington, Dubbo and Dubbo South will also be undertaken inside the control buildings, however due to the nature of these works they have not been the subject of this assessment.

Proposal details and further information on these components are outlined in Section 3.

Construction of the Proposal would be expected to take approximately 12 months and the Proposal would be operational for approximately 25 years.

After the initial 25 year operating period, the solar farm would either be decommissioned removing all infrastructure and returning the site to its existing land capability, or the PV infrastructure would be upgraded and the site would continue to operate as a solar farm.

The Proposal is fully reversible and would not result in any long-term impacts to the inherent soil fertility, allowing existing farming activities to recommence following decommissioning. This is further discussed in Section 3. Figure 1-5 provides an overview of the project and relevant site constraints.

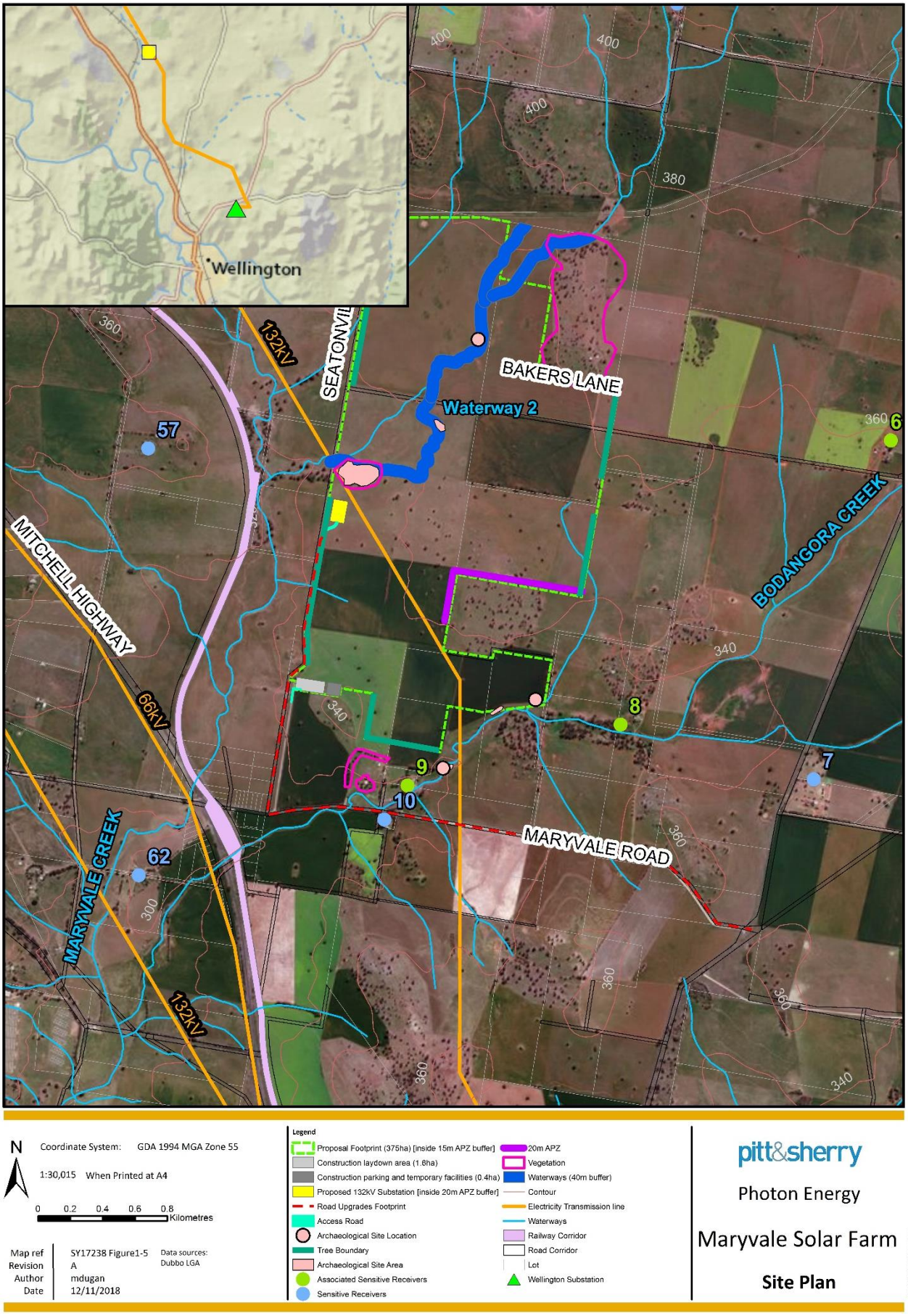

Figure 1-5: Overview of Project and Site Constraints

1.5 Capital Investment Value

The capital investment value (CIV) of the proposed development is estimated at approximately $188 million (AUD) (ex GST). A copy of the CIV report has been provided to DP&E.

1.6 Purpose and Scope of this Document

This Environmental Impact Statement (EIS) has been prepared to identify and assess the potential environmental impacts associated with the construction, operation and decommissioning of the Proposal including the solar farm, ancillary works and associated infrastructure.

The EIS will support a DA for the Proposal to be lodged with the DP&E in accordance with Part 4, Division 4.1 of the *Environmental Planning and Assessment Act 1979* (EP&A Act*).*

This EIS has been prepared by **pitt&sherry** on behalf of Maryvale Solar Farm in accordance with Schedule 2 of the *Environmental Planning and Assessment Regulatio*n 2000 (EP&A Regulation) and Section 4.15 of the EP&A Act and pursuant to the Secretary's Environmental Assessment Requirements (SEARs) issued on 13 October 2017. A copy of the SEARs is included in Appendix A**.**

Appendix B provides a table of the SEARs as they relate to the Proposal and identifies where the requirements are addressed in the EIS.

1.7 Environmental Assessment Process

Under Schedule 1 of the EP&A Regulation, the planning approvals process includes the following key steps:

- Submission of a State Significant Development Application (SSDA) with an accompanying Preliminary Environmental Assessment (PEA) lodged with the Secretary of the DP&E
- The Secretary is to prepare the SEARs in respect of the infrastructure under Schedule 2, Part 2 (3) of the EP&A Regulation
- Preparation and submission of an EIS under Schedule 2 of the EP&A Regulation, addressing the matters outlined in the SEARs
- Public exhibition of the EIS for a minimum of 30 days
- Preparation of a response to issues raised in submissions to be submitted to the secretary, if required
- Assessment of the application by the DP&E and preparation of the Secretary's environmental assessment report, and
- Determination of the proposal by the Minister for Planning or their delegate

Section 5 describes the planning and approvals pathway in greater detail.

1.8 EIS Structure

An outline of the structure and content of this EIS is included in Table 1-2.

Table 1-2: EIS Structure

Section		Content
N/A	Executive Summary	Key features of the report.
Section 1	Introduction	Purpose and scope of this document, proposal overview including the proponent, site location and construction and operation, planning pathway.

Section		Content
Section 2	Strategic Justification and Alternatives considered	Site suitability, energy context in Australia and the National Electricity Market Scheme, strategic direction of the region and state, Proposal benefits, alternatives considered.
Section 3	Description of the Proposal	Detailed description of the Proposal site and proposed solar farm, including construction, operation and decommissioning.
Section 4	Stakeholder Consultation	Summary of consultation undertaken with Government agencies, stakeholders and the community.
Section 5	Statutory Context	Consideration of the relevant statutory provisions at the commonwealth and state levels, including the principals of ecologically sustainable development.
Section 6	Environmental Impact Assessment	Risk assessment, detailed assessment of the potential impacts of the Proposal for a range of key environmental aspects.
Section 6.1	Biodiversity (Flora and Fauna)	Detailed assessment of the potential impacts of the proposal for a range of key environmental impacts.
Section 6.2	Traffic, Transport and Road Safety	
Section 6.3	Heritage	
Section 6.4	Aboriginal Heritage	
Section 6.5	Land Use	
Section 6.6	Visual Impact Assessment	
Section 6.7	Surface water, Hydrology and Groundwater	
Section 6.8	Soils, Geology and Contamination	
Section 6.9	Bushfire	
Section 6.10	Noise Impact Assessment	
Section 6.11	Air Quality	
Section 6.12	Socio- Economic	
Section 6.13	Hazards and electromagnetic interference	
Section 6.14	Waste	
Section 7	Cumulative Impacts	Consideration of the Maryvale Solar Farm project in relation to other projects planned or occurring in the area.
Section 8	Environmental Management	Environmental framework, and consolidated summary of recommended management and mitigation measures.
Section 9	Conclusion	Conclusion to the EIS including key findings.
Section 10	References	
Appendix A	Secretary's Environmental Assessment Requirements	Supporting documentation including the technical specialist reports.
Appendix B	Table summarising where SEARs are addressed in the EIS	
Appendix C	Community & Stakeholder Consultation	
Appendix D	Biodiversity Assessment Report	
Appendix E	Traffic Impact Assessment	

Section		Content
Appendix F	Aboriginal Heritage Impact Assessment	
Appendix G	Land Use Conflict Risk Assessment	
Appendix H	Visual Impact Assessment and Landscape Plan	
Appendix I	Soil Log Sheets & Laboratory Results	
Appendix J	Bushfire Assessment	
Appendix K	Noise Impact Assessment	
Appendix L	Draft Land Management Plan	
Appendix M	Draft Rehabilitation and Decommissioning Plan	

2. Need and Justification for the Proposal

2.1 Energy Context in Australia and NSW

2.1.1 Electricity generation in Australia & NSW

Electricity in NSW is generated from a wide range of fuel sources, including black coal, natural gas, coal seam methane gas and to a lesser extent from renewable energy sources such as hydro, wind, biomass and solar (DoEE 2017).

The Australian Energy Update 2017 (*DoEE, 2017*) report highlighted an increase in electricity generation by 2% overall in 2015–16. This growth is largely attributed to increasing demand for electricity and growth in off-grid use, as well as increased residential and commercial demand, mainly for heating. In terms of fuel consumption oil represented the largest percentage of fuel consumed in 2015–16 (37.0%), followed by coal (32%), gas (24.8%) and renewables (6.0%) (*DoEE, 2017*).

NSW has around 20,000 megawatts (MW) of installed electricity generation capacity (including many small generators and roof top PV systems). Table 2-1 provides the number of major existing, under construction and proposed NSW power stations larger than 30MW (*DP&E: Resources and Planning, 2016*).

Table 2-1: Current Solar Projects (NSW) Source: (DP&E: Resources and Planning, 2016).

	Number of Power Stations	Total Capacity (MW)
Major existing power stations	54	18,740
Projects with Development Approval	51	10,641
Projects in the planning system	39	7,874

Australian Energy Statistics recorded that Solar PV use grew by 23.6 % in 2015–16. Table 2-2 provides the Australian electricity generation, by fuel type for this period.

Table 2-2: Australian electricity generation, by fuel type (*Source: Department of Industry, Innovation and Science 2016*)

	2015 -16		Average Annual Growth	
	GWh	Share (%)	2015-16 (%)	10 years (%)
Fossil Fuels	**219,283**	**85.2**	**0.4**	**-0.1**
Black Coal	114,295	44.4	6.2	-1.6
Brown Coal	48,796	19.0	-4.3	-1.2
Gas	50,536	19.6	-4.5	5.3
Oil	5,656	2.2	-17.2	7.7
Renewables	**38,146**	**14.8**	**12.1**	**6.8**
Hydro	15,318	6.0	13.9	0.6
Solar PV	6,838	2.7	23.6	59.1
Wind	12,199	4.7	6.4	18.7
Bioenergy	3,790	1.5	5.5	-0.5
Total	**257,429**	**100.0**	**2.0**	**0.6**

2.1.2 National Electricity Market

The Australian Energy Market operator's (AEMO's) 2017 Electricity Forecasting Insight stated that *'forecast growth in maximum demand in the medium to longer term may require investments in generation, network, or demand-side solutions to ensure reliability and security of supply'.*

The three projected scenarios of strong, neutral or weak economic growth range considerably by almost 70,000 GWh across the three differing scenarios, highlighting the uncertainty of the outlook for grid-supplied electricity. AEMO highlights that this uncertainty can be mitigated through

- Careful and improved system wide grid planning, accounting for the uncertain future
- Considering projects that can be up-scaled or staged in development, and
- Reducing political and regulatory uncertainty

Solar Farms are scalable and can be installed regionally, allowing for this type of infrastructure to be suitable for the predicted uncertain energy climate.

2.2 Strategic Direction of the Region and the State

Australia is a signatory to various international agreements relating to climate change and greenhouse gas emissions, such as the United Nations Framework Convention on Climate Change and the Paris Agreement. Both the NSW and the Australian Government have developed renewable energy targets and strategies to meet these targets, reduce greenhouse gas emissions and provide reliable energy to the public. The proposal will contribute to the market aiming to reach NSW and Australian Government targets and international agreements.

Electricity prices are increasing in NSW and Australia due to increased demand and limited existing supply. In many parts of NSW, constraints on energy supply infrastructure result in energy shortages or uncertainty of reliable supply. Renewable energy generated from large scale solar farms in regional areas allow for distributed generation meaning the energy can be generated in the regions it is needed rather than from large fossil fuel power stations situated significant distance from the area of energy use. This increases energy efficiency and reduces energy loss that occurs during transmission of electrical energy across powerlines.

2.2.1 Australia's Renewable Energy Target

In 2001, the Commonwealth Government introduced the Renewable Energy Target (RET) Scheme to increase the amount of renewable energy being used in Australia's electricity supply. The RET aims to (*DEE, 2016*):

- Produce 33,000 GWh from renewable energy sources by 2020
- Reduce emissions of greenhouse gases in the electricity sector, and
- Provide for increased energy security through diversifying the energy mix and transitioning to low carbon intensive energy sources

The Proposal would produce an estimated 345.9 gigawatt hours (GWh) per year of renewable electricity which would assist in meeting the RET objectives. Additionally, the proposed solar farm will not generate greenhouse gas emissions through the process of energy generation and would contribute to energy diversity.

2.2.2 NSW Renewable Energy Action Plan

The NSW Renewable Energy Action Plan was created to guide NSW's renewable energy development and to support the former national target of 20% renewable energy by 2020. This plan aims to align with Goal 22 of the 'NSW 2021' Plan, to "*contribute to the national renewable energy target by promoting energy security*

through a more diverse energy mix, reducing coal dependence, increasing energy efficiency and moving to lower emission energy sources."

The Plan also aims to:

- Attract renewable energy investment and projects
- Build community support for renewable energy, and
- Attract and grow expertise in renewable energy technology

The Proposal aligns with Goal 22 of the 'NSW 2021' Plan, as it promotes a renewable energy, will not generate greenhouse gas emissions through the process of energy production and offers a competitive alternative to coal derived energy sources.

2.2.3 Paris Agreement

A global agreement to tackle climate change was made in November 2015 at the COP21 conference in Paris. At the Paris COP21 conference, Australia committed to the following:

- Reduce its emissions by 5% below 2000 levels by 2020
- Reducing its emissions to 26-28% below 2005 levels by 2030, and
- Net emissions in the second half of the century

Renewable energy helps to reduce emissions associated with electricity generation.

2.3 Benefits of the Proposal

The key benefit of the Proposal is the production of renewable electricity contributing to NSW Governments Renewable Energy Action Plan (REAP) and reducing greenhouse gas emissions and reliance on fossil fuels. On an annual basis, the Maryvale Solar Farm will produce enough electricity to meet the needs of approximately 36,900 households.

Additionally, the Proposal will reduce greenhouse gas (GHG) emissions by over 325,000 tonnes of CO2 equivalent per annum.

The Proposal would also provide the following benefits:

- Assist in reducing the reliance on fossil fuels in Australia and provide a cleaner and sustainable substitute
- Develop the solar power industry and supply chain in Australia
- Develop Australian intellectual property and expertise in solar power
- Assist with Australia's commitments under national and international agreements
- Diversify sources of income for the agricultural sector, allowing financial resilience for farmers, and
- Improve energy security

The proposal would also generate regional and local benefits including:

- Generating employment
  - 150 construction jobs (at peak) as well as indirect supply chain jobs
  - Support up to ten operational jobs, and
- Encouraging regional development
  - Employee expenditure in the Wellington region (e.g. fuel supply, vehicle servicing, uniform suppliers, hotels/motels, B&B's, cafés, pubs, catering and cleaning companies)
  - Maximising the use of local contractors and equipment hire
  - Increasing local skills and trades through project experience

2.4 Alternatives Considered

2.4.1 Alternative site locations

A desktop environmental site analysis was undertaken by pitt&sherry in May 2017 for nine proposed locations across NSW. The desktop assessment aimed to identify environmental aspects that may require additional, detailed and/or specialist assessment, may be impacted significantly or have the potential to impact upon the scope, construction or operation of a solar farm.

The desktop assessment considered a range of environmental aspects via analysis of aerial imagery and desktop search tools including:

- Biodiversity
- Aboriginal and Non-Aboriginal Heritage
- Zoning and Local Environmental Plan provisions (e.g. floodplain, bushfire)
- Surface and ground water resources
- Landscape features
- Access, and
- Current and previous land use

The desktop assessment formed part of the site selection process undertaken by MSF which also considered:

- Availability of land
- Access, proximity to and capacity of electrical infrastructure, and
- Commercial viability

The site location was considered a preferred location due to:

- The suitability of commercial scale solar electricity generation on the land, in terms of solar yield
- Availability of suitably sized lots
- Aspect of the land (north facing)
- Ease of access to major transport networks such as the Mitchell Highway
- Suitable landscape requiring minimal earthworks
- Locality population density
- Location relevant to natural waterways, and

- Proximity to and capacity of connection infrastructure (132kV transmission line and Wellington substation)

2.4.2 The 'do nothing' option

The consequences of not proceeding with the Proposal would be to forgo the benefits of the Proposal, resulting in:

- The loss of a source of renewable energy that would assist the Australian and NSW Governments to reach their targets such as 20% renewable energy by 2020, "*attract renewable energy investment and Proposals, build community support for renewable energy, and attract and grow expertise in renewable energy technology*" (*DPI 2013*)
- The loss of cleaner energy and reduced greenhouse gas emissions
- The loss of additional electricity generation and supply into the Australian grid
- The loss of energy security through diversification of energy sources
- Loss of social and economic benefits through the provision of direct and indirect employment opportunities locally and regionally during construction and operation of the solar farm, and
- Exposed vulnerability to impacts of climate change to the agricultural industry, such as drought impacting revenue streams

The '*do nothing*' option may avoid any potential environmental impacts associated with the proposal however, as outlined in Section 9, no significant environmental impacts have been identified. It is considered the benefits of the Proposal significantly outweigh any potential environmental impacts whilst contributing to ecologically sustainable development.

2.4.3 Alternative layout options

The design and configuration of the Proposal has taken into account the environmental and social considerations of the locality including:

- Identifying and avoiding/mitigating any environmental constraints including
  - Avoiding existing clusters of trees to maximise retention of native vegetation on Site
  - Avoiding riparian zones to avoid potential impacts upon waterways, biodiversity and aboriginal heritage
- Implementing buffer distances including
  - A 1km buffer from the nearest residence
  - A 20m buffer around areas of retained vegetation
  - An asset protection zone (APZ) of 15 m around the entire perimeter of the solar farm footprint, and 20 m around the substation
  - 40m buffer between infrastructure and waterway 2 (See Figure 6-22) on site.

2.4.4 Size of proposal

The Proponent has undertaken extensive grid modelling to determine the optimal size of the solar farm, to ensure constraint free operation and dispatch into the NEM. Through the finalisation of the connection application planning process, MSF will continue to liaise with Essential Energy. This will ensure the final plant layout and size is adequate for the existing grid infrastructure.

2.4.5 The preferred option

The preferred option is detailed in Section 3.

3. Description of the Proposal

3.1 Overview

The construction of the Proposal is estimated to consist of up to 450,000 PV panels which will be installed on a single axis tracker system across the Site.

The single axis tracker system option would consist of groups of east-west facing PV modules (each approximately 2m x 1m in area) on mounting structures approximately 4m in height and in rows approximately 11m apart. The mounting structure would be piled steel posts that would extend approximately 2m below ground (potentially ranging from 1.6m to 4m depending on geotechnical conditions).

The following works and infrastructure would be required to support the construction and operation of the solar farm:

- Upgrade of the intersection of Seatonville Road and Maryvale Road
- Upgrades to Maryvale Road
- Upgrade of the intersection of Maryvale Road and Cobbora Road and
- Construction of a main access road for all access and egress for the Site and substation from Seatonville Road
- Installation of Electrical infrastructure including
  - A 132kV Substation including two transformers and associated 132kV switchgear
  - Inverters to collect and convert DC to AC
  - Cabling and other electrical infrastructure (e.g. security systems)
- Underslinging of the communication cable from Wellington Substation to the Site through the existing 132kV transmission line adjacent to the site
- A maintenance compound and buildings and
- Fencing, landscaping and environmental works.

Power generated by the facility would be transmitted via existing 132kV transmission lines, in an easement owned by Essential Energy that runs through the site in a north-west to south-east direction and extends through to Wellington approximately 12 kilometres to the south -east of the Maryvale Solar Farm Site. A tee off connection would be used to connect to the existing Essential Energy 132kV transmission line.

A section of high capacity fibre wire will be installed to connect the new Maryvale Solar Farm Substation to Essential Energy's 132 kV Network. This communications infrastructure would be delivered through Essential Energy's existing network by under slinging on the existing poles.

The operational life of the solar farm is expected to be 25 years at which point the panels are either replaced and operations continue or removed and the site is decommissioned and rehabilitated.

3.2 Proposal Site

The Proposal would be located at "Waroona" 121 Maryvale Road, Maryvale and "Scarborough House", 801 Cobbora Road, Maryvale, NSW and contained within part of Lot 2 DP 573426, Lot 1 DP 1095725, Lot 2 DP 1095725, Lot 1 DP 1006557, part of Lot 182 and Lot 122 DP754318 (the "Subject Land").

The Site also includes Bakers Lane which is currently a gazetted Council road. An application for the closure and land disposal of Bakers Lane has been submitted to Dubbo Regional Council and Council are currently

undertaking the road closure process. It is anticipated this process will be completed prior to construction of the Proposal and as such would form part of the Site.

The Proposal is located within the Dubbo Regional Council Local Government Area (LGA) and is approximately 15 km north-west of the Wellington town centre.

The Subject Land is currently used for agriculture, including grazing of sheep and cultivation for cereal crops such as wheat, and fodder crops such as lucerne. The solar farm would occupy approximately 375 hectares (the "Site") with the remaining land retained as agricultural land.

There is an existing Essential Energy 132kV easement which runs through Lot 2 DP 573426 in a north – west to south-east direction and this easement contains an existing 132 kV powerline on wooden pole structures (Figure 1-3) which connects with the Wellington substation some 12 km south. The Wellington substation is located approximately 3.5km to the north of Wellington.

3.3 Maryvale Solar Farm

3.3.1 Key Infrastructure Components

The Proposal would consist of the following elements:

- Solar Components including
  - Up to 450,000 PV panels on mounting structures that enable the panels to track the sun (known as "single axis trackers")
  - Electrical connections and inverter stations (where the inverters are within containers within the solar PV arrays)
  - Underground cabling / collection circuits
- Electrical infrastructure including
  - Transmission kiosk
  - A 132kV Substation
  - 33kV switchgear
- A main access road
- Upgrade of intersections and roads to facilitate safe access
- Ancillary facilities and construction compounds
- Perimeter security fencing and
- Two maintenance storage containers

During the construction period, some additional temporary facilities would be located within the Site and may include:

- Material laydown areas
- Construction site offices, and
- Parking area

Further details have been provided below for indicative key infrastructure components however the final infrastructure for all components would be confirmed during the construction contract Request for Proposal (RFP) stage.

Solar Components

The solar modules will consist of a mounting system, PV solar panels and cabling. The support structures for mounting the PV panels will stand up to 4m high with steel posts as foundations. Piles would be driven or screwed in to the ground using pile drivers to a maximum depth of 4m depending on geotechnical conditions.

The Proposal will comprise of up to 450,000 PV panels, using a single axis tracking system, facing east-west and tilted 60° along the north-south axis. The PV modules (2m x 1m) will consist of 72 high efficiency monocrystalline cells with glass and aluminium frames. The mounting structures will be constructed in rows with approximately 11m spacing between the rows to facilitate movement of the panels and provide access for maintenance.

The modules will be arranged in strings and connected to inverters located adjacent to PV arrays. The PV arrays will be fitted with an earthing and lightning protection system connected to the main earth link. All PV modules would be installed in accordance with the relevant Australian Standards including AS 5033.

Figure 3-1 and Figure 3-2 provide an indication of what the proposed solar modules would look like. An indicative layout of the PV panels is shown in Figure 3-3.

Figure 3-1: Example of Ground Mounting Arrangements

Figure 3-2: Example of Tracking Solar PV panels

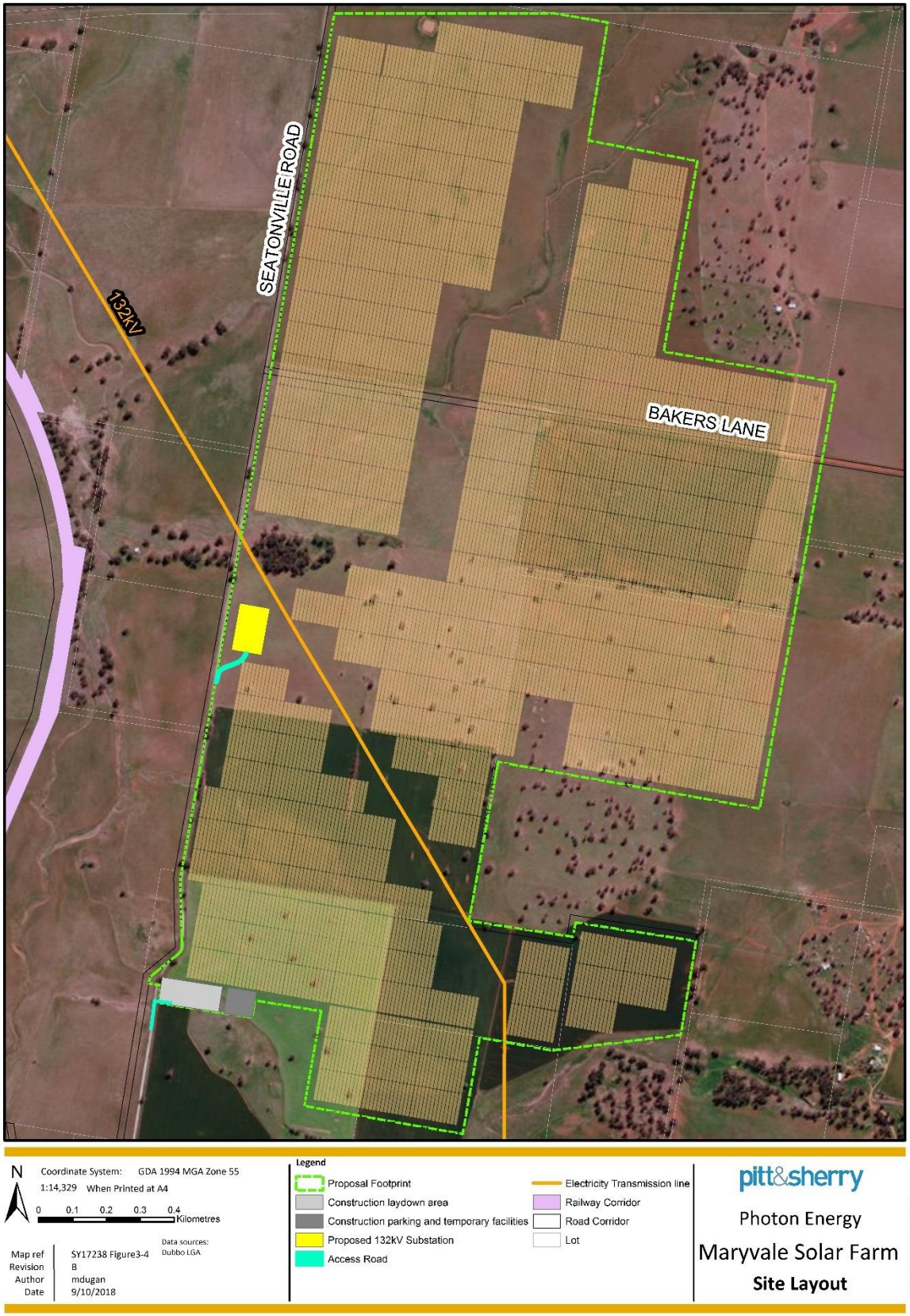

Figure 3-3: Maryvale Solar Farm Proposed Layout

Electrical Connections and Inverters

Electrical cabling would be attached beneath the modules and would connect the individual PV modules to each other. Groups of panels will be connected to each other by underground cables. Inverter stations will be located centrally to groups of approximately 10,000 PV panels and would be located within the solar PV arrays.

Inverter stations collect electricity from an area of panels, convert it from direct current (DC) to alternating current (AC). The energy is conveyed from the inverter station to the transformer to be located within the substation via electrical cabling.

Each inverter station will house 2-3 inverters and will be fitted with an overvoltage protection device at each DC and AC input/output. This would result in up to 40 inverter stations across the Site.

The type of inverters to be installed across the site would be one or a combination of the following options:

- Approximately 26 x 4.92 MW Ingeteam CON40 inverter station (Dimensions: 12.2m (l) x 2.4m (w) x 2.9m) – housed in a 40’ container
- Approximately 40 x 3.20 MW Ingeteam CON20 inverter station (Dimensions: 6.1m (l) x 2.4m (w) x 2.6m) – housed in a 20’ container

The inverter stations would be delivered as a fully containerised solution. These stations will be installed on a concrete foundation, slightly elevated above the ground to enable the installation of the AC and DC cabling (Figure 3-4) and fitted with:

- 80 Inverters (2 inverters for the CON20 inverter station or 3 inverters for the CON40 inverter station);
- Cable glands
- Transformer
- Oil retention safety tank
- HV switchgear, and
- Cooling fans

Figure 3-4: Example Inverter Station

Electrical Cabling

The majority of electrical cabling required for the Proposal would be installed underground and is considered high voltage (>1kV) and as such would be installed at a depth of approximately 1.2m (in accordance with AS 3000 and AS 3008) (subject to detailed design) including all DC power cabling connecting the panels. All

underground cabling would be installed in accordance with the relevant Australian Standards including mechanical protection in accordance with AS 3000.

Any low voltage cabling required for auxiliary loads on site may be installed at a depth of between 500-600mm (subject to detailed design). Some electrical cabling may be above ground to enable crossing of waterbodies on Site.

Prior to excavating the cable trench, the topsoil would be stripped and stockpiled for use in the rehabilitation of the trench following the cable installation. A sand bed will be placed in the trench before and after laying of the cables, followed by additional backfilling with excavated material.

Substation

A new 132 kV substation would be established on the western boundary of Lot 2 DP573426.

The substation footprint is approximately 60m x 80m is size and set back approximately 2km from Maryvale Road adjacent to Seatonville Road. The substation switchyard would include a transformer, 33kV switchgear building and auxiliary services building. The substation will connect directly to the existing 132kV transmission line traversing the Site. The maximum height of any component in the substation will be 22m. An example of a similar substation can be seen in Figure 3-5.

The new substation would include (subject to detailed design):

- 1 x 132kV 188MVA transformer
- 33kV switchgear building
- Auxiliary services building
- Elevated busbar
- A lightning protection system
- Circuit breakers
- Disconnectors
- Current transformers
- Voltage transformers
- Diesel Generators, and
- Communications pole with microwave dish and antennas

A chain link fence with upper barbed strands approximately 3m high would be installed around the substation to maintain security of the site and ensure safety for the public and the ongoing agricultural activities surrounding the substation. The substation would have a 20m asset protection zone (APZ) in accordance with design and safety standards.

The substation would be approximately 60m x 80m in accordance with Essential Energy requirements to ensure safe and reliable operation of the substation. Consistent with existing Essential Energy substation designs, gravel will be placed around the substation equipment and fence to restrict vegetation growth and provide a safe working environment in accordance with Australian Standards (AS 2067, AS 1025.1 and 1025.2). The substation will include 33kV switchgear which controls the flow of electricity within an electrical system to prevent overloads and short circuits and to de-energize circuits for testing and maintenance.

The connection will be made directly from the Substation to the existing overhead transmission lines on the Site.

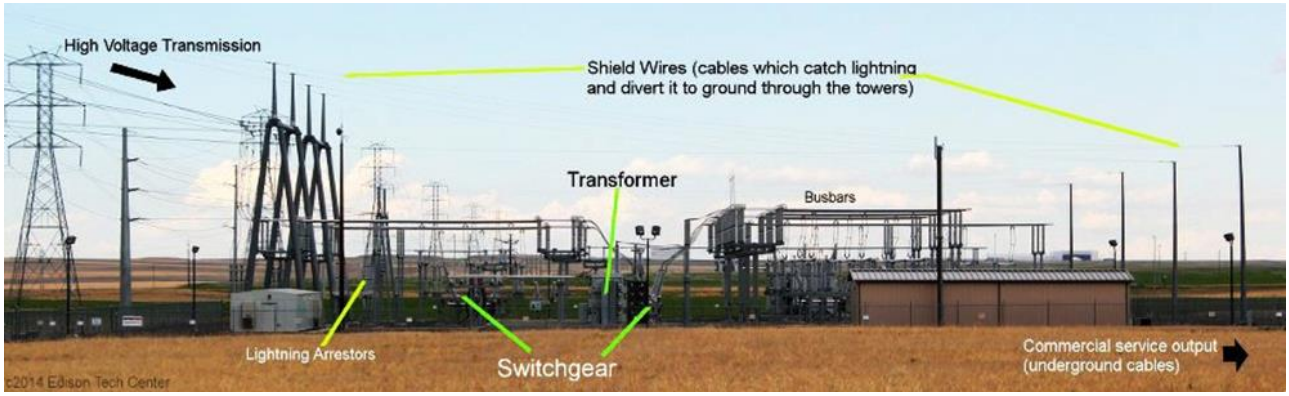

Figure 3-5: Example Substation

Essential Energy Infrastructure Works

The Proposal would require connection to electrical infrastructure within an existing Essential Energy easement at the western boundary of Lot 2 DP573426 within the Site. The connection will be made to the existing overhead transmission line. This connection is subject to Essential Energy detailed design however it is assumed that any new infrastructure to carry powerlines from the substation to the 132kV transmission line would consist of timber or spun concrete poles (similar to surrounding infrastructure).

A communications path from the Maryvale Substation to the Wellington Substation will also be required. An underslung fibre optic cable along the existing electrical infrastructure will be installed to achieve this with connections to the Substations at either end. Essential Energy have provided concurrence with these works as outlined in correspondence provided to DPE as landholder's consent.

In order to commission the new communications cable, electrical modification works at Wellington, Dubbo and Dubbo South will also be undertaken inside the control buildings, however due to the nature of these works they have not been the subject of this assessment.

Access Roads

Access to the Site is via Seatonville Road, an unsealed single lane road that provides access to the western side of the Site. Access into the Site will be through a newly constructed and improved gate way. A concept design for the entrance to the Site and access road is provided in Appendix E.

Seatonville Road will be upgraded to allow access for heavy vehicles and construction materials in accordance with the concept design in Appendix E.

During operations, access would also be required between the modules and inverter stations onsite for maintenance, however this would not need to be constructed access or delineated roads due to the low frequency of access. All access and maintenance roads would be maintained throughout the construction and operation of the solar farm.

Road Upgrades

The following road upgrades, as per Concept Design in Appendix E, are proposed to facilitate safe access for the duration of the Proposal:

- Seatonville Road will be upgraded to allow for 2-way traffic movements between the site access and Maryvale Road. This would be to a similar standard as the existing conditions on Maryvale Road
- The intersection of Seatonville Road and Maryvale Road will be upgraded to allow for truck movements
- The waterway crossing to the east of the intersection of Maryvale Road and Seatonville Road will be upgraded to allow for truck movements (strength) and will be widened to allow for 2-way truck movements

- The intersection of Maryvale Road and Cobbora Road will be upgraded to provide a minimum left turn deceleration lane for the trucks

All of the above road upgrades would be undertaken in accordance with relevant Road Authority requirements.

MSF will provide maintenance to Maryvale Road and Seatonville Road (to the point of site access) during the construction phase.

Ancillary Facilities and Construction Compound

The proposed works will require the installation and use of a compound site and a construction laydown area to be located in the southern portion of the Site on Lot 2 DP 573426 (Figure 3-3: Maryvale Solar Farm Proposed Layout) and not exceed a total area of 2ha. Temporary ancillary facilities associated with the compound site would include:

- Construction offices (one 12m x 3m site office, two 12 x 3m break rooms)
- Parking area
- Staff amenities, and
- CCTV (Security purposes)

Perimeter Security Fencing

The perimeter of the site would be fenced with security fencing at least 1.8m high with 24/7 surveillance cameras. The fence would be designed to ensure adequate access and exit points are provided during both the construction phase and ongoing operational life of the Proposal. An example is provided in Figure 3-6.

Figure 3-6: Example Security Fencing (Chain Link Security Fence)

Operations

Once operational the Solar Farm will be monitored and operated remotely therefore requiring minimal on-site maintenance personnel. A small area will be maintained for parking of vehicles during operation of the solar farm. Two 40' shipping containers for storage of maintenance equipment will be permanently situated within the Site on the compound areas used during construction.

3.3.2 Construction and Commissioning

Construction Activities

The construction and commissioning phase is expected to last approximately 12 months. The main construction activities are outlined in Table 3-1: Main Construction Activities by Stage.

Table 3-1: Main Construction Activities by Stage

Stage	Main activities
Site Establishment	• Installation of security measures including fencing • Establishment of site compound, material layout and equipment wash down areas • Establishment of tree and vegetation protection measures as required. • Ground preparation • Installation of environmental controls in accordance with a detailed Construction Environmental Management Plan (CEMP) • Vegetation clearing • Targeted clearance of low laying vegetation around trenching areas • Pile driven installation of PV mounting structures to minimise disturbance to existing ground cover • Establishment of additional sedimentation and erosion controls as required
Road Upgrades	• Upgrade to the intersection of Cobbora Road and Maryvale Road • Strengthen the waterway structure and widen the road in places to facilitate passing of two semi-trailers on Maryvale Road • Upgrade to the intersection of Maryvale Road and Seatonville Road • Widen Seatonville road from Maryvale Road to site access to facilitate passing of two semi-trailers
Preliminary civil works	• Setting up foundations for the substation and inverter stations • Drainage works (as required)
Install PV systems and cables	• Installation of steel post and rail foundation system for the solar panels • Installation of PV panels and DC wiring beneath the panels • Installation of electrical cabling including trenching for underground cabling and installation of inverter stations
Construction of 132kV substation	• Site Establishment and clearing (if required) • Bulk earthworks • Detailed civil works including earthing, foundations • Erection of steelwork, equipment, demountable buildings and transformers • Electrical connections • Install new poles • Transmission line stringing for new conductor and OPGW from substation to existing 132 kV transmission line
Rehabilitation and Commissioning	• Testing of electrical infrastructure • Removal of temporary construction facilities and rehabilitation of disturbed areas • Landscaping works based on the Landscape Plan (refer Appendix K)

Earthworks

While extensive earthworks are not proposed, some land forming (including localised cut and fill areas) may be undertaken to achieve more consistent gradients beneath the PV modules. Additionally, earthworks are required for trenching works and roadworks. Ground disturbance, resulting from earthworks would be minimal and limited to:

- The installation of the piles supporting the solar panels, which would be driven into the ground to a depth of approximately 1.6m to 4m (depending on geotechnical conditions)
- Concrete or steel pile foundations for the inverter stations, substation and maintenance storage containers
- Trenches up to 1.2m deep for the installation of cables
- Disturbance within the construction laydown area including works to flatten the surface. The construction laydown area will likely be lined with gravel over the top, this will be removed when the construction phase is complete
- Establishment of temporary staff amenities for construction
- Construction of perimeter security fencing
- Road widening and intersection upgrades, and
- Vegetation clearance - groundcover and scattered paddock trees on Site

The ground disturbance from pile foundations is estimated to equate to less than 1% of the total site area. Additional ground disturbance would result from trenches for cabling and footings for another infrastructure and vegetation removal.

Panels within the solar array area would sit above the ground and existing ground cover would be maintained underneath the panels.

Construction Hours and Duration

Construction hours for the project will be in accordance with the Interim Construction Noise Guideline (ICNG) recommended standard hours for construction with extended hours on Saturday as detailed below:

- Monday to Friday – 7am to 6pm
- Saturdays – 8am to 1pm, and
- Sundays or Public Holidays – No construction

No audible out of hours or night works are proposed excluding emergencies. In the event construction is required outside of these hours, approval from the relevant authorities and notification to the community would be undertaken.

Resourcing Requirements

Water

Water use during construction would be limited to staff amenities (temporary portable toilets) and dust suppression. Water for dust suppression would be sourced offsite and trucked onto site. A diluted organic polymer agent is proposed to be used to reduce the quantity of water required for dust suppression activities.

Potable water would be trucked to the Site on as needs basis and stored within temporary water tanks at the staff amenities area.

It is estimated that water use during construction would total approximately 25,000L/day equivalent to 1 water truck delivery per day.

Labour
It is estimated that up to 150 construction personnel would be required on site during peak construction period. Construction supervisors and construction labour force, made up of labourers and technicians are intended to be hired locally, where possible.

Plant and Equipment
A range of plant and equipment would be used during construction including earth-moving equipment for civil works, cable trenching equipment, trucks, all terrain forklifts and mobile cranes.

The final list of plant and equipment would be determined by the construction contractor/s. An indicative list of plant and equipment is provided in Table 3-2

Table 3-2: Plant and Equipment

Equipment	Quantity	Model Type
Pile Driver	10	Gayk HRE 1000 or similar
All terrain fork-lift (tele handler)	10	Manitou MHT-X or similar
All terrain utility vehicle	10	John Deere XUV560 or similar
Backhoe	5	New Holland LB90B or similar
Excavator	4	Cat C13 ACERT or similar
Bulldozer	4	Cat C9.3 ACERT or similar
Scraper	2	Open Bowl Scrapers or similar
Roller	4	Vibratory Soil Compactors
Winches	4	Attached to medium sized dozers or similar
Flatbed truck	5	Isuzu FVZ 1400 or similar
Mobile crane	1 – 2	KATO NK550VR or similar
Elevated work platforms	1	Bravi Lui 460 Elevated Work Platform 280kg Capacity or similar
Semi-trailers and tipper trucks	5	Roadwest End tipper or similar
Tree chipper	1	Vermeer AX19 or similar

Traffic Volumes and Requirements
Section 6.2 provides an indication of the total overall traffic movements anticipated throughout the construction and operational periods. The final traffic haulage route and number would be further detailed in the traffic management plan.

Materials
It is anticipated that PV infrastructure and associated materials would be transported via road from either Newcastle or Port Botany. This would include:

- Galvanized steel and Aluminium solar support structures
- Up to 450,000 Crystalline silicon solar PV panels with Aluminium frame
- 80 Inverters
- Substation components
- 1 x transformer
- 2 x maintenance storage shipping containers
- Copper and Aluminium interconnection cabling
- Chain link perimeter fence with lockable access gates and three barbed wires at the top (1.8m in height)
- CCTV security system, and
- Crash barriers and road signs

Materials associated with earthworks would likely include:

- Gravel / crushed rock to seal the access roads
- Liner with a gravel cap to seal the construction laydown area
- Sand for the bedding of cables that are to be buried throughout the Site
- Materials for shoulder widening including road sub base, concrete, road base, bitumen and gravel
- Drainage pipes, bedding shingle, geotextile, and
- Topsoil

3.4 Operation

The construction phase of the proposal is anticipated to commence in the first half of 2019 and subsequently the operational phase is anticipated to commence in the first half of 2020. Once operational, activities would include daily operations and maintenance. This would include:

- Remote 24/7 on-line monitoring
- Scheduled visual inspections and general maintenance
- Repair and cleaning operations of the PV arrays (as required)
- Replacement of equipment and infrastructure (as required), and
- Land management monitoring and activities including
  - Maintenance of groundcover vegetation
  - Livestock management
  - Weed control
  - Erosion and Sediment control
  - Pest and vermin control

The site will be monitored for security by a local security contractor and this will include 24hr response should a security event occur.

3.4.1 Hours of Operation

The solar farm will generate electricity during daylight hours throughout the year. Daily operations and maintenance by site staff would be undertaken during standard working hours of:

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

Emergency response, inspections and maintenance activities may be required to be undertaken out of hours or night works, however these would be minimised where practicable.

Electricity would be produced by the solar panels during daylight hours and as such may continue to produce electricity outside of standard hours during summer months (i.e. longer days).

There would be no permanent night lighting operating on the Site. The substation will contain lighting to be utilised only during emergency response.

3.4.2 Resourcing Requirements

During the operational phase the proposal will support up to ten operational jobs. Minimal operational plant and equipment will be required for operation of the facility including ad hoc maintenance vehicles (Utility Vehicle or similar) and other equipment associated with the activities outlined above.

On some occasions, such as during a major substation shutdown, additional maintenance staff may be required on site. During operation of the solar farm, water would be required for stock watering and vegetation management which would be supplied from existing on site dams plus existing bore water. When required water may also be trucked onto site.

Emergency firefighting water would be stored in a tank (approx. 20,000L) located adjacent to the maintenance storage containers.

Operational water use is estimated to be approximately 1.5ML/per annum and will be trucked to Site.

3.4.3 Decommissioning

The solar farm has an operational timeline of approximately 25 years following which the infrastructure would be reviewed and either:

- Updated - the plant would be updated for continued use (with the need for any additional approvals or modifications to approvals considered at this time), or
- Decommissioned - the plant will be permanently removed

Should the decision be made to remove the plant, then the Site would be returned as close as possible to its existing condition and will be decommissioned as per standard solar plant isolation and disconnection procedures. Key elements of proposal decommissioning would include:

- The PV arrays would be removed, including the foundation posts
- Materials would be sorted and packaged for removal from the site for recycling or reuse. Most of the solar PV panels would be recyclable
- All equipment would be removed and materials recycled or reused, wherever possible
- All posts and cabling and stabilising infrastructure (concrete footings) would be removed and recycled
- All areas of soil disturbed during decommissioning would be rehabilitated with the aim of meeting the existing (pre-construction) land capability, and
- Traffic required for decommissioning would be similar in type but considerably less in quantity than that required for the construction phase

The substation may remain in place to service the locality subject to review of viability by Essential Energy.

4. Stakeholder Consultation

4.1 Overview

A Community and Stakeholder Engagement Plan (CSEP) was prepared in October 2017 in accordance with The *Community and Stakeholder Engagement Draft Environmental Assessment Guidance Series June 2017* (Draft Guidelines) prepared by Department of Planning and Environment (DP&E). The CSEP documented the objectives of engagement, identification of relevant stakeholders, as well as the community and potential issues associated with the development. The CSEP also included an implementation plan which was updated as required through the duration of the community and stakeholder engagement. Table 6 from the CSEP outlines the implementation plan, which has been the guiding document used throughout stakeholder engagement (Appendix C1).

The objectives of the CSEP included:

- Developing a process for listening to the community and stakeholders regarding concerns over the development
- Providing information of the proposed development including the rationale
- Identifying stakeholders and engaging with them
- Providing the community and other stakeholder with the opportunity to inform design, where required
- Seeking feedback and comments on the proposed development, and
- Identifying engagement requirements through the EIS, Submission, Determination and post approvals stages of the proposed development.

The following is a summary of the engagement undertaken with stakeholders and the community. As a result of the engagement, several elements of design were reconsidered (Section 4.10) and incorporated into the final design.

4.2 Identified Stakeholders

The following stakeholders were identified:

- Adjacent landholders (referred to as Sensitive Receivers see Figure 4-1 and Figure 4-3)
- Maryvale community (via community drop in sessions)
- Dubbo Regional Council
- Government Agencies including
  - Department of Planning and Environment (DP&E)
  - Office of Environment and Heritage (OEH)
  - Department of Primary Industries (Lands)
  - Department of Resources and Geosciences (DRG)
  - Roads and Maritime Service
  - Rural Fire Service
  - Fire and Rescue NSW
- Neighbouring Industry
  - Civil Aviation Safety Authority (CASA)
  - Essential Energy, and

- Mineral Titleholders
- Wellington Local Aboriginal Land Council (LALC)

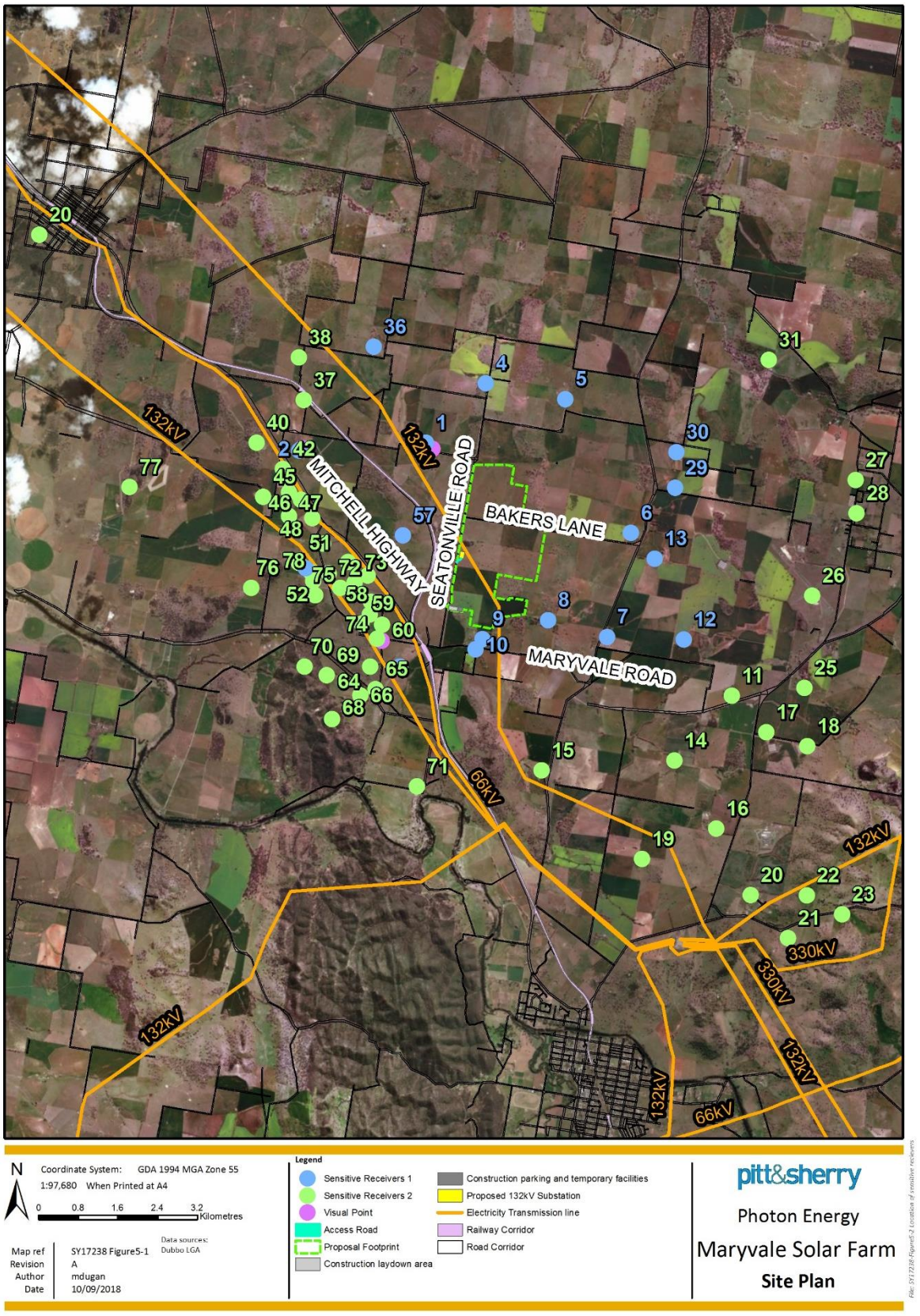

Figure 4-1: Sensitive Receivers

4.3 Government Agency Consultation

pitt&sherry undertook further consultation with relevant government agencies, subsequent to consultation conducted by DP&E. This consultation aimed to seek additional guidance from relevant authorities and clarify items identified in the SEARs as outlined in Table 4-1.

Table 4-1: Summary of Agency Consultation through the development phase

Stakeholder	Date	Details of Engagement	Key Aspects	Outcomes
Department of Planning and Environment (DP&E)	19/12/2017	Meeting	General project update	The meeting involved a review of a series of solar farm projects, with project details presented to DP&E for discussion.
	14/02/2018	Meeting	General project update	The meeting was held to provide an update or progress on each solar farm project site.
	6/7/2018	Teleconference	Aboriginal Heritage Assessment	Diana Mitchell and Natasha Homsey participated in a teleconference between OEH, **pitt&sherry** and DP&E. It is noted that to date the assessment is in compliance with the SEARs.
Roads and Maritime Services (RMS)	Date Unknown	Phone	Traffic Management	Andrew McIntyre, Manager Land Use Assessment, West Region at RMS discussed the proposed solar farm development with SECA Solution (Traffic Management Consultant). The discussion resulted in confirmation that construction activities are the critical phase for assessment, due to heavy vehicles accessing the site via regional and local roads in addition to a high number of construction workers. Recommended actions as follows: - consideration to staff movement post shifts onsite - detail access routes for heavy vehicles - differentiate vehicles and staffing during construction, operational and decommissioning phases - preparation of driver code of conduct - assessment of road safety and alternative transport options, including pedestrian, cyclist and bus route impacts; and detail road upgrades.

Stakeholder	Date	Details of Engagement	Key Aspects	Outcomes
Office of Environment and Heritage (OEH)	27/2/2018	Email	Flooding	Hydrological impacts of the proposed development assessed for the site regarding impacts and potential mitigation to surface water, hydrology and groundwater (if applicable) covered in the EIS and agreed that sections 10 – 14 of the SEAR's are not required for the MSF.
	6/7/2018	Teleconference	Aboriginal Heritage Assessment	Samantha Wynn and Phil Purcell from OEH joined the teleconference with DP&E and **pitt&sherry**. OEH interested in obtaining further information about the proposed impact and an opportunity to provide recommendations for any further assessment/consultation as it occurs. It is noted that to date the assessment is in compliance with the SEARs.
Department of Primary Industries (DPI)	22/10/18	Email	Land Use Conflict Risk Assessment	A copy of the draft Land Use Conflict Risk Assessment (LUCRA) was emailed to DPI for comment.
Fire and Rescue NSW	15/6/2018	Email	Emergency Response Plan	Email request for comments regarding Emergency Response Plan for the proposed development was sent to Fire and Rescue NSW. No response from Fire and Rescue NSW was received.
	27/7/2018	Email	Emergency Response Plan	Subsequent email request for comments regarding Emergency Response Plan for the proposed development was sent to Fire and Rescue NSW. A response was received on 15/8/2018 from Graeme Turnbull offering a meeting to discuss all proposed solar farm developments.
	27/8/2018 – 28/9/2018	Email, phone	Consultation Meeting	Phone and email correspondence regarding securing a consultation meeting time between MSF and Fire and Rescue NSW when design works commence. Fire and Rescue NSW confirmed their interest as stakeholders in the development.

Stakeholder	Date	Details of Engagement	Key Aspects	Outcomes
Rural Fire Services (RFS)	22/11/2017	Site inspection and meeting	Bushfire Risk and Emergency Response Plan	Alastair Patton from Ecological Australia (Bushfire Consultants) liaised with Peter Fothergill, District Officer at RFS Dubbo regarding the MSF. Summary and conclusion as follows: • MSF is a low risk site, fires are usually local, small (200ha maximum on a high Fire Danger Rating) and can be suppressed with direct attack • RFS unlikely to fight a fire within the MSF if one was to occur, nor would RFS go near the solar panels • RFS suggested the MSF should prepare an Emergency Response Plan (ERP); recommended to contact the local Emergency Management Committee when developing the ERP • Once finalise, the ERP should be a simple layout and located in a HAZMAT box at the entrance to the site Further engagement with the Management Committee will occur during preparation of the ERP. Note: RFS responded to the SEAR's with conditions recommended.
	25/9/2018	Email	Bushfire Risk Assessment	The Bushfire Risk Assessment was sent to the RFS Orana team for review (and comment).
Essential Energy	18/5/2017	Phone	Grid Capacity and Connection	MSF liaised with Darren Elliott from Essential Energy regarding the MSF project, the connections and grid capacity.
	19/5/2017	Email	Connection Application	MSF submitted a Connection Application to Essential Energy as per discussion on 18/5/2017.
	24/5/2017	Email, phone	Line Capacity	Further discussion with Essential Energy regarding line capacity.
	10/7/2017, 7/8/2017, 15/8/2017	Emails	Connection Application	MSF communicated with Essential Energy during July and August 2017 to follow up progress of the Connection Application enquiry.
	16/8/2017	Email	Connection Enquiry	MSF received the Preliminary Connection Enquiry response from Essential Energy.

Stakeholder	Date	Details of Engagement	Key Aspects	Outcomes
	8/9/2017, 14/9/2017	Email	Connection Investigation Services Agreement	Confirmation via email regarding progress to the Connection Investigation Services Agreement (CIAS) before the final was received from Essential Energy on 14/9/2018.
	15/9/2017, 13/10/2017	Email	CISA Invoice(s)	MSF and Essential Energy discussion surrounding the CISA invoices, before the invoice was received by MSF on 13/10/2017.
	17/10/2017	Letter	Request for Information (RFI)	RFQ provided to Essential Energy on 3 November 2017 and a response from Essential Energy was received on 13/11/17. This information was used to guide timelines for electrical infrastructure and assessment processes.
	15/11/2017	Email	Executed CISA	MSF received the executed CISA from Essential Energy.
	16/1/2018, 23/1/2018	Emails	Network data pack	MSF liaised with Essential Energy regarding the data pack for the network study, before the network data was received on 23/1/2018.
	26/2/2018	Phone	Connection, line upgrades and contestable works	MSF and Essential Energy discussed connection(s), line upgrades and contestable works.
	13/3/2018	Email	MSF Project	MSF received from Essential Energy documentation regarding the MSF project and associated works.
	23/8/2018	Letter	MSF Project Letter of Support	MSF received from Essential Energy a Letter of Support, confirming the Connection Service Investigation Agreement (CISA) and that the proposed generator connection is feasible. The Letter of Support is available in **Appendix C4**.
	21/8/2018, 30/8/2018	Email, phone	Electrical Infrastructure	MSF, **pitt&sherry** and Essential Energy liaised regarding connection(s), electrical infrastructure and associated works.
Department of Resources and Geosciences (DRG)	21/3/2018	Meeting	Exploration Licences	**pitt&sherry**, MSF and Diana Mitchell (DP&E), via phone, attended a meeting to provide background and an update on property and communication(s) with Magmatic (mineral title holder). Discussed actions

Stakeholder	Date	Details of Engagement	Key Aspects	Outcomes
				requested by licence holders regarding soil sampling. Soil sampling results and letter from Magmatic subsequently noted by DRG in July 2018 (Appendix F).
Civil Aviation Safety Authority (CASA)	16/01/2018	Letter Request to comment on the proposal	Ensure that the solar PV panels are safe and pose no risk to pilots, air traffic controllers, or airport operations.	**pitt&sherry** received an email response on 22/01/2018, stating CASA have no concerns with the proposed development. CASA reviewed the proposal and determined the distance of the development from Dubbo and Bodangora Airports pose little threats to their operation (Appendix F).

4.4 Dubbo Regional Council

MSF and pitt&sherry have held five meetings with Dubbo Regional Council to discuss the development. Meetings have been held at the Dubbo Regional Council offices with the following Council representatives:

14 September 2017

- Darryll Quigley – Statutory Planning Services Team Leader

23 November 2017

- Shannon Starr – Economic Development Officer
- Josie Howard – Manager Economic Development and Marketing
- Darryll Quigley – Statutory Planning Services Team Leader, and
- Musarrat Khan – Senior Development Engineer

6 February 2018

- Darryll Quigley – Statutory Planning Services Team Leader
- Musarrat Khan – Senior Development Engineer, and
- Steven Clayton – Manager Transport and Emergency

30 April 2018

- Musarrat Khan – Senior Development Engineer

19 July 2018

- Darryll Quigley – Statutory Planning Services Team Leader
- Musarrat Khan – Senior Development Engineer
- Steven Clayton – Manager Transport and Emergency, and
- Mano Manokaran – Road Services Engineer

MSF and pitt&sherry attended a meeting with Councillor Ben Shields at Dubbo Regional headquarters on 5/06/2018. Following this meeting, Mayor Ben Shields on behalf of Dubbo Regional Council provided a letter of support for Maryvale Solar Farm. A copy of this supporting letter can be found in Appendix C2.

MSF and pitt&sherry also contacted Dubbo Regional Council (Musarrat Khan) via email and phone on 31/8/2018 to confirm Councils requirements should the Proposal seek to enable B-double access for the route Cobbora Road – Maryvale Road – Seatonville Road. No response was received. The Proponent is not seeking B-double access at this time.

MSF contacted Dubbo Regional Council (Musarrat Khan and Steven Clayton) on 7/8/2018 and again on 21/8/2018 regarding the Bakers Lane closure. Council advised via email on 3/10/2018 that the road closure process was in progress.

Table 4-2 includes the key concerns raised by Dubbo Regional Council from their response to the SEARs and subsequent consultation.

Table 4-2: Key concerns raised by Dubbo Regional Council during consultation

Key concern	Outcome of Engagement
Proposed road upgrades, access and Bakers Lane Closure	MSF is liaising with Dubbo Regional Council regarding cost sharing for the sealing of Maryvale Road and southern portion of Seatonville Road. A pre-project dilapidation survey is scheduled to occur prior to MSF's use of the road shortly before construction commences ensuring baseline data is accurate. MSF is liaising with NSW Water to determine the approval requirements for Maryvale Road waterway crossings. MSF is liaising with RMS regarding the proposed Cobbora Road upgrade as it is a regional road. Traffic impacts are outlined in the Traffic Impact Assessment (Section 6.2). Bakers Lane is a "paper road" (i.e. not formed) and will be de-gazetted by Council and the land sold to an adjacent landholder. Council will continue to liaise with MSF.
Local employment, accommodation and transport, including the cumulative impact of annual events and other proposed developments	Opportunities for local employment and accommodation have been addressed within the Socio-Economic Impact Assessment (Section 6.12). All attempts will be made to hire local resources for undertaking the construction. If this is not possible, skilled employment will be sourced from further afield, most likely Dubbo / within the Region. Some of the temporary workers will stay in Dubbo and be transported to site each day. The Manager Economic Development and Marketing and the Economic Development Officer at Dubbo Regional Council discussed opportunities for involving local industries through industry breakfasts. MSF will participate in these to source local contractors and labour.
Sourcing skilled workers, potential opportunities for sponsorship in workforce training programs	MSF is coordinating with the Manager Economic Development and Marketing and the Economic Development Officer at Dubbo Regional Council to understand how best to engage with the local community on future employment opportunities. MSF has engaged Skillset and coordinated with the Local Central Network on other projects in the State and intends to follow this process if the proposal is approved. In addition, MSF are recording enquiries regarding working on the solar farm through targeted communication methods including updating project websites to allow interested workers to submit their details and interest in working on projects. Numerous interested workers attended the community drop in

Key concern	Outcome of Engagement
	session on Thursday 19 July 2018, during which their contact details were recorded.
Noise and dust during construction	Dust mitigation has been addressed within the Air Quality Assessment (Section 6.211). Noise impacts and mitigation measures have been assessed in the Noise Impact Assessment (Section 6.9). Mitigation will include standard construction hours, a water truck on site to wet down the site if required and coordinated drilling activities to minimise impact.

Consultation with Dubbo Regional Council revealed other concerns to be addressed within the assessment of environmental impacts. Concerns and how they were addressed by pitt&sherry are outlined below in Table 4-3.

Table 4-3: Moderate concerns raised by Dubbo Regional Council through consultation

Concern	Outcome
Bush fires as a result of construction activities such as welding, angle grinding etc	All bushfire related impacts of construction activities during the development have been covered in the Bushfire Risk Assessment (Section 6.8).
Substation sub-division	Dubbo Regional Council outlined that sub-division is required for public infrastructure and Essential Energy require freehold title. Dubbo Regional Council is in agreeance that sub-division be addressed in the EIS as part of the SSD approval process.
S94 of the EP&A Act enabling Council's to levy for public amenities and services as a consequence of development.	Dubbo Regional Council appreciates that the MSF wont trigger S94 Contribution requirements and suggested developing a community benefit fund in lieu of a S94 Contribution.
Output from agricultural land	All agricultural land related impacts of construction activities during the development have been covered in the Draft Land Management Plan (Appendix L).
Visual impact	Discussed visual impact from Mitchell Highway in light of the expanded footprint. Dubbo Regional Council had no concerns with the photomontages presented and noted the temporary impact on road users. Visual impacts associated with the project have been addressed in Section 6.5.

4.5 Aboriginal Consultation

The Aboriginal Heritage Assessment included consultation with the Wellington Local Aboriginal Land Council (WLALC), whereby two representatives, Mike Nolan and Adam Peckham participated in field surveys in February and August 2018.

Seven Aboriginal archaeological sites were identified near to the proposed Maryvale Solar Farm. The sites are not located within the proposed development footprint. The seven sites are located within the riparian corridors of Bodangora Creek and the unnamed tributary of Maryvale Creek.

No impact to Aboriginal heritage will occur as a result of the proposed Maryvale Solar Farm or proposed road upgrade works related to the Maryvale Solar Farm development as all seven sites will be retained within riparian corridors and will be avoided as part of the solar farm development.

Further, the WLALC had no objections to the proposed solar farm development provided that impacts to the archaeological sites are avoided. WLALC have provided a written report summarising the consultation, available in Appendix B of the Aboriginal Archaeological Assessment which can be found in Appendix F of this EIS.

4.6 Mineral Titleholders Consultation

As requested by DP&E in the SEARS, Table 4-4 outlines the engagement outcomes of consultation with potentially impacted exploration licence holders, quarry operators and mineral title holders. Magmatic Resources Limited was identified as a potentially impacted exploration licence holder, as their licences EL8357 and EL6178 intersect a section of the proposed MSF as shown on Figure 4-2.

Table 4-4: Engagement outcomes of consultation with potentially impacted mineral title holders

Title Holder	Outcome of Engagement
Magmatic Resources Limited	In November 2017, pitt&sherry contacted Magmatic via phone and then a follow up email with relevant proposal information attached. On 12th December 2017, pitt&sherry received a letter response from magmatic objecting to the proposal (Appendix C3). During January and February 2018, pitt&sherry liaised with Magmatic in order to confirm a meeting time. On 7/2/2018, representatives from MSF and pitt&sherry met with the Exploration Manager Steven Oxenburgh. It was proposed that soil tests were to be undertaken at a cost to MSF to prove that the Site did not have potential for substantial extractable minerals. MSF agreed to perform testing and completed soil surveys in May 2018. Results of the soil surveys and previous assessment of the site area performed by Magmatic led them to draw the conclusion that 'the Project will not conflict with our current exploration activities', as stated in their letter in Appendix C3.

Figure 4-2: Mineral Titleholder Licences

4.7 Community Engagement

The CSEP documents the methodology for community engagement and can be found in Appendix C1. During the progression of the project, the engagement methodology was adapted to maximise outcomes. Table 4-5 provides a summary of the engagement conducted to date across multiple communication platforms, highlighting community concerns where relevant. Figure 4-1 provides indication of all the sensitive receivers consulted with during this process. Figure 4-3 identifies the adjacent landholders and sensitive receivers with moderate-high impact.

Figure 4-3: Maryvale Solar Farm Adjacent Landholders and Moderate - High Impact Stakeholders

In addition to stakeholders identified within the CSEP, other receivers were identified by undertaking the following actions:

- Development of an attendance register at Community Meeting on the 13th of September 2017
  - Attendance register allowed for the collection of contact details for interested community members, for future direct updates
  - Of the 4 attendees at the community meeting, all 4 provided their contact details
  - Of the 4 attendees, 2 were identified as sensitive receivers. One of these 2 sensitive receivers identified as moderately visually impacted (or above). An offer for a one on one meeting(s) with this receiver was made
- Development of an attendance register at Community Information Drop in Session on the 19th of July 2018
  - Attendance register allowed for the collection of contact details for interested community members, for future direct updates
  - Out of the 14 attendees at the community meeting, 10 provided their contact details
  - From this list, contact details for 2 out of the 14 attendees were identified as sensitive receivers, moderately visually impacted or above. One of these are associated with the Proposal
- Updates provided by the Maryvale Solar website (www.photonenergy.com.au/current-projects/maryvale-solar-farm), and the option for contact through the website as well as a dedicated hotline (1300 881 045) and email maryvalesolarfarm@photonenergy.com, also allowed for interested community members to voice their queries and/or concerns by a number of methods
- Development of a project update in the July Project Fact Sheet (Appendix C5). Copies of this were given to residents attending the July community information session, as well as posted to the wider community via mail (53 posted)
- pitt&sherry contact details were provided via business cards and the July Project Update flyer during the first round of one on one community consultation meetings in July 2018. These contact details have since been shared with community members through word of mouth, offering the community another mechanism to provide input

Over the course of the consultation period to date, a total of 18 community members were present during open community consultation sessions, 70 residents within the locality of the site were contacted either through letters, emails or phone calls, and 7 neighbouring residents have participated in a group or one on one meeting. A summary is provided in Table 4-5.

Table 4-5: Summary of community engagement performed to date

Stakeholder	Communication method	Date	Action / Evidence
General Community	Newspaper Advertisement	30/8/2017	Advertisement posted by MSF in the Wellington Times. The post invited members of the community to participate in the community meeting at the Lion of Waterloo to be held the evening of the 13th September, see Appendix C6.

Stakeholder	Communication method	Date	Action / Evidence
	Newspaper Advertisement	11/7/2018	Advertisement posted by MSF in the Wellington Times. The post invited members of the community to participate in the community drop in session at the Wellington Civic Centre from 4-7pm on the 19th July, see Appendix C7.
General Community	Community Meeting at the Lion of Waterloo	13/9/2017	A total of 4 local residents attended the initial meeting. A presentation was given by MSF on the proposed development. Questions from attendees related to connection to the powerline or substation, sale of the energy, number of panels to be installed, other solar farms being developed by the Proponent and the possibility of merging sites. Enquiries were received relating to expected life of the solar farm, decommissioning, infrastructure removal and site rehabilitation. One comment from an attendee related to visual impact. Meeting Minutes are provided in Appendix C6.
	Community Information Drop In Session at Wellington Civic Centre	19/7/2018	A total of 14 community members attended the drop-in session. Of the 14 who attended, 10 provided contact and address/postal details. The majority of attendees were construction workers currently engaged on the Bodangora wind farm construction project, interested in construction timing, opportunities for employment and details regarding the construction management process. Remaining attendees were local landholders. Comments were generally positive regarding the Maryvale Solar Farm. Community questions related to why the site was chosen, size of the project encompassing land area, megawatts and panel dimensions, construction timing and process, ability to graze sheep amongst the panels, weed management and bushfire management.
General Community	Email	18/7/2018	Email sent to 7 community members (included in this email were sensitive receivers 70, 49 and 15) who had registered their details as interested community members. Email contained the project fact sheet July project update and advised of the community drop in

Stakeholder	Communication method	Date	Action / Evidence
			session held in July 2018. Fact sheet available in Appendix C5.
General Community	Website	Permanent	Project updates, information, frequently asked questions (FAQ's) and their responses are available on the Maryvale Solar Farm project webpage. The community are able to interact with MSF using a 'contact us' form or the provided contact details (email and phone).
		During July 2018, ongoing until removed	pitt&sherry on behalf of MSF arranged for details of the July community information drop in session to be published on two community websites, Dubbo events and Wellington Tourism, available as shown in Appendix C7.
General Community	Phone	From March – May 2018	pitt&sherry on behalf of MSF have responded to three enquiries from the general community to the hotline phone number. An enquiry on 9/3/2018 related to operations timelines and a subsequent two enquiries on 7/5/2018 and 29/5/2018 from a local security firm offering services (sales call).
Adjacent Landholders	Phone	6/7/2018	pitt&sherry spoke with sensitive receiver 8, twice regarding confirming a time for a one on one session during the consultation period.
		6/7/2018	pitt&sherry left a voicemail message with sensitive receiver 7 regarding confirming a time for a one on one session during the consultation period.
		10/7/2018	pitt&sherry spoke with sensitive receiver 7 regarding confirming a time for a one on one session during the consultation period.
		13/7/2018	pitt&sherry spoke with sensitive receiver 8, after which the landholder confirmed they had no further interest in a one on one meeting but indicated potential presence at the community information drop in session, pending availability closer to the date.
		13/7/2018	pitt&sherry left a voicemail for sensitive receiver 7 regarding confirming a time for a one on one session during the consultation period.

Stakeholder	Communication method	Date	Action / Evidence
		16/7/2018	pitt&sherry spoke with sensitive receiver 36 who apologised for not replying to the email but confirmed unavailability for both 18/7/18 and 19/7/18. Sensitive receiver indicated interest in engagement via email or phone instead.
		16/7/2018	pitt&sherry spoke with sensitive receiver 62 who was not interested in a one on one meeting but indicated potential presence at the community information drop in session. Sensitive receiver noted interest in road management and fire risks relating to the development.
		16/7/2018	pitt&sherry spoke with sensitive receiver 7 twice regarding re-confirming a time for a one on one session during the consultation period.
Adjacent Landholders	One on one meeting	18/7/2018	MSF and pitt&sherry met with sensitive receivers 1, 2, 4 and 7. A detailed summary of the concerns raised by these receivers can be found below in Table 4-6.
		18/7/2018	pitt&sherry visited sensitive receivers 3 and 51; at both properties, the front door was unanswered. A copy of the July project update fact sheet was left under the front door with a pitt&sherry business card. To date, sensitive receiver 3 and 51 have not made contact with the hotline.
		19/7/2018	pitt&sherry met with sensitive receiver 6. A detailed summary of the concerns raised by these receivers can be found below in Table 4-6.
Adjacent Landholders	Letter	20/12/2017	A letter was sent to all 4 registered attendees of the community meeting held on 13/09/2017 detailing a project update. This letter included a summary of work achieved since the community meeting regarding environmental assessment and community consultation, as well as an anticipated timeline for the next steps in accordance to the approval pathway. The Letter is provided in Appendix C5.
		2/3/2018	Letters sent to sensitive receivers 2, 5, 6, 9 and 10. The letter contained a project update regarding Geotech testing and is provided in Appendix C5.

Stakeholder	Communication method	Date	Action / Evidence
		10/7/2018	Letters sent via express post on 10/7/2018 to sensitive receivers 2, 5, 6, 10, 12, 13, 30 and 57 with a visual impact rating of medium or high. The letters dated 9/7/2018 offered an opportunity to meet for a one on one meeting with MSF and pitt&sherry and is provided in Appendix C5.
		10/7/2018 and 13/7/2018	July project update fact sheet was posted to all other nearby sensitive receivers, to a total of 53 properties.
Adjacent Landholders	Email	20/12/2017	Project update letter was sent via email to adjacent landholders and interested community members and is provided in Appendix C5.
		6/7/2018	pitt&sherry emailed sensitive receiver 8 to organise a one on one meeting during July and to promote event details for the community information drop in session.
		10/7/2018	pitt&sherry emailed sensitive receiver 7 to organise a one on one meeting during July and to promote event details for the community information drop in session.
		10/7/2018	pitt&sherry emailed sensitive receiver 36 to organise a one on one meeting during July and to promote event details for the community information drop in session.
		10/7/2018	pitt&sherry emailed sensitive receiver 62 to organise a one on one meeting during July and to promote event details for the community information drop in session.
		10/7/2018	pitt&sherry emailed a combined total of 7 adjacent landholders. The email contained the July project update fact sheet and a reminder with details of the community information drop in session. Of these 7 landholders, 4 were sensitive receivers.
		13/7/2018	pitt&sherry confirmed via email the details of the phone call with sensitive receiver 8 and encouraged distribution of hotline details via word of mouth.
		16/7/2018	pitt&sherry confirmed via two emails the details of the one on one meeting with sensitive receiver 7, reconfirming the timeslot when this changed as advised by the sensitive receiver.
		17/7/2018 – 25/7/2018	Sensitive receiver 36 advised unable to attend engagement sessions. pitt&sherry subsequently confirmed via email

Stakeholder	Communication method	Date	Action / Evidence
			additional detail regarding bushfire control, security around the development, access upgrade and repair on surrounding roads, replacement of any removed trees.
		18/7/2018	pitt&sherry sent a reminder email to four interested community members containing the details of the community information drop in session.
		8/8/2018	pitt&sherry sent a copy of the Wind Farm Land Valuation Impacts Report to sensitive receiver 7 as per discussion at the one-on-one consultation.
Adjacent Landholders	Email	19/9/2018 and 21/9/2018	pitt&sherry responded to sensitive receiver 36's enquiries relating to bushfire control, vegetation control, details of the Emergency Response Plan, water storage, staffing arrangements, tree removal, flooding, security and traffic.

Table 4-6 provides a detailed summary of the discussions undertaken for each of the sensitive receivers that accepted one on one consultation request (18 – 19 July 2018). During this round of consultation, the July Project Update fact sheet, a map, photomontages and an updated site layout were provided for discussion with the sensitive receivers.

Table 4-6: Summary- one on one consultation with sensitive receivers 18 – 19 July 2018

Sensitive Receiver	Concerns Raised
1	No specific concerns raised, rather the receiver indicated support for the project to proceed, referencing other wind and solar farms have been positive initiatives. Sensitive receiver had general enquiries regarding the truck types and deliveries, construction process and timing, decommissioning process and other solar projects in the region.
2	No specific concerns raised, rather the receiver indicated support for the project to proceed. Sensitive receiver had general enquiries regarding potential glare, lease arrangements and project timing.
3	No response received to offers of one on one meeting. No one home on 18/7/2018 when a door knock was performed. Business card and July Project Update Fact Sheet left under the door.
4	No specific concerns raised, rather the sensitive receiver indicated support for the project to proceed.
6	No specific concerns raised, rather the sensitive receiver indicated the project was of no concern to the household.
7	Sensitive receiver concerned that cumulative impacts from a number of projects in the area (AGL, Solar First, Photon and Bodangora Wind Farm) would impact property value. **Land value:** Sensitive receiver seeking a guarantee that the MSF project would not devalue their land (fifth generation family farm asset), impacting equity and ability to

Sensitive Receiver	Concerns Raised
	borrow money. MSF provided the Wind Farm Land Valuation Impacts Report to the sensitive receiver. **Compensation:** Sensitive receiver enquired about possibility of compensation for any devaluation of land. **Cropping:** Quite concerned about the impact on cropping cessation throughout the life of the project and sceptical about grazing sheep under the panels. Sensitive receiver was sceptical that cropping would return post decommissioning. **Road upgrades, traffic and safety:** Enquired about road upgrades, specifically mentioned the impact on Cobbora Road and were concerned from a safety perspective with the increase in truck movements. Sensitive receiver was shown the Roads Concept Plan. Sensitive receiver also enquired generally regarding site operation and ownership, fire management and long-term economic benefits for the local community and economy.
51	No response received to offers of one on one meeting. No one home on 18/7/2018 when a door knock was performed. Business card and July Project Update Fact Sheet left under the door.

4.8 Media

Two articles featuring the Maryvale Solar Farm were published by the Wellington Times during preparation of the EIS and community engagement, dated 30/10/2017 and 28/2/2018. An article featuring the Maryvale Solar Farm was published in the Western Advocate on 31/1/2018. A subsequent article relating to the Maryvale Solar Farm was published in the Western Magazine on 17/4/2018.

The community information drop in session held on Thursday 19 July 2018 was advertised on community, tourism and events webpages such as www.dubbo.com.au and www.visitwellington.com.au. Drop in session details were provided to local radio station Binjang 91.5 Radio for promotion in community news segments.

Community members also expressed their opinions on the proposed development through social media platforms, such as Facebook and the Maryvale Solar Farm website (www.photonenergy.com.au/current-projects/maryvale-solar-farm) between November 2017 and February 2018. Media examples are available in Appendix C6 and C7.

4.9 Summary of Actions

Table 4-7 outlines the actions taken to date as a response to the concerns raised by Maryvale community members during consultation. As consultation is an ongoing process, actions will continue to be performed during the remainder of the submission process.

Table 4-7: Summary of actions taken to date to address key concerns raised

Concern	Actions	Response to key issues
Road upgrades, access and closures	MSF is liaising with Dubbo Regional Council regarding Maryvale Road and the southern portion of Seatonville Road. A pre-project dilapidation survey is scheduled to occur prior to MSF's use of the road, shortly before construction commences, ensuring baseline data is accurate.	Further detail and mitigation measures have been identified in the Traffic Impact Assessment in Section 6.2.

Concern	Actions	Response to key issues
	MSF is liaising with RMS regarding the proposed Cobbora Road upgrade as it is a regional road. Traffic impacts are outlined in the Traffic Impact Assessment in Section 6.2.	Continued liaison with relevant stakeholders as required.
Property devaluation	Following on from the July one on one consultation, MSF and pitt&sherry liaised with sensitive receiver 7 and provided a copy of the Wind Farm Land Devaluation Study for their review. The Study provided information regarding the land devaluation issue identified during the one on one consultation in July 2018.	Copy of Wind Farm Land Devaluation Study provided to sensitive receiver 7 and devaluation issues discussed.
Internal waterway crossing	Waterway crossings are exempt under State Significant Development (Section 5.4.1).	No internal waterway crossings are anticipated to be required. Should crossing of internal waterways be required it would be addressed in the Construction or Operational Soil and water Management Plan as outlined in Section 6.7.
Bushfire management	Several sensitive receivers enquired regarding bushfire management. pitt&sherry and MSF reiterated the mitigation measures to sensitive receivers as will liaise with the RFS Emergency Management Committee when developing an ERP, as outlined in Table 4-1.	Liaised with sensitive receivers as required. To liaise with the Management Committee as per RFS' recommendation during compilation of an ERP.
Land use	Several sensitive receivers engaged during one on one consultations enquired regarding land use, specifically the impact on cropping cessation throughout the life of the project, grazing sheep under the panels and land rehabilitation during decommissioning.	Land use assessment and mitigation has been addressed within Section 6.4.

4.10 Changes in Design

Through the development of the project several changes were made to optimise preliminary design and minimise impact on the local community and environment. These changes included:

- Revised layout of the MSF with footprint expanded from 150ha to 375ha to cater for larger area required for single axis tracker solar system
- Expanded footprint of the MSF with extensions to the east and south to avoid waterway impacts
- Upgrades to Cobbora Road, Maryvale Road and Seatonville Road to facilitate safe access during construction and provide a long term community benefit, and

- Planning for screening vegetation to reduce visual impacts

4.11 Ongoing Community Consultation

MSF are committed to continual engagement with members of the community and interested stakeholders. This will be achieved through maintaining the current platforms for contact such as the enquiries hotline (1300 881 045), enquiries email and the Maryvale Solar Farm project website. An email notifying the dates of public exhibition will be distributed to all community members who registered at the community meeting, all sensitive receivers and to the residents identified through the community consultation process.

5. Planning Context

5.1 Planning Pathway

Under Schedule 1, Part 20 of the *State Environmental Planning Policy (State and Regional Development) 2011* electricity generating works with a capital investment value of more than $30million, or a capital investment of more than $10million and located in an environmentally sensitive area of State significance, are deemed State Significant Developments (SSDs). The Proposed solar farm exceeds the $30million capital investment (Section 1.5) value and is therefore a declared SSD.

The proposal to construct and operate the Maryvale Solar Farm requires development consent under Part 4 of the *Environmental Planning and Assessment Act 1979* (EP&A Act). In accordance with section 4.12 of the *Environmental Planning and Assessment Act 1979* (EP&A Act), a SSD requires an Environmental Impact Statement (EIS) to be submitted in tandem with the development application.

On 21 September 2017, the proponent submitted a Preliminary Environmental Assessment along with a request to the Secretary for the Secretary's Environmental Assessment Requirements (SEARs), as required by clause 3 of Schedule 2 of the *Environmental Planning and Assessment Regulation 2000* (EP&A Regulation). In formulating the environmental assessment requirements, requests were sent to relevant public authorities and agencies to inform the key issues raised in Section 4. The SEARs were issued to MSF on the 13 October 2017 (Appendix C1) and are summarised in Appendix D including cross reference to where it has been addressed within this EIS.

This EIS complies with the requirements prescribed within the SEARs, and the environmental assessment requirements contained in Schedule 2 of the EP&A Regulation.

Part 4, Section 4.37 of the EP&A Act designates the Minister for Planning and Infrastructure as the approval authority for SSD however section 2.4 of the EP&A Act enables the Minister to delegate the consent authority function to the Independent Planning Commission (IPC), the Secretary or to any other public authority.

5.2 Evaluation of the Development

Section 4.15 of the EP&A Act applies to the determination of development applications for a SSD. Under Section 4.15, the consent authority is required to consider a number of matters when determining a development application under Part 4 (EP&A Act). These matters are listed in Table 5-1 and assessed in terms of their relevance to the proposal.

Table 5-1: Matters of consideration

Provision	Relevance to the Proposal
Any environmental planning instrument	Relevant environmental planning instruments (EPIs) are discussed in Sections 5.4 to 5.6. They include: • *State Environmental Planning Policy (State and Regional Development) 2011* • *State Environmental Planning Policy (Infrastructure) 2007* • *State Environmental Planning Policy (Rural Lands) 2008* • *State Environmental Planning Policy No. 55 – Remediation of Land, and* • *Wellington Local Environmental Plan 2012*

Provision	Relevance to the Proposal
Any proposed instrument that is or has been the subject of public consultation under the EP&A Act and that has been notified to the consent authority	There are no draft instruments relevant to the proposal
Any development control plan	Clause 11 of the State and Regional Development (SRD) SEPP 2011 prescribes that development control plans do not apply to SSD.
Any planning agreement that has been entered into under Section 93F, or any draft planning agreement that a developer has offered to enter under Section 93F	There are no planning agreements that have been entered into, or proposed, with regards to this proposal.
The regulations (to the extent that they prescribe matters for consideration)	Clause 92 of the EP&A Regulation requires consideration of: • The Government Coastal Policy, for development application in certain local government areas • The provisions of AS 2601 for development applications involving the demolition of structures, and • The provisions of a subdivision order and a development plan for development of land that is subject to a subdivision order None of the above are included as part of the proposed Maryvale Solar Farm. • The provision of development under the Dark Sky Planning Guideline This Planning guideline was originally applied to the Dubbo Council LGA as it was within the prescribed distance from the Sidings Springs Observatory at Coonabarabran. Prior to the amalgamation of Wellington and Dubbo LGA's, this guideline did not apply to areas within the Wellington LGA. The development does not involve installation of lights that will be operational all night. Emergency lighting and sensor lights will be installed to assist with any emergencies. The type of light globe and their orientation will be in accordance with this guideline.
Any coastal zone management plan (within the meaning of the *Coastal Protection Act 1979),* that apply to the land to which the development application relates	The Proposal is not within an area mapped as a Coastal Zone under the *Coastal Protection Act 1979*. Therefore, any additional considerations under this act are not relevant to the Proposal.
The likely impacts of that development, including environmental impacts on both the natural and built environments, and social and economic impacts in the locality	The likely impacts of the proposal, including environmental (built and natural), social and economic impacts in the locality, are detailed in Sections 6 to 9 of the EIS. This EIS demonstrates that the environmental impacts of the proposal have, wherever feasibly possible, been avoided, minimised or mitigated through careful proposal design and detailed mitigation measures summarised in Section 8.
The suitability of the site for the development	The suitability of the Site for the proposal is discussed in Sections 6 to 9

Provision	Relevance to the Proposal
Any submissions made in accordance with this Act or the regulations	The proponent is committed to address any submission made in relation to the Maryvale Solar Farm. Consultation with stakeholders that has been undertaken during the planning stages are summarised in Section 4.
The public interest	The proposal is in the interest of the public for the following reasons: • It will assist in the reduction of greenhouse gas emissions to further combat climate change • It will provide a source of clean electricity generation • It will directly contribute to aiding Australia in meeting the RET, and • It will create localised economic benefits for the region, including employment, stimulation of local business' and diversification of land use, developing new skills in a growing industry A Community and other Stakeholder Engagement Plan (CSEP) was prepared and the outcomes of consultation undertaken in accordance with the plan is provided in Section 4. This plan aims to inform the community and stakeholders about the proposal and their role in providing input into the assessment and development process.

5.3 Commonwealth Legislation

There are several issues of Commonwealth interest relevant to the proposal and they are dealt with under the following legislation.

5.3.1 Environment Protection and Biodiversity Conservation Act 1999

The *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) is administered by the Commonwealth Department of the Environment and Environment (DoEE) and provides a legal framework to protect and manage nationally important flora, fauna, ecological communities and heritage places defined as '*matters of national environmental significance'* (MNES). An action that "*has, will have or is likely to have a significant impact on a matter of National Environmental Significance"* may not be undertaken without prior approval from the Commonwealth Minister as provided under Part 9 of the EPBC Act.

A referral must be made for actions that are likely to have a significant impact on the following matters protected by Part 3 of the EPBC Act:

- World heritage properties
- National heritage places
- Wetlands of International importance
- Listed nationally threatened species and ecological communities
- Listed migratory species
- Commonwealth marine areas
- The Great Barrier Reef Marine Park
- Nuclear actions including uranium mining, and
- Water resources in relation to coal seam gas or large mining development

World Heritage Properties

The Site does not contain any World Heritage Properties and is not in close proximity to any such area. On this basis, the Proposal will not impact upon any World Heritage Property either directly or indirectly.

National Heritage Places

The Proposal Area does not contain any National Heritage Places and is not in close proximity to any such area. On this basis, the Proposal will not impact upon any National Heritage Place either directly or indirectly.

Wetlands of International Importance (Declared Ramsar Wetlands)

The Proposal Area is not located within any Wetlands of International Importance. The site is however downstream of four Ramsar wetlands, all of which are located upstream of the proposed development and not likely to be impacted. The closest of these is the Macquarie Marshes which is 150-200 km upstream of the site. On this basis, the Proposal will not impact upon any Wetlands of International Importance either directly or indirectly.

Great Barrier Reef Marine Park

The Great Barrier Reef Marine Park does not occur within or near to the Proposal Area. On this basis, the Proposal will not impact upon any areas of the Great Barrier Reef Marine Park.

Commonwealth Marine Areas

The Site is not located within a Commonwealth Marine Area and is not in close proximity to any such area. On this basis, the Proposal will not impact upon any Commonwealth Marine Area.

Listed Threatened Ecological Communities

Two Threatened Ecological Communities (TEC) listed under the EPBC Act have been recorded within a 5 km radius of the Proposal. These are:

- White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland (Critically Endangered), and
- Grey Box (*Eucalyptus microcarpa*) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia (Endangered)

A patch of remnant Yellow Box Woodland (approximately 3.1ha) occurs adjacent Seatonville Road and the existing Essential Energy easement. Survey of this area of vegetation determined it best matches the EPBC Act White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland TEC.

This patch of remnant Yellow Box Woodland will not be impacted by the development as it is excluded from the development footprint.

Nationally Listed Threatened Species

A total of 30 threatened species listed under the EPBC Act have been recorded or have suitable habitat within a 10km radius of the Proposal. None were recorded during survey of the site.

Of the eight listed threatened flora species, none are likely to occur on the Site due to the absence of suitable habitat.

Of the 22 threatened fauna species potentially occurring in the area, only the Regent Honeyeater and Swift Parrot have any probability (low for both) of occurring on site. The Site is unsuitable for breeding by the Regent Honeyeater and the Swift Parrot as they are winter migrants to the mainland, breeding only in Tasmania. Potential food resources on the Site are limited to scattered mature White Box trees and small plantings of mixed eucalypts. These trees are unlikely to be attractive to either species given their isolation

and the preference of both birds for intact woodland and forest habitats. In addition to this, the fauna impact assessment conducted for the Site identified that no threatened fauna is likely to be affected to the point that a local population would be placed at risk of extinction (refer Section 6.1).

Nationally Listed Migratory Species

Two migratory species listed under the EPBC Act have been recorded or have potential suitable habitat within a 10km radius of the Proposal, Eastern Curlew and Curlew Sandpiper.

No migratory species listed under the EPBC Act were recorded nearby the Subject Land during the current surveys. The Proposal is unlikely to significantly impact any listed migratory species under the EPBC Act as the Site does not possess any suitable habitat.

Nationally Listed Marine Species

Only one marine species listed under the EPBC Act is considered to have potential to occur, Swift parrot, which is also listed as critically endangered. This is considered to have a low probability to occur but is not a consideration as a marine species as no Commonwealth Marine Area is impacted by the proposal.

5.3.2 Native Title Act 1993

The *Native Title Act 1993* recognises that Aboriginal people have rights and interests to land and waters which derives from their traditional laws and customs. Native title may be recognised in places where Indigenous people continue to follow their traditional laws and customs and have maintained a link with their traditional country. It can be negotiated through a Native Title Claim, an Indigenous Land Use Agreement (ILUA) or future act agreements.

An ILUA is an agreement between a native title group and other parties who use or manage the land and waters. The ILUA process allows for negotiation between indigenous groups and other parties over the use and management of land and water resources, and the ability to establish a formal agreement. An ILUA is binding once it has been registered on the Native Title Tribunal's Register of Indigenous Land Use Agreements.

Searches of the National Native Title Register, the Register of Native Title Claims, and Native Title Applications Registration Decisions and Determinations, in May 2018 identified no current applications or determinations within Dubbo Regional Council LGA (Wellington area) that are relevant to the Site.

Section 6.3 outlines management and mitigation measures that will be implemented as part of the Proposal to ensure protection of any un-expected Indigenous heritage finds.

5.3.3 Renewable Energy (Electricity) Act 2000

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

- Encourage the generation of electricity from renewable sources
- Ensure renewable energy sources align with the principals of Ecologically Sustainable Development
- Reduce GHG emissions produces by the electricity sector, and
- Solar energy is listed as an eligible renewable energy source under Section 17 of this Act

The proposed Solar Farm aligns with the aims of *the Renewable Energy (Electricity) Act*, such that it will generate significant quantities of renewable energy, whilst emitting negligible GHG emissions. The principles of Ecologically Sustainable Development have been addressed Section 9.4.

5.4 New South Wales

5.4.1 Environmental Planning and Assessment Act 1979

The EP&A Act is the principal piece of legislation covering assessment and determination of development proposals in NSW. It aims to encourage the proper management, development and conservation of resources, environmental protection and ecologically sustainable development. The development assessment and approval system in NSW is set out in Parts 4 and 5 of the EP&A Act.

As noted in Section 5.1, the Proposal is classified as SSD in accordance with the State and Regional Development (SRD) SEPP and development consent is being sought under Part 4 of the EP&A Act.

The relevant objectives under the EP&A Act for this development are to:

- 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
- To facilitate ecologically sustainable development by integrating relevant economic, environmental and social considerations in decision-making about environmental planning and assessment
- Encourage the promotion of and co-ordination of the orderly and economic use and development of land
- Encourage the protection of the Environment, including the conservation of threatened and other species of native animals and plants, ecological communities and their habitats
- To promote good design and amenity of the built environment and
- Provide increased opportunity for public involvement and participation in environmental planning and assessment

These objectives have been considered throughout the site selection and environmental assessment process. This Proposal aims to promote the orderly and economic use of land through the provision of utility services (power generation). During the site selection process, the location and design of the solar farm were considered, such that it would avoid protected areas and generally minimise the use of natural and artificial resources. Stakeholder consultation and engagement with the community began as early as feasible, to allow for public involvement and participation throughout the environmental assessment process.

Authorisations not required for approved SSD
Section 4.41 of the EP&A Act identifies authorisations that are not required for approved SSD. These are:

- Concurrence under Part 3 of the *Coastal Protection Act 1979* of the Minister administering that Part of that Act
- A permit under sections 201, 205 or 219 of the *Fisheries Management Act 1994*
- An approval under Part 4, or an excavation permit under Section 139, of the *Heritage Act 1977*
- An Aboriginal heritage impact permit (AHIP) under Section 90 of the *National Parks and Wildlife Act 1974*
- A bush-fire safety authority under Section 100B of the *Rural Fires Act 1997,* and
- A water use approval under Section 89, a water management work approval under Section 90 or an activity approval (other than an aquifer interference approval) under Section 91 of the *Water Management Act 2000*

Authorisations required for approved SSD
Under Section 4.42 of the EP&A Act, certain approvals that may normally be required for carrying out certain development "*cannot be refused if it is necessary for carrying out State Significant Development that is authorised by a development consent*…", these being:

- An aquaculture permit under Section 144 of the *Fisheries Management Act 1994*

- An approval under Section 15 of the *Mine Subsidence Compensation Act 1961*
- A mining lease under the *Mining Act 1992*
- A production lease under the *Petroleum (Onshore) Act 1991*
- An environment protection licence under Chapter 3 of the *Protection of the Environment Operations Act 1997* (for any purposes referred to in section 43 of that Act)
- A consent under section 138 of the *Roads Act 1993, and*
- A licence under the *Pipelines Act 1967*

The only one of these likely to be required is a consent for works within the road reserve.

5.4.2 Environmental Planning and Assessment Regulation 2000

The EP&A Act and the EP&A Regulation provide the overarching structure for planning in NSW.

Clause 256P of the EP&A Regulation requires an accurate estimate of the capital investment value (CIV) of the development. A copy of the CIV report and the letter of landowner consent was provided to DP&E.

Division 6 (clauses 82 to 85B) specifies the conditions for public participation in SSD proposals. The Proposal and accompanying information (including this EIS) will be placed on public exhibition by DP&E for at least 30 days and the public must be appropriately notified of the application. Preparation of a response to issues raised in submissions to be submitted to the secretary, if required.

Clause 92 of the EP&A Regulations requires that the consent authority must consider certain matters when determining development applications (Section 5.4.2).

Clause 228 of the EP&A Regulation lists the factors that must be taken into account concerning the impact of an activity on the environment. These factors have been considered during preparation of the EIS.

Schedule 2 of the EP&A Regulation provides the requirements of Environmental Impact Statements, which provide the basis for the Secretary's Environmental Assessment Requirements (SEARs) issued for proposals. The relevant sections in the EIS are referenced against each of the SEARs in Appendix D. Clause 6 and 7 of Schedule 2 specifies the form and content requirements of the EIS.

5.4.3 Protection of the Environment Operations Act 1997

The *Protection of the Environment Operations Act 1997* (POEO Act) is administered by the Environmental Protection Authority (EPA) and includes provisions relating to the protection of the environment.

One of the objectives of the Act is to protect, restore and enhance the quality of the environment in NSW, having regard to the need to maintain ecologically sustainable development. There are serious offences under this Act for causing pollution of air, noise, water or land and obligations to notify Office of Environment and Heritage (OEH) when a "pollution incident" occurs that causes or threatens "material harm" to the environment. Maryvale Solar Farm and the construction contractor would ensure that the construction, operation and decommissioning of the Proposal is managed to prevent pollution and any "pollution incidents" would be notified in accordance with the Act.

Section 48 of the POEO Act requires an Environmental Protection Licence (EPL) for premises which a scheduled activity is carried on. Scheduled activities are defined in Schedule 1 of the POEO Act. General electricity works, as described in Clause 17 of Schedule 1, requires an EPL where the activity has the capacity to generate more than 30 MW of electrical power. Wind power and Solar power are excluded from the definition of 'General electricity works,' hence an EPL is not required under the POEO Act for the proposed Solar Farm.

The POEO Act and *POEO (Waste) Regulations 2014* specify the legal requirements for the management of waste. There are serious offences under the POEO Act for the unlawful transportation and deposition of waste (Section 143). Waste management should be undertaken in accordance with the *Waste Avoidance and Resource Recovery Act 2001* (WARR Act) such as ensuring that resource management options are considered against a hierarchy (avoidance, reuse, reprocess, recycle, energy recovery and disposal). Waste aspects of the Proposal are covered in Section 6.14.

5.4.4 Roads Act 1993

Roads Act 1993 (Roads Act) provides for the classification of roads and for the declaration of the Roads and Maritime Services (Roads and Maritime) and other public authorities as roads authorities for both classified and unclassified roads.

The objectives of the Roads Act are to set out the rights of the public to access and use public roads, to establish procedures for opening and closing public roads, to provide for the classification of roads, to confer function of carrying out road work on Roads and Maritime and on other roads authorities and to regulate the carrying out of various activities on public roads.

Section 138 of the Roads Act requires consent be obtained prior to disturbing or undertaking work in, on or over a public road.

Consultation with Dubbo Regional Council and Roads and Maritime Service has been undertaken as outlined in Section 4. Further consultation will be undertaken during detailed design.

Proposed works associated with access to the Site is summarised in Section 6.2.

5.4.5 Local Land Services Act 2013

The *Native Vegetation Act 2003* was repealed on 25 August 2017. Legislation now governing the clearing of native vegetation is the *Local Land Services Act 2013* and the *Biodiversity Conservation Act 2016*.

The *Local Land Services Amendment Act No 64*, Division 3 prescribes the regulation of clearing of native vegetation in regulated rural areas. In Section 60O of the Amendment, clearing of native vegetation in a regulated rural area is authorised under Part 4 of the AP&A Act 1979. As development consent is being sought under Part 4 of the EP&A Act, authorisation for clearing of native vegetation is not required.

5.4.6 Biodiversity Conservation Act 2016

The *Biodiversity Conservation Act 2016* (BCA Act) aims to maintain a healthy, productive and resilient environment for the greatest well-being of the community, now and into the future, consistent with the principles of ecologically sustainable development. The BCA Act replaces the *Threatened Species Conservation Act 1995* (TSC Act) as the key piece of legislation that identifies and protects threatened species, populations and ecological communities in NSW.

Under the *Biodiversity Conservation (Savings and Transitional) Regulation 2017* this proposal is to be assessed in accordance with the Framework for Biodiversity Assessment (FBA), given the SEARs have been issued and the field data has been collected under the FBA.

As the proposal is a SSD and the Planning Agency Head and/or Environment Agency Head have not specified that the proposal is unlikely to have any significant impact on biodiversity values a Biodiversity Development Assessment Report (BDAR) has been prepared (Section 6.1). The Proposal will result in the loss of some remnant native vegetation, however impacts on threatened species and communities will be limited by the absence of these or their habitats on site. The loss of habitat value provided by paddock trees will to an extent be mitigated by the planting of screening vegetation.

5.4.7 National Parks and Wildlife Act 1974

The *National Parks and Wildlife Act 1974* (NPW Act) provides the basis for the legal protection and management of Aboriginal sites within NSW. The Director-General of the National Parks and Wildlife Service (NPWS) is responsible for the management of all national parks, historic sites, nature reserves, reserves, Aboriginal areas and State game reserves listed under the NPW Act. The Director-General is also responsible for the protection and care of native fauna and flora throughout NSW.

The Site is not in or in close vicinity to a protected area, as defined in the NPW Act and the provisions of the Act have been considered and addressed in Sections 6.1 and 6.3.

Part 6 of the NPW Act provide statutory protection for Aboriginal objects and places.

An assessment of the potential to impact Aboriginal Heritage is provided in Section 6.3 and includes the management and mitigation measures that will be implemented as part of the Proposal to ensure protection of any existing or un-expected Aboriginal heritage finds. No sites identified during survey are within the development footprint and therefore will not be impacted by the Proposal.

It is noted that under Section 4.41 of the EP&A Act, an Aboriginal Heritage Impact Permit (AHIP) under Section 90 of the NPW Act is not required for a SSD.

5.4.8 Crown Lands Act 1989

The *Crown Lands Act 1989* ensures that Crown land is managed for the benefit of the people of New South Wales. The *Crown Lands Act* 1989 provides for the administration and management of Crown Land in the eastern and central divisions of NSW. Crown land may not be occupied, used, sold, leased, dedicated, reserved or otherwise dealt with unless authorised by this Act or the *Crown Land (Continued Tenures) Act* 1989. The Minister may grant a "*relevant interest*" such as a lease, licence or permit, over Crown Land for the purposes of any infrastructure, activity or other purpose that the Minister thinks fit.

There are no Crown Lands associated with the Site.

5.4.9 Heritage Act 1977

The *Heritage Act 1977* provides for the conservation of items of environmental heritage in NSW. The Act defines heritage as items or places that are of state and/ or local heritage significance and include: places, buildings, works, relics, moveable objects and precincts. As part of NSW heritage protection and management the Act establishes a register including an inventory and list to protect the listed items.

According to the Office of Environment and Heritage, no items of state significant heritage have been found on the site, as listed in the NSW Heritage and Conservation Register.

An assessment of heritage impact is provided in Section 6.11.

5.4.10 Rural Fires Act 1997

The *Rural Fires Act 1997* (Rural Fires Act) provides for the preparation, mitigation and suppression of bush and other fires in local government areas and to provide protection of persons, infrastructure and environment, economic, cultural, agricultural and community assets from damage arising from fire.

The requirement to obtain a Bushfire Safety Authority under s100B of the Rural Fires Act is triggered for developments on bushfire prone land for a 'special fire protection purpose', which does not include the development of a solar farm. On the basis that the proposal is SSD and is not listed as a 'special fire protection purpose', this approval will not be required in accordance with Section 4.41 of the EP&A Act.

Additionally, a search of the Rural Fire Service (RFS) was conducted on 7 September 2017 which concluded that the Site is not mapped as fire prone land (RFS 2017). An assessment of bush fire impacts is provided in Section 6.8.

5.4.11 Water Management Act 2000

The objectives of the *Water Management Act 2000* (WM Act) are to provide for the sustainable and integrated management of the water resources of the State for the benefit of both present and future generations. The provisions of the WM Act are being progressively implemented in NSW, repealing various other pieces of legislation in the process. Under this Act, licences and approvals are required for certain activities and works, including dewatering excavations and groundwater interference.

The Proposal is within the area applicable to the *Water Sharing Plan for the Macquarie Bogan Unregulated and Alluvial Water Sources 2012*, prepared in accordance with the provisions of the WM Act. The plan includes rules for protecting the environment, water extractions, managing licence holders' water accounts, and water trading in the plan area.

The water source in respect of this Plan is comprised of 30 surface water sources and 4 groundwater sources within the Central West Water Management Area. The Plan includes all water occurring naturally on the surface of the ground, in rivers, lakes, and wetlands and contained within all sand beds or other alluvial sediments on or below the surface of the ground within the bed and the top of the high banks of rivers. The *Water Sharing Plan for the Macquarie Bogan Unregulated and Alluvial Water Sources 2012* does not include the Site.

The proposal does not involve extraction of groundwater for commercial purposes such as irrigation or industrial use, however, some water may need to be accessed for continued stock and domestic purposes.

The Bodangora River is mapped on the Bureau of Meteorology Groundwater Dependant Ecosystem Atlas as having a high potential for aquatic groundwater dependant ecosystems. Maryvale Creek is mapped as having a moderate potential for aquatic groundwater dependant ecosystems. Limited areas of native vegetation communities associated with the watercourses are mapped as having moderate potential for terrestrial groundwater dependant ecosystems. None of these areas are affected by the proposed works.

5.4.12 Fisheries Management Act 1994

The *Fisheries Management Act 1994* (FM Act) aims to conserve native fish stocks and key habitats to conserve the biological diversity of aquatic fauna and flora. The FM Act also intends to promote viable commercial fishing, aquaculture industries and recreational fishing opportunities. Threatened species, populations and ecological communities and key threatening processes are listed in the FM Acts' Schedules.

Section 192 of the FM Act states that a habitat protection plan may be determined for the protection for critical habitat declared under Part 7A. The proposed site location is not identified by the Department of Primary Industries Register of critical habitat.

The closest major water course is the Macquarie River which is located approximately 3.5km to the south of the Site. Minor works (i.e. culvert strengthening or replacement) will occur in the waterway crossing Maryvale Road however this will not impact on any fisheries resource. No approval under the FM Act is required.

5.4.13 Biosecurity Act 2015

The *Biosecurity Act 2015* aims to provide modern, flexible tools and powers that allow effective, risk-based management of biosecurity in NSW. The *Biosecurity Act 2015* replaces the *Noxious Weeds Act 1993* as the key piece of legislation that identifies and manages State and regional priorities for weeds in NSW.

In NSW, all plants are regulated with a general biosecurity duty to prevent, eliminate or minimise any biosecurity risk they may pose. According to this Act, any person who deals with any plant, who knows (or ought to know) of any biosecurity risk, has a duty to ensure the risk is prevented, eliminated or minimised, so far as is reasonably practicable.

Seven introduced flora species recorded in the study area are considered to be High Threat Exotic weeds by OEH - African Boxthorn, Khaki Weed, Bathurst Burr, Saffron Thistle, St. Johns Wort, Paspalum and Great Brome. African Boxthorn, is listed as a Priority Weed for the Dubbo Regional LGA under the NSW Biosecurity Act 2015 (DPI, 2018) and as a Weed of National Significance by the Australian Weeds Committee of the Commonwealth Government (www.weeds.org.au).

5.5 Planning Instruments and Policies

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

Under Schedule 1, Part 20 of the *State Environmental Planning Policy (State and Regional Development) 2011* (SRD SEPP) electricity generating works with a capital investment value of more than $30million, or a capital investment of more than $10 million and located in an environmentally sensitive area of State significance, are deemed state significant developments.

The solar farm has an estimated capital investment value greater than $30 million and is therefore classified as '*state significant development*'. Under Part 4, clause 39 of the EP&A Act, an Environmental Impact Statement (EIS) must be prepared and submitted to Department of Planning and Environment (DP&E) for approval. The EIS has been prepared in accordance with the SEARs issued by DP&E.

5.5.2 State Environmental Planning Policy (Infrastructure) 2007

State Environmental Planning Policy (Infrastructure) 2007 (ISEPP) aims to enable the efficient delivery of infrastructure across NSW, provide a consistent planning regime for infrastructure, providing greater flexibility in the location of infrastructure and service facilities and identifying the environmental assessment category into which different types of infrastructure and services development fall.

Clause 34(7) of the ISEPP provides that development for the purpose of '*solar energy systems*' may be carried out with consent on any land, except as prescribed by sub clause 34(8). The solar farm is located within a Rural Landscape (RU1) zone and is permissible with consent under the ISEPP.

Clause 45 of the ISEPP will also apply as the Site intends to connect with existing transmission lines that traverse the Site and as such has the potential to affect an electricity transmission line.

Clause 104 of ISEPP refers to traffic generating developments. Schedule 3 lists the types of developments that must be referred to Roads and Maritime Services (Roads and Maritime). Clause 104 also applies to developments that have the capacity to accommodate 200 or more vehicles. Clause 104 does not apply as traffic generated is below the trigger (refer Section 6.2) and Schedule 3 does not include electricity generating works.

5.5.3 State Environmental Planning Policy (Rural Lands) 2008

State Environmental Planning Policy (Rural Lands) 2008 aims to identify Rural Planning Principles to assist in the proper management, development and protection of rural lands for the purpose of promoting the social, economic and environmental welfare of the State. This Policy encourages the identification and protection of natural resources, having regard to maintaining biodiversity, the protection of native vegetation, the importance of water resources and avoiding constrained land. Local Environmental Plans developed by councils with land relevant to this Policy must consider a list of Rural Planning Principles stated within Part 2 Clause 7 of this Act.

Part (a) of Clause 7 states that councils should consider '*the promotion and protection of opportunities for current and potential productive and sustainable economic activities in rural areas*.' The proposed Solar Farm complies with this Clause as this development will provide socioeconomic benefits during the duration of the Proposal, as well as agricultural land use opportunities (grazing) occurring throughout the Proposal life cycle, and subsequent to decommissioning.

The proposal complies with the SEPP objectives as it still facilitates agricultural land use through grazing and has considered land use conflicts by completing a land use risk assessment (Section 6.4).

Schedule 2 of this State Environmental Planning Policy does not list any land that is considered State significant agricultural land, therefore this site is not considered to be state significant agricultural land.

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

This policy recognises the importance of mining, petroleum production and extractive industries to NSW. This policy aims to:

- Provide for the proper management and development of mineral, petroleum and extractive material resources for the purpose of promoting the social and economic welfare of the State
- Facilitate the orderly and economic use and development of land containing mineral, petroleum and extractive material resources
- Establish a gateway assessment process for certain mining and petroleum (oil and gas) development
  - To recognise the importance of agricultural resources, and
  - To ensure protection of strategic agricultural land and water resources, and
  - To ensure a balanced use of land by potentially competing industries, and
  - To provide for the sustainable growth of mining, petroleum and agricultural industries

Identify if the land is located on or near:

- State or regionally significant resources of minerals, petroleum, or extractive materials
- Extraction related activities on surrounding land which will be affected
- Biophysical strategic agricultural land, or
- Any mining licences

Magmatic Resources Limited was identified as a potentially impacted exploration licence holder. As outlined in Section 4.6, the Maryvale Solar Farm will not impact these licences.

5.6 Local Environmental Plans

5.6.1 Wellington Local Environment Plan (2012)

The matters specified in Section 4.15 of the EP&A Act are to be considered for SSD and includes the provision of any relevant EPI. The Proposal is located within the Dubbo Local Government Area (LGA) and the relevant local planning instrument is the Wellington Local Environmental Plan (LEP) 2012.

Subdivision of Land

MSF has a lease agreement with the landholders for the Site as outlined in Figure 1-2.

As per Section 7A of the *Conveyancing Act 1919*, the project is expected to require reconfiguration of the lots, since the proposed lease with the landholder will exceed 5 years. The reconfiguration of the five new lots as a result of this Proposal are outlined in Figure 5-1.

Lot 1

It is proposed that the area leased by MSF for the solar farm would create one (1) new lot (approximately 375ha), and would encompass:

- Part Lot 2 DP 573426
- Part Lot 1 DP1031281
- Part Lot 130 DP754318
- Lot 122 DP754318
- Part Lot 182 DP754318
- Lot 1 DP1006557
- Lot 1 DP1095725
- Part Lot 2 DP1095725, and
- The existing Bakers Lane (currently in the process of being closed by Dubbo Regional Council as outlined in Section 3.2)

Lot 2

Additionally, a portion of land totaling approximately 4,800m^2 within Lot 2 DP 573426 would be subdivided to Essential Energy for the Substation. Associated with this will be a dedicated road easement into the Substation from Seatonville Road and a dedicated easement for the connection to the 132kV powerline.

The residual land remaining outside of the solar footprint would be reconfigured and retained by the landholders for continuation of existing uses, and would encompass:

Lots 3, 4 & 5

- A new lot for retained Part Lot 2 DP1095725 (58ha)
- A new lot for retained Part Lot 182 DP754318 (64ha)
- A new lot (85ha) encompassing:
  - Part Lot 2 DP 573426
  - Part Lot 1 DP1031281
  - Part Lot 130 DP754318

The following land surrounding the Site will not be subject to any lease arrangements or require subdivision:

- Lot 1 DP 723474
- Lot 173 DP 754318
- Lot 1 DP 957428
- Lot 4 DP1095725

The Wellington LEP designates the Site as 'AF' on the Lot Size Map Sheet LSZ_XXX, where the minimum lot size is 400ha. Section 2.6 of the Wellington LEP states that the size of any lot resulting from subdivision of land to which this clause applies is not to be less than that shown on the Lot Size Map.

Four of the new lots will not be compliant with this clause.

However, Section 4.38 of the EP&A Act allows the consent authority to grant development consent to a State Significant Development which may be partly prohibited by an environmental planning instrument. Accordingly, development consent may be granted, inclusive of this subdivision.

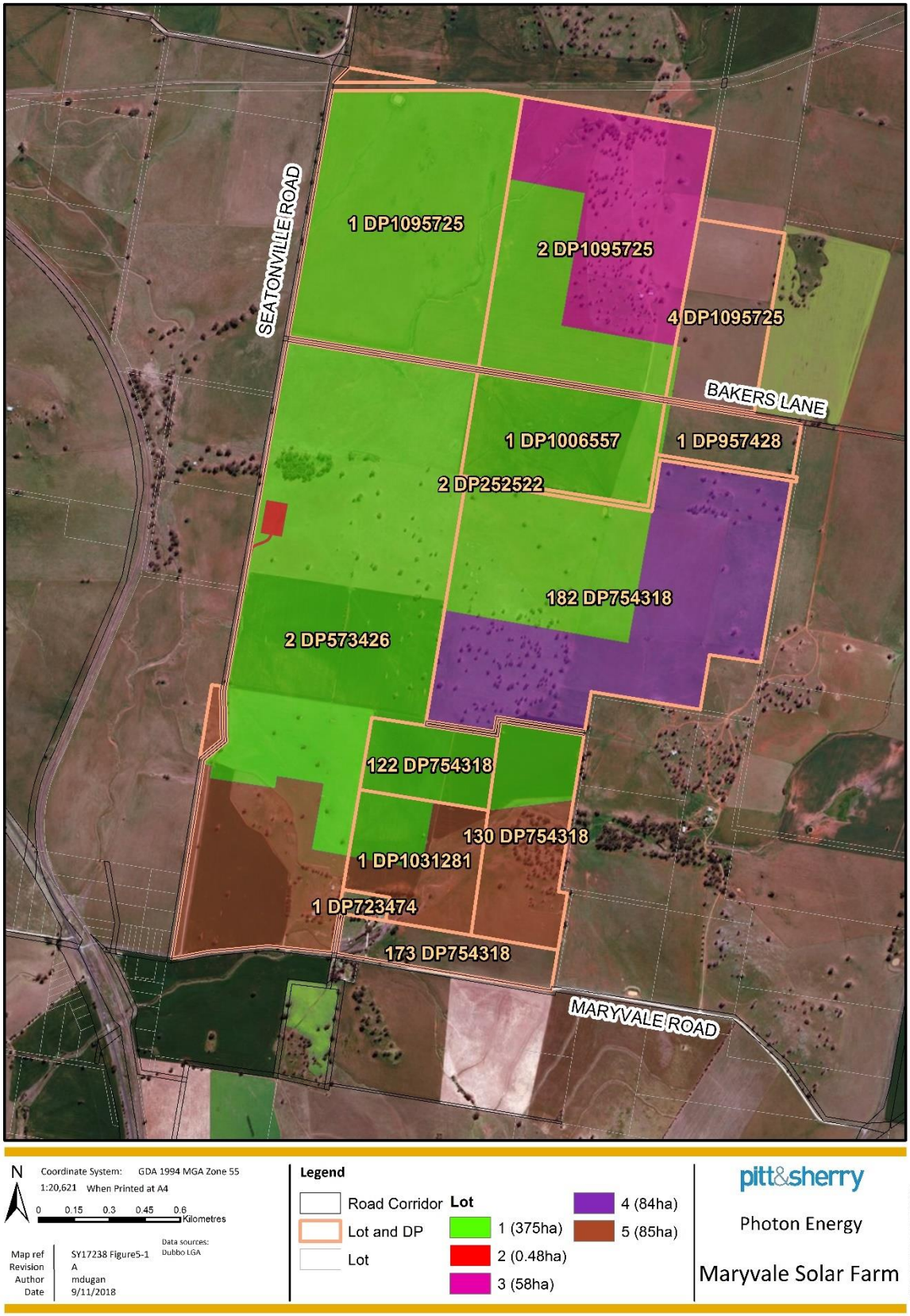

Figure 5-1: Reconfiguration of Lots

Relevant Provisions of the LEP

As the proposal will be assessed under Part 4 of the EP&A Act the consent and land use provisions of the LEP do not apply. Relevant provisions of the LEP are listed in Table 5-2.

Table 5-2: Relevant provisions from the Wellington LEP

Relevant objectives	Relevance to the Proposal
Land use zones	The LEP zones the site of the proposed works RU1 Primary Production. The objectives of this zone are: • To encourage sustainable primary industry production by maintaining and enhancing the natural resource base • To encourage diversity in primary industry enterprises and systems appropriate for the area • To minimise the fragmentation and alienation of resource lands • To minimise conflict between land uses within this zone and land uses within adjoining zones, and • To provide for a range of tourism-related uses that support the agricultural industry or are compatible with agricultural uses The Proposal is generally compliant with these objectives as it: • Is an ecologically sustainable rural land use which provides socio-economic benefits to the region, generates renewable energy and enables limited agricultural use of the Site to continue • Is complementary to surrounding land uses, and • Is highly reversible and will not impact the future productivity of the land Electricity generation is not listed among developments which are permitted with consent for this zone however, under clause 34(7) of the ISEPP the Proposal is permissible with consent.
5.10 Heritage conservation	The objectives of this clause are to: • Conserve the environmental heritage of Wellington • Conserve the heritage significance of heritage items and heritage conservation areas, including associated fabric, settings and views • Conserve archaeological sites, and • Conserve Aboriginal objects and Aboriginal places of heritage significance No sites of environmental or historic heritage significance or archaeological sites are located on or adjacent the site. A number of sites of Aboriginal heritage significance are located on Site but none are located within the development footprint and there is considered to be a low risk of disturbance of any sites. Although no sites of Aboriginal heritage will be impacted, an assessment of potential impacts was undertaken and is attached in Appendix F**.** Potential impacts are summarised in Sections 6.11 and 6.3. There are no additional requirements under this clause.
5.11 Bush fire hazard reduction	This clause provides that bush fire hazard reduction work authorised by the *Rural Fires Act 1997* does not require development consent. Most vegetation within the development footprint will be removed to allow works however future hazard reduction may be required to protect infrastructure in the future.

Relevant objectives	Relevance to the Proposal
6.3 Terrestrial biodiversity	This clause applies to those areas identified as Biodiversity on the LEP maps. This applies to Lot 2/DP573426 (small area in north west portion), Lot 2/DP1095725 (large central area) and part lot 182/DP754318 (in the western portion). The objective of this clause is to maintain terrestrial biodiversity by: (a) protecting native fauna and flora, and (b) protecting the ecological processes necessary for their continued existence, and (c) encouraging the conservation and recovery of native fauna and flora and their habitats Council must consider: (a) whether the development is likely to have (i) any adverse impact on the condition, ecological value and significance of the fauna and flora on the land, and (ii) any adverse impact on the importance of the vegetation on the land to the habitat and survival of native fauna, and (iii) any potential to fragment, disturb or diminish the biodiversity structure, function and composition of the land, and (iv) any adverse impact on the habitat elements providing connectivity on the land, and (b) any appropriate measures proposed to avoid, minimise or mitigate the impacts of the development The Biodiversity Development Assessment Report at Appendix E outlines the impacts on the ecological values present on site. Biodiversity values are further discussed in Section 6.1. It is considered that the habitat provided on site is of minor value for listed threatened species and that the removal of some of the vegetation on site will not have a significant impact. The provision of landscape screening vegetation around the site will provide replacement habitats and mitigate the losses to some extent. There are no significant vegetation corridors present on site and the values provided by paddock trees can be replicated to some extent by landscape plantings. It is considered the Proposal satisfies the requirements of this clause.

Relevant objectives	Relevance to the Proposal
6.4 Groundwater Vulnerability	Before determining a development application for development on land to which this clause applies, the consent authority must consider the following: (a) the likelihood of groundwater contamination from the development (including from any on-site storage or disposal of solid or liquid waste and chemicals) (b) any adverse impacts the development may have on groundwater dependent ecosystems (c) the cumulative impact the development may have on groundwater (including impacts on nearby groundwater extraction for a potable water supply or stock water supply), and (d) any appropriate measures proposed to avoid, minimise or mitigate the impacts of the development The Proposal does not involve any intersection with the groundwater. Chemicals to be stored on site include LPG (2-5 tonnes), Fuel (Petrol – 5-10 tonnes), lubricating and hydraulic oils and greases (small amounts) and herbicides (1-3 tonnes). Petrol and lubricants will be stored in appropriately sized bunded areas. LPG and herbicides will be stored in an appropriate secure location within the site. No SEPP 33 triggers are exceeded and it is considered that the Proposal poses a low risk to groundwater resources.
6.5 Riparian land and watercourses	Before determining a development application for development on land to which this clause applies, the consent authority must consider: (a) whether or not the development is likely to have any adverse impact on the following (i) the water quality and flows within the watercourse (ii) aquatic and riparian species, habitats and ecosystems of the watercourse (iii) the stability of the bed and banks of the watercourse (iv) the free passage of fish and other aquatic organisms within or along the watercourse (v) any future rehabilitation of the watercourse and riparian areas, and (b) whether or not the development is likely to increase water extraction from the watercourse, and (c) any appropriate measures proposed to avoid, minimise or mitigate the impacts of the development A short section of Bodangora Creek and the associated riparian land buffer runs through Lot 2, DP 573426 however the Proposal footprint avoids this area. The adoption of best practice erosion and sedimentation controls throughout the construction and operation of the facility will minimise the potential for any impacts associated with uncontrolled run-off. There will be no impacts on riparian vegetation and no direct impacts on water quality or instream habitats. No extraction of water from the creek is proposed and it is considered that the Proposal will not have a significant impact on waterways.

Relevant objectives	Relevance to the Proposal
Essential services	Development consent must not be granted to development unless the consent authority is satisfied that any of the following services that are essential for the development are available: • The supply of water • The supply of electricity • The disposal and management of sewage • Stormwater drainage or on-site conservation, and • Suitable road access No staff are required to be present on site for general operations. The development will not require a permanent water supply or sewage disposal and management. These services will be transported onto and off the site temporarily during construction. A permanent 20,000L water tank will be located near the farm entrance to provide a fill point for fire-fighting vehicles. The development will supply electricity and will not impact existing storm water drainage. Road access is addressed in Section 6.2.

5.7 Summary of Licenses and Approvals

Table 5-3 provides a summary of the licenses and approvals required for the proposed Maryvale Solar farm.

Table 5-3: Licences and Approvals

Legal Instrument	License or Approval
EP&A Act 1997 – Part 4	Development consent is required under Part 4 of the EP&A Act.
Roads Act 1993	Section 138 approval for work within a public road.

6. Environmental Impact Assessment

This chapter introduces and describes the key environmental risks and provides an assessment of these risks. Each potential environmental impact was systematically reviewed with reference to:

- The current scope of the Proposal
- The SEARs issued by DP&E
- The findings and recommendations (for management and mitigation measures) from the specialist reports
- Other documentation, and
- Consultation with relevant government agencies and neighbouring landowners

Environmental risk analysis informs the scope of the EIS by ensuring all potential environmental impacts are identified and that the EIS is focused on the key risk areas. A detailed assessment of the key risks has been completed in the following chapters. It responds to the following SEARs requirements:

"*an assessment of the likely impacts of all stages of the development (which is commensurate with the level of impact), taking into consideration any relevant legislation, environmental planning instruments, guidelines, policies, plans and industry codes of practice*".

The environmental risks analysis identified several key environmental issues, aligning with those identified within the SEARs. These issues were (in order of inherent risk):

- Biodiversity
- Traffic
- Heritage
- Land Use
- Visual amenity
- Erosion and Sediment control
  - Surface Water and Hydrology
  - Soils
- Bushfire
- Noise
- Air Quality
- Socio-Economic
- Hazards, and
- Waste

6.1 Biodiversity (Flora and Fauna)

A Biodiversity Assessment Report (BDAR) was prepared by Dr Colin Bower (FloraSearch), who is an accredited assessor under section 6.10 of the BC Act (assessor accreditation number BAAS18048) and supported by Arthur White (Biosphere Environmental Consultants Pty Ltd) to determine the biodiversity significance of the site (Appendix D). A summary of the key findings of this assessment and associated mitigation measures are outlined below.

6.1.1 Assessment Methodology

In accordance with the BAM (OEH, 2017a) the *Biodiversity Assessment Method Calculator* (BAMC or the Credit Calculator) was used for this assessment. This is an online application that allows the assessor to apply the BAM at a site to provide a consistent method of assessing potential impacts on biodiversity. It does this by providing a scientific and repeatable calculation of how biodiversity impacts need to be offset to achieve a "no net loss" of biodiversity.

As specified by the BAM (OEH, 2017a), three stages of assessment are outlined in the BDAR:

- Stage 1 summarises the biodiversity values of the BDAR Footprint that are entered into the Credit Calculator (e.g. landscape features, native vegetation and threatened species)
- Stage 2 assesses potential impacts on biodiversity, describes impact avoidance and mitigation measures and determines offset requirements, and
- Stage 3 describes the Biodiversity Offset Strategy

Due to the small area of native vegetation to be impacted by the proposal the Site assessment used the *Streamlined Assessment Module* of the BAM. The native vegetation on the Site comprises 107 live remnant paddock trees, two stags (dead standing trees) and two linear plantings (0.4ha) of native trees along fence lines and 0.8ha of derived native grassland.

The total area of the native vegetation clearance is 1.2ha which is above the minimum threshold (1.0ha) for application of the Biodiversity Offsets Scheme, and below the 5ha maximum area limit for application of the streamlined assessment module (BAM, Appendix 2 [OEH, 2017a]) on a site with a minimum Lot size of 40ha. Accordingly, the BDAR followed the requirements of the BAM streamlined assessment module (OEH, 2017a), which is applied in two parts:

- The streamlined assessment module for the on-site plantings and the derived native grassland in Bakers Lane, and
- The paddock tree module for 107 paddock trees and 2 paddock stags that would be removed from the Site

Database Searches

A desktop review of relevant spatial ecological datasets was conducted to identify vegetation communities mapped for the Site as well as locations of threated flora species that have been previously recorded in the Wellington locality. This included a search of the:

- Mitchell Landscapes regional vegetation mapping
- OEH Atlas of NSW Wildlife database, and
- Commonwealth Department of the Environment and Energy (DoEE) EPBC Protected Matters database

Details of the Mitchell Landscapes within the BDAR footprint are listed in Table 6-1. The BDAR footprint is predominantly within the Mullion Slopes Mitchell Landscape (OEH, 2018a).

Table 6-1: Landscapes in the BDAR Footprint

Landscape Name	Percentage Cleared Estimate	Area (ha)	Percent (%) of BDAR Footprint Covered by Landscape
Mullion Slopes	93	389.9	96
Macquarie Alluvial Plains	78	16.3	4

Similar desktop searches were conducted to determine the fauna that are likely to occur in the vicinity. The searches included the:

- Office of Environment and Heritage (OEH) Threatened Species Profiles database (Wellington region)
- OEH Atlas of NSW Wildlife database
- Commonwealth Department of the Environment and Energy (DoEE) EPBC Protected Matters database
- Birdlife Australia database

To complete the data requirements for the BAM in relation to threatened flora and fauna, three other data sources were searched. These included the:

- BAM online calculator which lists the ecosystem credit species and species credit species generated by the BAMC from the BioNet databases using inputs on Interim Biogeographic Regionalisation for Australia (IBRA) subregion, Site location and vegetation integrity (OEH, 2018d)
- BioNet website which includes searches of the NSW Atlas of Wildlife, NSW State Forests, Australian Museum and Royal Botanic Gardens Sydney databases (BioNet, 2018b). The search area comprised a 20 × 20km square centred on the study area. This search returned a list of threatened species records from within the search area and are listed in **Appendix E**
- Commonwealth DoEE website – Protected Matters Search Tool (PMST) (DoEE, 2018a). The search area comprised the same 20 × 20km square as for the BioNet search. The PMST uses actual records and habitat modelling to return a list of 'protected matters' that are known or predicted to occur in the search area, including threatened species, migratory species, ecological communities, wetlands of international significance and national and world heritage properties

Search Results

The BAMC returned 17 ecosystem credit species all being fauna species and 19 species credit species, 7 flora and 12 fauna species (refer **Appendix E**). Six of the fauna species are dual ecosystem and credit species.

The BioNet database search returned records of one flora species, the Pine Donkey Orchid (*Diuris tricolor*) and six fauna species close to the Site and not identified by BAMC:

- Little Eagle (Hieraaetus morphnoides)
- Black Falcon (Falco subniger)
- Turquoise Parrot (Neophema pulchella)
- Masked Owl (Tyto novaehollandiae)
- Black chinned Honeyeather (Melithreptus gularis), and
- Varied Sitella (Daphoenositta chrysoptera)

The PMST search returned 8 potentially occurring flora species and 22 fauna species. Assessment of these species is required to determine whether there is any obligation to refer the Proposal to the Commonwealth DoEE under the EPBC Act.

The total numbers of potentially occurring threatened species identified by the searches are 14 flora and 44 fauna species (refer **Appendix E**).

Commonwealth Matters of National Environmental Significance (MNES)

An EPBC protected matters report was undertaken by pitt&sherry in August 2018 (10km buffer of the development site) to identify MNES that have the potential to occur within the development site. The assessment has been undertaken in accordance with the Commonwealth Significant Impact Assessment Guidelines (DoE 2013) which lists a suite of significant impact criteria to assist in determining whether there is likely to be a significant impact on MNES and thus whether a referral to the Commonwealth DoEE is required.

Results of the protected matters search are provided in Table 6-2 below.

Table 6-2: EPBC Protected Matters Search Results

MNES	Number of MNES identified within a 10km buffer from the Subject Land
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	5
Listed Threatened species	30 Threatened species 8 flora species 22 fauna species (mammals, birds, fish, reptiles)
Listed Migratory Species	10

Based on the search results, the proposal would not impact upon any world heritage properties, national heritage places, Commonwealth marine areas nor the Great Barrier Reef Marine Park given their absence from the vicinity of the Subject Land.

Previous Studies

No previous fauna or flora studies have been conducted on the Site and surveys on adjoining and neighbouring lands include only the occasional opportunistic surveys that have been undertaken with sightings of threatened flora and fauna species (as evident on NSW Bionet Wildlife database).

6.1.2 Existing Environment

The Proposal is located entirely within the New South Wales South Western Slopes Bioregion and Upper Slopes Sub-region of the IBRA and the Dubbo Regional LGA. The BDAR Footprint comprises approximately 375ha and includes an existing Essential Energy easement running in a south-easterly direction across the Site.

The Site is currently divided into 14 fenced paddocks which have been largely cleared for agricultural use including cropping (e.g. wheat, Lucerne and canola) and grazing. Photographs of the existing environment are provided in Figure 6-1,Figure 6-2 and Figure 6-3.

Figure 6-1: Existing Environment (Fallow After Wheat - Paddock 13)

Figure 6-2: Existing Environment (Native Grasses - Bakers Lane)

Figure 6-3: Existing Environment (Planting of Eucalypts - Paddock 10)

The Site is almost entirely cleared of original vegetation except for:

- A 3.1ha patch of remnant Yellow Box woodland adjacent the easement and Seatonville Road (not to be removed)
- 107 scattered paddock trees (85 with potential wildlife hollows) including
  - 6 Yellow Box (Eucalyptus melliodora)
  - 99 White Box (Eucalyptus albens)
  - 2 Kurrajong (Brachychiton populneus)
- Two stags probably White Box (to be removed)
- Two narrow linear plantings of eucalypts totalling 71 individuals with an area of 0.4ha mostly comprising River Red Gum (*Euclayptus camaldulensis*), Mugga Ironback (*E. sideroxylon*) and Yellow Gum (*E. leucoxylon*) (to be removed) (Figure 6-3), and
- Approximately 0.8ha of native grassland along Bakers Lane (to be removed) (Figure 6-2)

Access is via Seatonville Road which runs parallel to the western boundary of the Site via Maryvale Road and Cobbora Road. The roadside vegetation along these roads and at the intersection of Maryvale Road and Cobbora Road is dominated by perennial exotic species however some old growth eucalypts are scattered along Seatonville Road (comprising White Box and Yellow Box) but these would not be impacted by the development or the proposed road upgrade works. Due to the disturbed nature of the roadside vegetation and dominance of exotic species no formal assessment has been undertaken.

Based on the remnant vegetation and paddock trees the following two Plant Community Types (PCTs) are likely to have occupied the Site pre-European settlement:

- PCT266 – White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion, and

- PCT277 – Blakelys Red Gum – Yellow Box grassy tall woodland in the NSW South Western Slopes Bioregion

Both of these PCTs form part of the *White Box Yellow Box Blakely's Red Gum Woodland* Endangered Ecological Community (EEC) under the BC Act and *White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland* Critically Endangered Ecological Community (CEEC) under the EPBC Act.

6.1.3 Survey Results

The flora survey was conducted over three days on the 28th November 2017 and the 21st and 22nd June 2018. This consisted of walking and driving around the site and conducting various analysis and recording the species on site and its present condition. A fauna survey was also undertaken by Biosphere Environmental Consultants Pty Ltd on 23rd November 2017.

Areas of potential habitat value were identified and then traversed by foot. As most of the site consisted of cleared agricultural paddocks, there were relatively few areas left that could provide potential habitat for native fauna. During the course of the site investigation, any fauna observed or heard calling were noted, as was indirect evidence that may suggest the presence of a native species (e.g. scratch marks on trees, faecal droppings, chew marks, tracks and burrows).

Threatened fauna listed under the *NSW Fisheries Management Act 1994* are not discussed further as the survey determined that no habitat exists for threatened fish species on the site.

Flora Survey Results

The likely Pre- European PCTs are detailed in Table 6-3.

Table 6-3: Pre- European Plant Community Types.

Vegetation Formation	Vegetation Class	PCT		Dominant Tree Species	Justification	Threatened Ecological Communities
		No.	Name			
Grassy woodlands	Western Slopes Grassy Woodlands	266	White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion.	*E. albens* *Brachychiton populneus* *E. blakelyi*	This community formerly dominated over most of the Site as demonstrated by the widespread occurrence of White Box (*E. albens*) paddock trees along with occasional Kurrajongs (*Brachychiton populneus)*	*White Box Yellow Box Blakely's Red Gum Woodland Endangered Ecological Community (BC Act)* and *White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland Critically Endangered Ecological Community* (EPBC Act).

Vegetation Formation	Vegetation Class	PCT		Dominant Tree Species	Justification	Threatened Ecological Communities
		No.	Name			
		277	Blakely's Red Gum – Yellow Gum grassy tall woodland in the NSW South Western Slopes Bioregion	*E. melliodora* *E.blakelyi* *E.bridgesiana*	This community formerly occurred on flatter terrain and lower slops in Paddocks 3, 5 and 6 associated with a tributary of Maryvale Creek. The dominant remnant tree is Yellow Box (*E. melliodora*) with occasional *E. blakelyi,* best matching PCT277.	

The Site is almost entirely cleared of original vegetation except for:

- A 3.1ha patch of remnant Yellow Box woodland adjacent the easement and Seatonville Road (not to be removed)
- 107 scattered paddock trees (85 with potential wildlife hollows) including
  - 6 Yellow Box (Eucalyptus melliodora)
  - 99 White Box (Eucalyptus albens)
  - 2 Kurrajong (Brachychiton populneus)
- Two stags probably White Box (to be removed)
- Two narrow linear plantings of eucalypts (to be removed), and
- Approximately 0.8ha of native grassland along Bakers Lane (to be removed)

Seven introduced flora species regarded as High Threat Exotic weeds were recorded on the Site, these being:

- African Boxthorn
- Khaki Weed
- Bathurst Burr
- Saffron Thistle
- St. Johns Wort
- Paspalum, and

- Great Brome

African Boxthorn is listed as a Priority Weed for the Dubbo LGA under the *NSW Biosecurity Act 2015* and as a Weed of National Significance by the Australian Weeds Committee.

Fauna Survey Results
The fauna assessment did not identify or locate any of the listed threatened species. The survey included targeted searches for threatened fauna species that could potentially occur on the site and their habitats.

The following broad fauna habitats were identified during the site assessment:

- Hollow-bearing trees (totalling 85 scattered paddock trees)
- Rock pile and minor rocky outcrops, and
- Reed beds in ephemeral channel

A total of 22 species of vertebrate fauna were recorded during the survey and are listed in **Appendix D**. This included 12 species of bird (one of which was non-native), three exotic species of mammal, five species of reptile, one species of frog but no fish. No migratory species were recorded.

Aside from the habitats identified above the majority of the site comprises cleared land with scattered trees which offer little habitat.

Four exotic species (excluding livestock) were recorded including:

- European Fox (*Vulpes vulpes*)
- House Mouse (*Mus musculus*)
- Rabbit (*Oryctalagus cuniculus*), and
- European Starling (*Sturnus vulgaris*)

6.1.4 Assessment of Potential Impacts

Threatened Ecological Communities

Five threatened ecological communities (EEC/CEEC) may occur or are likely to occur within a 10km search area however, based on the survey results only one resembles the native vegetation on the Site.

A patch of remnant Yellow Box Woodland (approximately 3.1ha) occurs adjacent Seatonville Road and the existing Essential Energy easement (north west corner of Paddock 5). Two BAM flora quadrats were conducted in November 2017 and the floristic data is provided in Appendix E. This patch of Yellow Box Woodland is best matching PCT277 which forms part of the:

- BC Act – White Box Yellow Box Blakely's Red Gum Woodland EEC, and
- EPBC Act – White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland CEEC

This patch of remnant Yellow Box Woodland will not be impacted by the development as it is excluded from the development footprint.

The scattered paddock trees and eucalypt plantings are not representative of any threatened ecological communities.

Listed Threatened Species

No flora species returned by BAMC were ecosystem credit species. Seven threatened flora species returned by BAMC were species credit species.

All threatened flora species identified by database searches were assessed as having nil likelihood of occurring in the Study area.

The majority of threatened fauna species identified by database searches were assessed as having nil likelihood of occurring in the Study area. Of the 17 ecosystem credit fauna species listed by BAMC, 6 are considered to have potential foraging habitat and of the 19 species credit fauna species only 3 have likelihood of utilising the site.

The Little Eagle (Hieraaetus morphnoides) was identified to have moderate likelihood to be present in the study area. The following were identified as having a low likelihood to be present in the study area:

- Regent Honeyeather (*Anthochaera Phrygia*)
- Little Lorikeet (*Glossopsitta pusilla*)
- Swift Parrot (*Lathamus discolor*)
- Scarlet Robin (*Petroica boodang*), and
- Flame Robin (*Petroica phoenicea*)

These species are only likely to utilise the Site rarely to occasionally as nomadic foraging visitors. None of the species are likely to breed on Site.

Habitat features present on the Site for the threatened species identified as having the potential to occur include:

- Hollow bearing trees
- Semi-permanent/ ephemeral wet areas, and
- Waterbodies

Given the attributes of the native vegetation on Site and the specific site characteristic very few threatened species are likely to utilise the area and those that do would do so rarely.

No threatened flora or fauna species, populations or critical habitat listed under the BC Act or the EPBC Act were identified during the survey.

Part 7 Assessment (5 Part Test)

Under Section 7.3 of the new BC Act, proponents must apply the test of significance to "*determine whether the proposed activity is likely to significantly effect on threatened species or ecological communities, or their habitats*".

An impact assessment under Part 7 of the BC Act (referred to as the 5-part test of significance) has been undertaken for BC Act-listed Threatened species and ecological communities recorded or predicted to occur in the Site and have the potential to be directly or indirectly impacted upon as a result of the proposed works (refer **Appendix E**).

The 5-part test concluded that the proposal is not expected to have a significant effect on subject species and communities and thus the preparation of a Species Impact Statement is not deemed to be required.

Wetlands of International Importance

The nearest wetland of international importance is over 150km upstream (Macquarie Marshes). Given the distance to this wetland, there will not be any impact from this Proposal.

Migratory Species

A total of 10 migratory bird species listed under the EPBC Act have been recorded within the locality or predicted to occur however none of these bird species were identified during the fauna survey.

Impact to Koalas

Schedule 2 of the *State Environmental Planning Policy No. 44 (Koala Habitat Protection*) list specific "feed trees" that are known to be used by Koalas. One of the most important factors influencing the distribution and numbers of koalas in any area is the presence and density of their food tree species.

Two of the remnant eucalypt species on and around the Site are recognised as secondary Koala food trees (OEH, 2018e), these being Yellow Box and White Box. White Box is listed as a Koala feed tree in Schedule 2 of SEPP 44. However, the Site does not have an extant Koala population and therefore is not 'core' Koala habitat so a SEPP 44 plan of management is not required.

Avoidance Measures

Following the Site Survey, preliminary findings and constraints were summarised and used to guide the detailed design. The site layout was revised to avoid any impacts to the 3.1ha patch of Yellow Box woodland.

Furthermore, it should be noted that waterways were graded and no items were identified in the small waterways.

In addition, road upgrades have been designed to avoid damage to any old growth eucalypts within the road reserve along Seatonville Road.

Construction

Direct biodiversity impacts that must be managed during construction and decommissioning include:

- Clearing of native vegetation, and removal of dead wood and dead trees which in turn may cause
  - Loss of tree food sources and reduced foraging habitat
  - Loss of nest sites
  - Loss of habitat connectivity
  - Increase edge effects
- Introduction and/or spread of noxious weeds and pathogens
- Disturbance of fauna during construction due to light, noise and air quality impacts generated by vehicles, equipment and construction activities
- Fauna mortality or injury
- Entrapment of fauna in trenches
- Increase in predation by feral animals, and
- Erosion of disturbed areas leading to sedimentation and dust affecting any downgradient habitat (Section 6.7).

Removal of vegetation will not interfere with habitat connectivity as the trees to be removed are widely spaced and the habitats within the Site are already impacted by edge effects (light, noise, dust, etc.) associated with the establishment of agricultural land.

The PV panels will provide greater ground coverage than currently exists which should assist in reducing the occurrence of wind-blown dust. There will be some increase in noise and air quality impacts during the construction of the solar farm. However, these will be limited to the construction period and once construction is complete, both noise and dust levels will be reduced. No additional artificial lighting is proposed during the construction of the solar farm.

Nocturnal species, species with low mobility, territorial species and some ground-dwelling species (such as lizards and snakes) are particularly susceptible to injury or death during construction and clearing. However, clearing works would be minimal and the areas to be developed have been deemed to have limited habitat value.

It is also possible that some fauna may be disturbed or become trapped within trenches, pits or other enclosed areas. Fauna may also be impacted by increased traffic volumes however wildlife mortality on roads would be limited as a result of the Proposal, given all the existing roads are currently in operation with relatively low vehicle speed limits and no new roads would be created (with the exception of a short road from the site entrance to the immediately adjacent construction office and laydown area).

No impacts in addition to those mentioned for construction are anticipated during the decommissioning phase.

Operation

The following impacts have been considered as having potential to occur during operation:

- Microclimate impacts under the PV array (shading, ground cover decline, water availability, temperature, humidity and erosion)
- Weed growth and spread
- Movement barrier and collision hazard created by perimeter fencing
- Vehicle collision risks to fauna
- Impacts of habitat connectivity, and
- Noise from the sub-station

Tracking panels will reduce potential microclimate impacts as the vegetation underneath the PV arrays will be exposed to the sun at certain parts of the day. Changes to water availability to land and vegetation underneath the PV arrays is not expected due to lateral movement of surface water from adjacent rain-exposed areas.

Ground disturbance as well as vehicle movement on and off Site has the potential to contribute to the spread of weeds.

As the site has negligible habitat value, the potential to create a barrier to movement is unlikely to be significant to any local fauna over time. Some isolated collisions with fencing may occur, however, this is considered to be a low risk and it is not anticipated that collisions with fencing will constitute a significant impact.

Operational vehicle movements will be limited and vehicle speed limits will be set to reduce risk of collision with fauna. Noise impacts will be highly localised to the Site and will not be a factor that will negatively impact on native fauna. Other specific mitigation measures are listed in Section 8.1.

Cumulative Impacts

The cumulative impacts of the project on remnant native vegetation loss are considered negligible. The loss of 109 mature paddock trees represents a loss of habitat for native species adapted to agricultural landscapes and many similar trees will remain.

Vegetation screening works for the proposal (Section 6.5) will provide an opportunity to add biodiversity value to the Site.

6.1.5 BAMC

The identification of relevant parameters for the flora and fauna identified on site for input into the BAMC is summarised below and detailed further in **Appendix D**.

Eucalypt Plantings

These plantings total 71 individuals and mostly comprise River Red Gum (*Euclayptus camaldulensis*), Mugga Ironback (*E. sideroxylon*) and Yellow Gum (*E. leucoxylon*). The species composition does not mimic the original vegetation of the sight (Figure 6-43) however for the purposes of the BAMC it was assumed to represent the likely original dominant PCT (PCT266) which they were intended to replace. Tree stem diameter was measured for all trees for input into the BAMC. Other parameters were estimated as per 5.3 of Appendix 2 of the BAM (OEH,2017a).

The plantings all have large perimeter to area ratios, being long, narrow and two trees wide and are surrounded by agricultural paddocks. The plantings lack a mid-storey and the ground cover is sparse or absent and comprises mainly exotic species. The plantings cover a small area totalling 0.4ha and are unlikely to support any population of threatened species. They may have value as stepping stones through the landscape or short-term foraging.

Native Grassland

The native grassland comprises large tussock grasses which have been heavily grazed by livestock. There is potential for the grassland, in an undisturbed state, to provide cover for foraging and nesting wildlife.

Due to drought conditions at the time of field survey (June 2018) and grazing on site it was not possible to undertake a BAM flora quadrat and as such for the purposes of the BAMC data for native ground cover in PCT266 was used. This is considered likely to overestimate the actual quality of the grassland (Figure 6-3).

Paddock Trees

The remnant trees across the Site are treated as paddock trees and diameter at breast height and presence of hollow recorded for input into the BAMC. Of the 109 paddock trees (and stags), all but five of the paddock trees exceed the lower limit (50cm) for classification as large trees within PCT266 and 85 trees were identified as containing hollows.

Biodiversity Credit Report

The biodiversity credit report output from the BAMC is provided in Appendix E and indicates that for:

- Plantings and the derived native grassland the total area of 1.2ha of native vegetation to be removed from the Site is valued at 21 credits, and
- Paddock trees totalling 109 trees to be removed from the Site is valued at 103.25 credits

The total credit liability for the Project is 124.25 credits.

Offset

MSF will choose to acquit this liability of 124.25 credits by making a lump sum payment of equivalent value to the Biodiversity Conservation Trust Fund.

6.1.6 Mitigation Measures

Reference	Mitigation Measures
Construction and Decommissioning Mitigation Measures	
B1	A 10-m buffer shall be established between the perimeter of the remnant Yellow Box Woodland and the works footprint. No works (e.g. plant, material stockpiling) should encroach this area.
B2	Erect barriers to protect roadside vegetation including old growth eucalypts during road upgrade works.
B3	A clearing protocol will be developed to ensure any potential impacts to native fauna are minimised during vegetation removal. This will include supervised removal of trees with hollows by a trained wildlife carer and tree removal to be undertaken in the non-breeding season.
B4	The Land Management Plan (refer Appendix L) will be incorporated into an overall construction environmental management plan (CEMP). This will include weed management, animal pest management and monitoring as well as an induction for all employees and contractors detailing the trees that are protected on Site.
B5	Trenches should be backfilled as soon as possible to minimise the chance of fauna becoming trapped. Any trench sections left open for greater than a day would be inspected daily, early in the morning and any trapped fauna removed. The use of ramps or ladders to facilitate trapped fauna escape is recommended.
B6	Speed limits should be set to 20km per hour on internal roads and tracks.
B7	A Vegetation Management Plan will be developed and incorporated into an overall CEMP including protection measures to conserve the remnant Yellow Box Woodland and other significant vegetation.
B8	All staff and contractors will be inducted into the CEMP and informed of the biodiversity management measures and no-go zones.
B9	A rehabilitation plan will be prepared and implemented prior to decommissioning.
Operational Mitigation Measures	
B10	Development of an OEMP which will include: • The land management plan – which will have a procedure or plan for monitoring vegetation cover and composition and allow for adaptive management • A weed management plan – including monitoring and control • A pest animal management plan – including monitoring and control and site cleanliness • Vehicle speed limits, to reduce risk of collision with fauna, and • Prohibition of domestic pets on site

6.2 Traffic, Transport and Road Safety

A Traffic Impact Assessment (TIA) was prepared by Seca Solution to investigate the potential traffic impacts of the Proposal (Appendix E). A summary of the key findings of this assessment and associated mitigation measures are outlined below.

6.2.1 Assessment Methodology

The assessment included:

- A site visit to assess the existing condition of the local road network
- Observations during the AM peak period on 22nd November 2017
- Review of the local road network, with regard to road safety, intersection controls, any access constraints and any concerns over access to the regional road network
- Identifying access concerns or potential road upgrades required to facilitate access
- The review of potential impacts from the increase in traffic along the local and regional roads for the various stages of the development

6.2.2 Existing Environment

The site is located with road frontage to Maryvale Road and Seatonville Road. The existing road environment related to the proposal is described in Table 6-4.

Table 6-4: Existing road environment

Road	Local/ State Road	Width/ Movements	Condition	Speed Limit	Connection
Maryvale Road	Local	6m wide Two-way traffic movements as required	Sealed (approx. 1.5km) Unsealed (approx. 2km)	100km/h	Connects with Mitchell Highway via a T intersection to the west and Cobbora Road via a T intersection to the east. Mitchell Highway and Cobbora Road are priority roads.
Seatonville Road	Local	4m wide Single lane road	Unsealed road	100km/h	Connects with Maryvale Road to the south via a T intersection with Maryvale Road being the priority road.
Cobbora Road	Local	7m wide Two-way traffic movements	Sealed Road	100 km/h	Joins with Maryvale Road with Cobbora Road being the priority road.
Mitchell Highway	State	7m wide Two-way traffic movements	Sealed road	100 - 110 km/h	Connects with Cobbora Road on outskirts of Wellington and then Maryvale Rd further north of the Cobbora Road intersection.

Existing Traffic Volumes

Traffic volumes in the immediate vicinity of the Site are very low, reflective of the rural environment.

Maryvale Road provides access to rural land holdings and a link between the Mitchell Highway and Cobbora Road. It does not provide direct access to a town or village and accordingly, traffic flows on this road are

considered to be less than 100 vehicles per day two-way. Seatonville Road is an unsealed lane that currently provides access to rural properties and similarly carries low traffic flows.

Cobbora Road is a link road between the Mitchell Highway and Golden Highway and the towns of Wellington and Dunedoo with approximately 1000 vehicles per day two way.

As part of the regional road network, the Mitchell Highway carries higher traffic flows that are associated with both local and regional demands. The Roads and Maritime Services web page for traffic count data shows that in 2017 the 2-way traffic flow south of Wellington was 2,428 vehicles per day (count I.D 6170) with 23% heavy vehicle content. The traffic data shows that the split in traffic flows north and south in this location are even, as to be expected.

Observations on site during a typical morning peak period (22nd November 2017) show that the current road network in the vicinity of the subject site and Wellington operates very well with minimal delays and congestion. The route proposed to be used for the Proposal carries low traffic flows and operates with no delays except for those associated with drivers slowing down at the various intersections. The only delays noted were along the Mitchell Highway through the centre of Wellington, mainly associated with semi-trailers and B-doubles manoeuvring through two roundabouts on the Mitchell Highway in Wellington.

6.2.3 Impact Assessment

Proposed Haulage and Traffic Routes

Traffic movements associated with the construction, operation and decommissioning of the Proposal include transport of materials to/from the site and transport of workers to/from the site. The Proposal will require the delivery of the construction materials and other specialist equipment from Newcastle or Sydney with the access route via:

- Newcastle or Sydney metropolitan regional road network
- M1 Motorway to Hunter Expressway (Sydney source)
- Hunter Expressway / New England Highway
- New England Highway to turn off for the Golden Highway
- Golden Highway to Dubbo
- Mitchell Highway from Dubbo to Wellington
- Travel along Cobbora Road and Maryvale Road to access the Site off Seatonville Road

The proposed access route from the exit of the Mitchell Highway onto Cobbora Road to the Site is outlined in Figure 6-4.

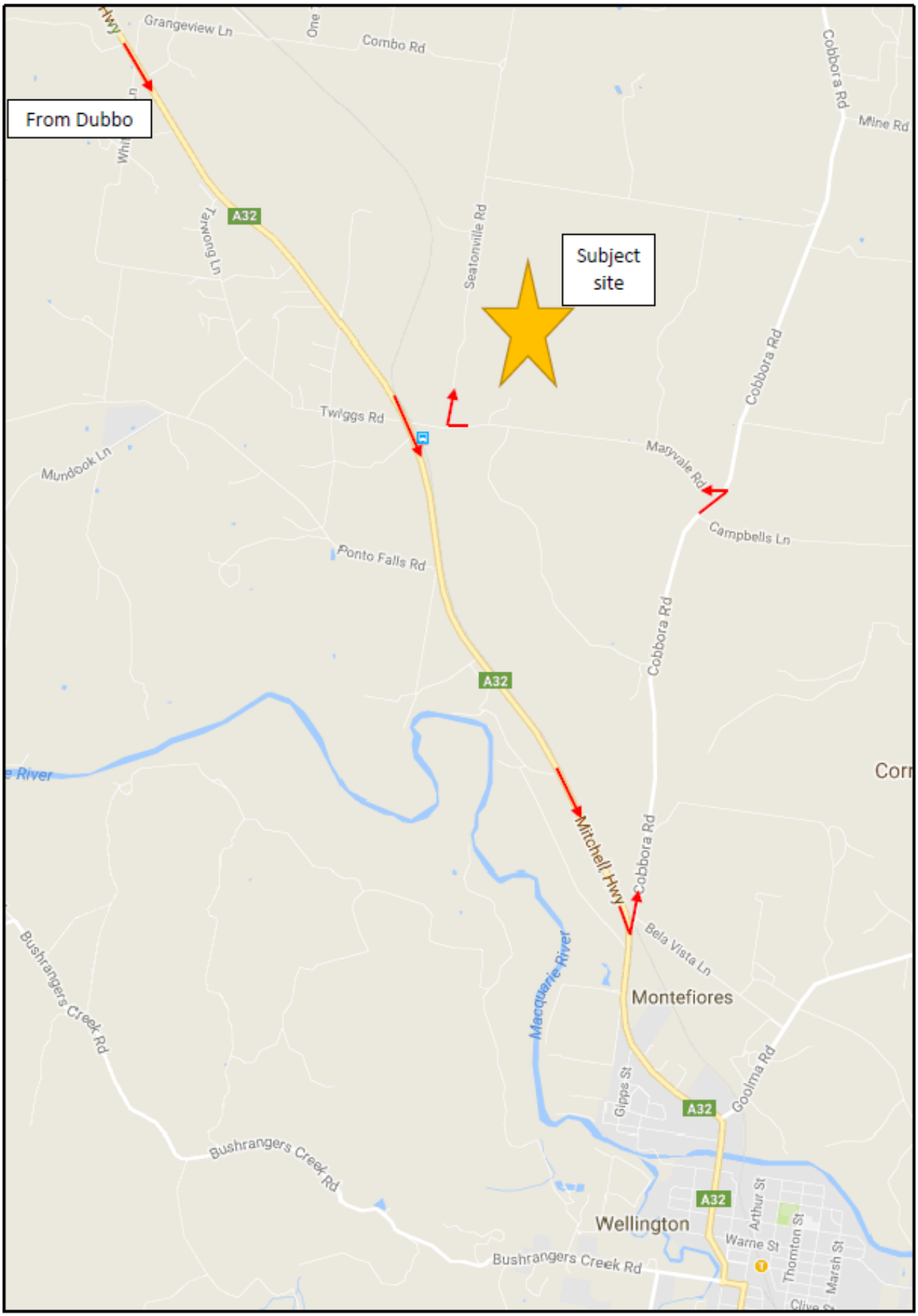

Figure 6-4: Proposed Access Route (Figure from SECA Solution)

These roads all form part of the road freight routes within the State road network and all currently carry heavy vehicle movements for the full length of the routes.

These roads carry a high number of heavy vehicles, associated with local and regional agricultural and transportation demands. These demands are seasonal in nature and occur 24 hours a day often involving night travel and operations. There are a number of farms in the general locality of the Site as well as in the wider Wellington area that use these local and regional roads during these seasonally high demand periods.

For the regional road network including the Mitchell Highway, Golden Highway and New England Highway / Hunter Expressway, the total traffic flows will remain well within acceptable limits and as such will continue to operate to a good level of service for all road users.

The traffic flows along the local roads providing access for the heavy and light vehicle movements associated with the Proposal (as identified in Figure 6-4) are currently low (based on-site observations) and there is minimal background traffic growth in this location. The Roads and Maritime Service count data from the station south of Wellington on the Mitchell Highway (Station I.D. 6170) shows traffic flows of 2,428 in 2017 and 2,380 in 2015, representing an increase of around 0.7% per annum. Other counts along the regional road network show similar or lower increases.

There is no school within the general locality of the Site however an existing school bus run operates along Cobbora Road.

There will be no impact upon public transport services (including bus stops), emergency vehicles or heavy vehicles as no diversions are required.

Public vehicle access within the work site during the construction works will not be permitted with site access off Seatonville Road being via a locked gate. There will be no pedestrian access to the site for the general public and there are no pedestrian paths in the locality of the site or expected demands for pedestrian access to the Proposal.

The decommissioning haulage route will be determined towards the end of the operational period of the Proposal as the road infrastructure may change. The indicative decommissioning haulage routes are the same as the construction haulage routes.

Site Access

Access to the site will be facilitated by two new access roads off Seatonville Road providing access to the Site (including carpark and construction laydown area) and the substation as identified in Figure 3-3.

A concept design for the access road has been prepared and is provided in Appendix C of the TIA which can be found in **Appendix E.**

The access road will be sealed for the first 30 metres to allow for safe construction, operational and decommissioning traffic movements and to reduce potential for dust and erosion. The remaining section of access road will be constructed of suitable compacted gravel and a shaker device will be installed to ensure dust and other material is removed from vehicles and not tracked onto Seatonville Road.

To facilitate safe turning movements in and out of the site, a satisfactory turning area off Seatonville Road will be maintained.

Construction

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

- Increased collision risks (other vehicles, pedestrians, stock and wildlife)
- Damage to road infrastructure
- Associated noise and dust which may adversely affect nearby receivers
- Disruption to existing services (school buses, cyclists, pedestrians)

Associated noise and dust impacts from traffic are assessed in Section 6.9 and Section 6.10.

No traffic impacts in addition to those mentioned for construction are anticipated during the decommissioning phase however this will be reviewed as part of the TMP for decommissioning given that circumstances are likely to change between construction and decommissioning.

Increased Vehicle Numbers

During the 12-month construction period the number of staff will vary with approximately 150 staff expected during peak periods with a lower level outside peak construction periods. The staff will be sourced locally where appropriate and local staff participation will be maximised where possible. Some specialist and project management staff from outside the local area will be temporarily located in Wellington for the duration of the construction stage.

To maximise local staff participation, MSF propose to use the same methodology as they have successfully implemented for other Projects in Australia. This will include holding a community information session and creating an Expressions of Interest (EOI) for interested local suppliers and contractors.

All staff will be encouraged to car pool as appropriate with other staff and transfers to and from the site via mini coaches will also be provided to reduce vehicle demands. Due to the size of the Site, these same vehicles will also be used on site to move staff across the site, as required.

Alternatives such as walking and cycling to site were considered. Cycling to the site could be an option for the proposal as the site is approximately 10km from the Wellington town centre estimated as a 30minute ride. Cyclists can ride on the road due to low traffic flows and can park bikes on site as required. However, walking is not considered appropriate due to the relatively remote location of the site, the lack of footpaths available in the locality and excessive travel time which is estimated to be over 2 hours.

The level and type of heavy vehicles accessing the site will vary throughout the construction stage including:

- Site establishment and set up – requirement for some earthwork moving equipment to construct the access tracks and some minor earthworks. This may require a scraper or bull dozer which will be transported to site on a low loader. This machinery will remain on site for the duration of the earthworks portion of the construction work
- Construction - Once the earthworks have been completed, the balance of the construction work will commence. All plant will be located on site and will therefore be only required to access the site once for the construction works

It is estimated that during construction the average number of traffic movements would consist of approximately 75 light vehicle movements per day and 20 heavy vehicle movements per day.

The light vehicle movements have been estimated based upon 150 staff at peak period and a vehicle occupancy rate of four people per vehicle (assumed based upon carpooling and the use of a mini bus e.g. Toyota Coaster). The majority of these will be inbound movements in the morning bringing workers to the site with these vehicles then remaining on site for the full day before leaving at the end of the working day. It is expected that there will be limited light vehicle movement outside of these periods, other than support staff e.g. office staff or visitors to the site.

The vehicle numbers associated with the construction work are relatively low and it is considered that the movement of vehicles in and out of the site for construction works can occur in a safe manner. No limitation on truck access times is considered appropriate for the project due to the journey length between the port and the Site. The vehicles as they are approaching the site will be spread out ensuring staggered arrival and with unloading of vehicles taking up to 30 minutes or more, trucks exiting the site will also be staggered.

At all times the heavy vehicle movements will be spread across the working day. For the delivery of components such as the solar panels, trucks will be arriving from either the Port of Sydney or the Port of Newcastle with the travel time being over 5 hours, this will see a spread of arrival times across the day with no concentration of heavy movements expected.

It is considered the additional traffic movements will have a minimal and acceptable impact upon the operation of the local roads and the heavy vehicle route can safely accommodate the additional traffic movements.
A summary of the anticipated vehicle movements, excluding the above staff movements, is provided in Table 6-5 below.

Table 6-5: Vehicle movements expected as a result of the proposal

Phase	Purpose	Vehicle Type/ Trailer Type	No. of one-way vehicle movements
Site Set-Up and Demobilisation	Portacabin delivery and removal	Low loader	20
	Skip delivery and removal	Low loader	40
	Generator delivery and removal	Semi-trailer	4
	General deliveries	Semi-trailer	30
	Crane mobilization and demobilization	Crane	4
	Water tank delivery and removal		4
Roads and hardstands	Delivery of imported capping for road laydowns and crane hardstands	Truck and dog	400
	Plant delivery and removal: excavators, compactors drill rig	Low loader	30
	Concrete deliveries for maintenance container hardstands	Concrete agitator	90
Generating Equipment	Tool container delivery and removal	Low loader	4
	Module deliveries	Semi-trailer	1300
	Mounting structure and pile deliveries	Semi-trailer	1000
	Inverter Station deliveries	Low loader	26
	DC cabling trays and combiner boxes	Semi-trailer	200
AC Cable Installation	AC Cable delivery	Semi-trailer	180
	Backfill material delivery	Dump Truck	1400
Plant Delivery and removal	Telescopic handler and excavator	Low loader	28
Overhead Line	Conductor delivery	Semi-trailer	20
	Pole deliveries	RAV	5
	Pole dressing delivery	Semi-trailer	1
Other	Miscellaneous deliveries	Light vehicle	40-75
	Monitoring equipment fibre SCADA servers etc	Truck	2
	Waste Collection	Truck	200
	Consumables (Oil and Fuel)	Truck	20
	Miscellaneous deliveries	Light Vehicle	20
	Construction water	Truck	1
		TOTAL	5,104

It is anticipated that there will be two (2) oversize overmass (OSOM) delivery for the transformer/s carrying kit during construction.

Parking arrangements

All parking will be contained on site within a temporary construction parking and temporary facilities area adjacent to the site office and construction laydown area as shown in Figure 3-3.

All staff vehicles will be able to park within the construction compound on Site, adjacent to the site office with no external parking demands. The construction park area will allow for up to 70 vehicles to park within this compound area. The size of the Site will allow for all construction staff vehicles to park on site.

Shuttle bus and car pooling arrangements will reduce the vehicle numbers and parking requirements.

Road condition

Some sections of the proposed access route contain unsealed or narrow sections which will be upgraded to improve road safety and reduce potential environmental impacts.

The unsealed section of Maryvale Road does not allow sufficient width for opposing heavy vehicles to pass in some locations. As such, Maryvale Road will be widened to allow for the passing of semi-trailers at 3 locations as identified in **Appendix E**.

The length of Seatonville Road from Maryvale Road to the Site Access will be upgraded to allow two-way movements of heavy vehicles. The approach to Maryvale road will be sealed and a new gateway will be constructed to facilitate the swept path of a semi-trailer.

Intersection sight distances

The intersection sight distances from key intersections along the primary haulage route are shown in Table 6-6. Traffic control Plans have been developed for the intersection of Cobbora Road/Maryvale Road and are included with the Traffic Impact Assessment (TIA) in **Appendix E**.

Table 6-6: Intersection sight distances

Intersection	Speed Limit	Austroads Guidelines (sight visibility requirement)	Sight distance measured onsite	Upgrade works required
Mitchell Highway/Cobbora Road	80km/h	181m	300m	No
Cobbora Road/Maryvale Road	100km/h	248m	Left – 185m Right – 200m	Yes Left turn deceleration lane on Cobbora Road (AUL (S) type upgrade)

Increased Collision Risk

There will be an increase in the number of heavy vehicle movements during construction which may impact the local road network along the haulage route. The major road safety impact is associated with traffic entering and exiting the Site and moving through intersections along the haulage route.

However, as the vehicle numbers associated with the construction work are relatively low it is considered that the movement of vehicles in and out of the site for construction works can be conducted in a safe manner.

Damage to Road Infrastructure

The increase in traffic and heavy vehicle movement could impact the condition of roads on the haulage network. Along the Mitchell Highway the impact is expected to negligible due to the existing capacity of the road network. Local roads are already subject to heavy vehicle movements from agricultural activities and general haulage, however, should any additional damage occur as a consequence of the proposal this will be rectified.

With regards to any emergency repairs required, the contractor on Site would contact the relevant authorities and will ensure the road is safe. Repairs will be made in accordance with the relevant authority standard and approved council contractors.

Disruption to Farming

There are a number of farms in the general locality of the site as well as in the wider Wellington area however, coordination of construction traffic with seasonal agricultural haulage is not necessary considering the level of additional vehicles associated with construction and the existing capacity of the road network.

Disruption to School Bus Services

There is no school within the general locality of the Site however an existing school bus run operates along Cobbora Road.

As part of the employee and site induction for all heavy vehicle drivers this school bus route will be highlighted so that drivers are aware of a potential school bus over this section. The Proposal will also seek to minimise truck movements between 08:00 – 09:00 and 15:00 – 16:00 during school days to avoid school bus pick up and drop off times.

It is noted that the light vehicles associated with the staff movements will typically occur in the morning prior to this school bus inbound movement and staff leaving the site at the end of the day will be after the return of this school bus run and as such are not expected to have any interaction. Once on the regional and state road network all school zones will be delineated in accordance with RMS Guidelines with reduced speed limits in accordance with normal NSW road rules. All drivers associated with the Proposal construction work will adhere to the road rules as applicable.

Operation

Post construction, the traffic numbers generated by the Proposal are very low, with a maximum on-site workforce of 10 people. There will not be any need for regular heavy vehicle access to the site once the solar farm is operational.

Heavy vehicle movements associated with the operation phase will be irregular and subject to varying maintenance and management needs on the Site. However, it is anticipated that there will be on average 50 heavy vehicles movements per annum during operation.

10 Year Horizon

The major impact of the Proposal is during the construction phase which will be approximately 12-months. The impact of this construction phase has been assessed based on current traffic flows.

For the 10-year horizon, the traffic that will be that associated with the proposal will be vehicles required to access the site for on-going maintenance and operation of the facility. Up to 10 staff will conduct

maintenance and ad-hoc repair work on the site once the facility is operational, and it assessed that the impact on the local road network from these staff movements will be very low.

Proposed Road Upgrades

The following upgrades are proposed (pitt&sherry concept designs can be found in Appendix C of the TIA in Appendix E. pitt&sherry drawing references (e.g. SY17238-P1) refer to the Appendix C concept design drawings):

- Intersection treatment at Cobbora Road/Maryvale Road - Left turn deceleration lane on Cobbora Road (AUL (S) type upgrade) (SY17238 – P3)
- Widening of Maryvale Road at three locations (SY17238-P1)
- Strengthening of one waterway structure (approximately 450m east of Seatonville Road) on Maryvale Road (SY17238-P1)
- Widening of Seatonville Road to allow two-way movements of heavy vehicles (SY17238-P1)
- Sealing of Seatonville Road for 30m at the approach to Maryvale Road. (SY17238 – P2)

A concept design for the upgrade works is provided in **Appendix E**.

A concept design for both the permanent new access road and temporary access road from Seatonville Road into the Site is provided **Appendix E**.

6.2.4 Mitigation Measures

Reference	Mitigation Measures
Construction and Decommissioning Mitigation Measures	
T1	Undertake consultation with the relevant Road Authority for the proposed road improvements, as stated in 6.2.4, and any ancillary road works and obtain a Section 138 approval prior to the construction of the proposal.
T2	A Traffic Management Plan (TMP) for construction shall be developed in accordance with Roads and Maritime Guidelines and the Australian Standard AS1742.3. The plan would include: • The designated routes of construction traffic to the site • A map of the primary access routes highlighting critical locations • Drivers Code of Conduct • Carpooling/shuttle bus arrangements to minimise vehicle numbers during construction • Scheduling of deliveries • Community consultation requirements • Any restrictions on traffic movements (such as residential areas, school pick-up and drop-off times) • Traffic controls (speed limits, signage, etc.) • A complaint handling procedure / register • An induction process for vehicle operators • The origin, number, size, frequency, including peak and daily traffic volumes and destination of vehicles accessing/exiting the site • Loads, weights and lengths of haulage and construction related vehicles and the number of movements of such vehicles • Existing background traffic, peak hour volumes and types and their interaction with projected development related traffic • Cumulative impacts of existing background traffic and traffic generated by the construction of the solar farm • The management and coordination of construction and staff vehicle movements to the site and measures to limit disruption to other motorists • Specifically, the TMP will detail how the projected maximum of seventy (70) light vehicles accessing the site per day will be achieved and enforced • Shuttle bus collection and drop off locations and details of parking at these locations • Measures to be employed to ensure a high level of safety for all road users during the construction and operation phases of the development • Scheduling of haulage vehicle movements to minimise convoy length or platoons • Details of intersection improvement works in accordance with Austroads Guide to Road Design • Local climate and environment conditions that may affect road safety for vehicles used during construction, operation and decommissioning of the project (e.g. fog, wet weather and wildlife strikes)
T3	All Proposal personnel will be provided training on the requirements of the TMP through site inductions, toolbox talks or specific training
T4	The heavy vehicle route will be included within the Driver's Code of Conduct and will form part of the project inception meeting for the project for all staff and drivers. This will include informing all drivers of school bus pick up, and drop off times along the route.
T5	Traffic control will be provided in accordance with the approved construction TMP to manage traffic movements (vehicular, cycle and pedestrian) during construction and maintain the flow of traffic within the site and on surrounding public roads

Reference	Mitigation Measures
T6	Traffic management controls will be communicated to appropriate stakeholders which will include the local community in the site vicinity via a letter box drop
T7	Directional signage will be installed to direct construction traffic, and warn other motorists of construction traffic. This signage is positioned in accordance with the approved Traffic Control Plans.
T8	All employees, subcontractors and suppliers will comply with the speed limits within the worksite, which are as follows: • 40 km/h on formed roads • 20 km/h during foggy/dusty conditions with headlights on • 10 km/h when passing pedestrians
T9	A dilapidation survey will be completed along Maryvale Road prior to upgrades on this road and after the works are complete. A dilapidation survey protocol is provided in **Appendix H**.
T10	Temporary traffic controls will be installed at the intersection of Maryvale Road and Cobbora Road to reduce the posted vehicle speeds to 80km/h and signage to advise drivers of turning trucks.
T11	A Traffic management plan (TMP) for decommissioning will be developed as part of the decommissioning management plan. This will include a decommissioning haulage route. The indicative decommissioning route provided in this EIS will be reviewed prior to the start of decommissioning.
T12	Establish a maintenance schedule with Dubbo Regional Council for Coborra Road, Maryvale Road and Seatonville Road for the duration of construction.

6.3 Aboriginal Heritage

An Aboriginal Cultural Heritage Assessment was prepared by Kelleher Nightingale Consulting (Kelleher Nightingale) to determine the archaeological significance of the site (Appendix F). A summary of the key findings of this assessment and associated mitigation measures are outlined below.

6.3.1 Assessment Methodology

The assessment employed a regional approach, taking into consideration resource availability within the area (water and stone raw materials), the landscape of the Site (landforms, water resources, soils, geology, etc.) and the regional archaeological patterning identified by past studies.

The report has been prepared in accordance with:

- *The Due Diligence Code of Practice for the Protection of Aboriginal Objects in NSW* (DECCW 2010a), and
- *The Code of Practice for the Archaeological Investigation of Aboriginal Objects in NSW* (DECCW 2010b)

The assessment was undertaken in consultation with Wellington Local Aboriginal Land Council (WLALC) who also participated in two field surveys. The Site lies within the boundaries of the WLALC.

The following tasks were undertaken as part of the assessment:

- A Desktop Assessment including a review of Aboriginal Heritage Information Management System (AHIMS) for known archaeological sites
- A review of local environmental information (topographic, geological, soil, geomorphological and vegetation descriptions) to determine the likelihood of archaeological sites and specific site types, prior and existing land uses and site disturbance that may affect site integrity
- A review of previous cultural heritage investigations to determine the extent of archaeological investigations in the area and any archaeological patterns
- The development of a predictive archaeological statement
- Identification of human and natural impacts to the Site
- Consultation with the WLALC
- Site inspection with the WLALC to both the Site and along Maryvale and Seatonville Roads on 27 February 2018 and 19 August 2018
- Traversing the Site by pedestrian survey in a series of transects. Site locations were plotted using handheld GPS units, mapped and photographed, including landform context and site contents, and
- The development of mitigation and conservation measures in consultation with the WLALC.

Desktop Assessment

A search of AHIMS was conducted on 1 May 2018 to identify registered (known) Aboriginal sites or declared Aboriginal places within or adjacent to the Subject Land. The AHIMS Web Service database search was conducted with the following coordinates (GDA, Zone 55):

- Eastings: 677108 – 684447, and
- Northings: 6402886 - 6411578

Other sources of information including heritage registers and lists were also searched for known Aboriginal heritage in the vicinity of the Subject Land. These included:

- Wellington LEP 2012
- State Heritage Register

- State Heritage Inventory
- Commonwealth Heritage List
- National Heritage List
- Australian Heritage Places Inventory, and
- Historic Heritage Information Management System (HHIMS)

No items of Aboriginal heritage were listed or registered on these databases within the study area.

Review of Previous Archaeological Work

Several archaeological surveys and test excavations have been carried out across the region. The majority of previous assessments were associated with infrastructure developments.

Archaeological Potential

Archaeological potential in the local area has been affected by various factors, primarily the extent of historical disturbances. Extensive land clearing activities would have removed mature native vegetation and therefore directly impacted on the preservation of culturally modified trees. Agricultural activities such as cultivation would have also affected the presence of subsurface cultural material through disturbances to the upper soil horizons.

Spatial and stratigraphic movements of cultural material could be expected, but these processes do not remove or destroy archaeological material. Some post- depositional movement of cultural material can also be expected due to erosion, especially on hillslope landforms and fluvial processes along stream channels. Construction of farm buildings, artificial dams, irrigation channels and installation of fences has also caused ground disturbance and may have removed and/or displaced soils containing cultural material.

The majority of the study area has been subject to cultivation for a considerable period of time, including extensive clearing, cropping and construction of dams while the road corridors have been subject to extensive disturbance from their construction.

6.3.2 Existing Environment & Archaeological Context

Aboriginal Settlement

The Wellington area is within the Wiradjuri territory. Wiradjuri is the largest Aboriginal language group in NSW and means “people of the three rivers”, referring to the Macquarie, Lachlan and Murrumbidgee rivers (NPWS 2003:121). Local movement of people was associated with several purposes which included, hunting and gathering, social activities and ceremonial gatherings. Resources were utilised seasonally when family groups would be drawn to the riverine environment and would have camped nearby. In times of less abundance, visits to an area would generally be short and associated with a particular activity. This implies that areas around permanent and reliable water sources, such as rivers and larger creeks were revisited periodically over time, while smaller ephemeral creeks were visited only seasonally but not necessarily returned to regularly. Ridgelines and crests were also visited as passing corridors with very short or transient occupation events.

Landscape Features

Aboriginal heritage items are often associated with particular landscape features as Aboriginal people used these features in their day-to-day lives or for cultural ceremonies. Common elements that influence occurrence of sites in the Wellington area are proximity to water, good soil drainage and views over watercourses. Oral history and archival investigation has also demonstrated that many of the historic, social and spiritual aspects of Aboriginal culture share a common theme with rivers, creeks and waterholes.

Aboriginal heritage artefacts such as Aboriginal scarred trees and stone tools have been found in other locations along the Macquarie River. The Subject Land however, is located approximately 3 km from the River landscape within a highly disturbed intensive agricultural environment.

Soils and Geology

Soil type would determine the state of preservation of cultural material with the higher preservation rate in deep alluvial deposits and in areas with limited previous surface and ground disturbance.

Soils within the study area consist entirely of the Bodangora Soil Landscape. Soils consist of Euchrozems, present on lower, gentle slopes and Non-calcic Brown Soils, present on steep slopes, outcrops and moderately inclined slopes. Terra Rossa Soils are present where limestone geological inclusions are present (Murphy & Lawrie 1998). Euchrozems are defined by dark reddish-brown clay loams to light clays in topsoils and moderate strongly structured reddish-brown light to medium clays in subsoils. Gravel increases with depth and soft nodules of calcium carbonate begin to appear at approximately 90 centimetres below the ground surface. Non-calcic Brown Soils present on steep slopes or hillcrests consist of hard setting gravelly dark reddish-brown fine sandy loams. Pockets of Terra Rossa Soils are present across the local area where associated with limestone deposits and are described as friable dark reddish-brown fine sandy clay loams to clay loams. The Bodangora Soil Landscape is slightly to moderately erodible where vegetation or earthworks are not maintained.

The distribution of native vegetation within the study area has been affected by historic and contemporary European land use practices in the region. Current land use in the area is predominantly agricultural and includes ploughed paddocks and pastures. Landscaping and construction activities associated with European land use practices have caused varying levels of disturbance within the study area. In areas affected by ploughing or the construction of dams, roads and utility infrastructure disturbance is generally higher while tree clearance and vehicle movement generally cause low to moderate disturbance.

It should be noted that waterways were graded and no items were identified in the small waterways.

Archaeological Potential

Archaeological sites in the region generally occur as surface artefact scatters and isolated artefacts. Relatively elevated landforms along the margins of creeks, especially those offering permanent water and associated environmental resources such as Macquarie River and its tributaries would have been favourable for occupation by Aboriginal people. This is reflected in the archaeological record by higher artefact densities recorded along the major creek lines, potentially reflecting repeated or more intensive use of these locations. Other types of non-occupational sites would be directly dependent on the environmental conditions such as quarry sites which occur within landforms with suitable geological formations.

The Proposal area is located within a landscape with varying levels of natural and human disturbance. Ploughing, the construction of roads, dams and utilities in addition to natural process such as erosion disturb both surface and subsurface deposits. Within these contexts Aboriginal objects are unlikely to survive in situ and the archaeological potential of such sites is generally low. Conversely, ground surface visibility is often increased by these processes, leading to increased identification of surface artefacts in these areas.

The following predictive statements can be made:

- Aboriginal archaeological sites are likely to consist of open artefact scatters or isolated finds in proximity to waterways and scarred trees within areas of remnant mature vegetation
- Silcrete, quartz, quartzite, chert and volcanics will be the most commonly encountered artefact raw material
- Clearance of the majority of original vegetation lessens the likelihood of identifying culturally modified trees, but old growth trees may be present in the study area and have the potential to display scars or carvings of Aboriginal origin

- Stone arrangements may be encountered on knolls or prominent landscape features, and
- The identification of Aboriginal archaeological sites is likely to be affected by differential visibility of the ground surface, but successful assessment of areas of potential archaeological deposit can be made based on landform and other environmental factors such as disturbance, degree of slope and distance to reliable water resources

Database Searches

The AHIMS search concluded that there are 13 Aboriginal sites or places recorded within the search area, however none were recorded within the Site. The review of other sources did not identify any items of Aboriginal heritage value listed within the Subject Land.

The distribution of recorded Aboriginal sites within the search area is shown on Figure 6-6 and the frequencies of site types (site context/features) within the AHIMS database search area is listed in Table 6-7.

Table 6-7: Frequency of site types from AHIMS database search

Site Context	Site Features	Number	%
Open Site	Artefact	10	77
	Modified Tree (Carved Tree or Scarred)	1	7.7
	Stone Arrangement; Stone Quarry (Artefact)	2	15.3
TOTAL		13	100

Field Survey

WLALC was consulted at the commencement of the Proposal and invited to participate in a site inspection. Some limitations were imposed on the survey by infrequent exposure but generally there was moderate visibility. The survey identified seven Aboriginal archaeological sites within the study area. The sites comprised four surface artefact scatters (Maryvale Road AFT 1, Maryvale Road AFT 2, Seatonville Road AFT 1 and Seatonville Road AFT 2), two isolated surface artefacts (Maryvale Road IF 1 and Seatonville Road IF 1) and one culturally modified tree (Maryvale Road TRE 1). Aboriginal archaeological sites identified in the study area are listed in Table 6-8 and locations shown on Figure 6-5.

Table 6-8: Identified Aboriginal archaeological sites in the study area

Site Name	Feature	Survey Unit	Landform
Maryvale Road AFT 1	Artefact	3	Flat and open depression
Maryvale Road AFT 2	Artefact	3	Flat and open depression
Maryvale Road IF 1	Artefact	3	Flat
Maryvale Road TRE 1	Culturally modified tree	3	Flat
Seatonville Road AFT 1	Artefact	2	Open depression, flat and slope
Seatonville Road AFT 2	Artefact	2	Open depression
Seatonville Road IF 1	Artefact	1	Open depression

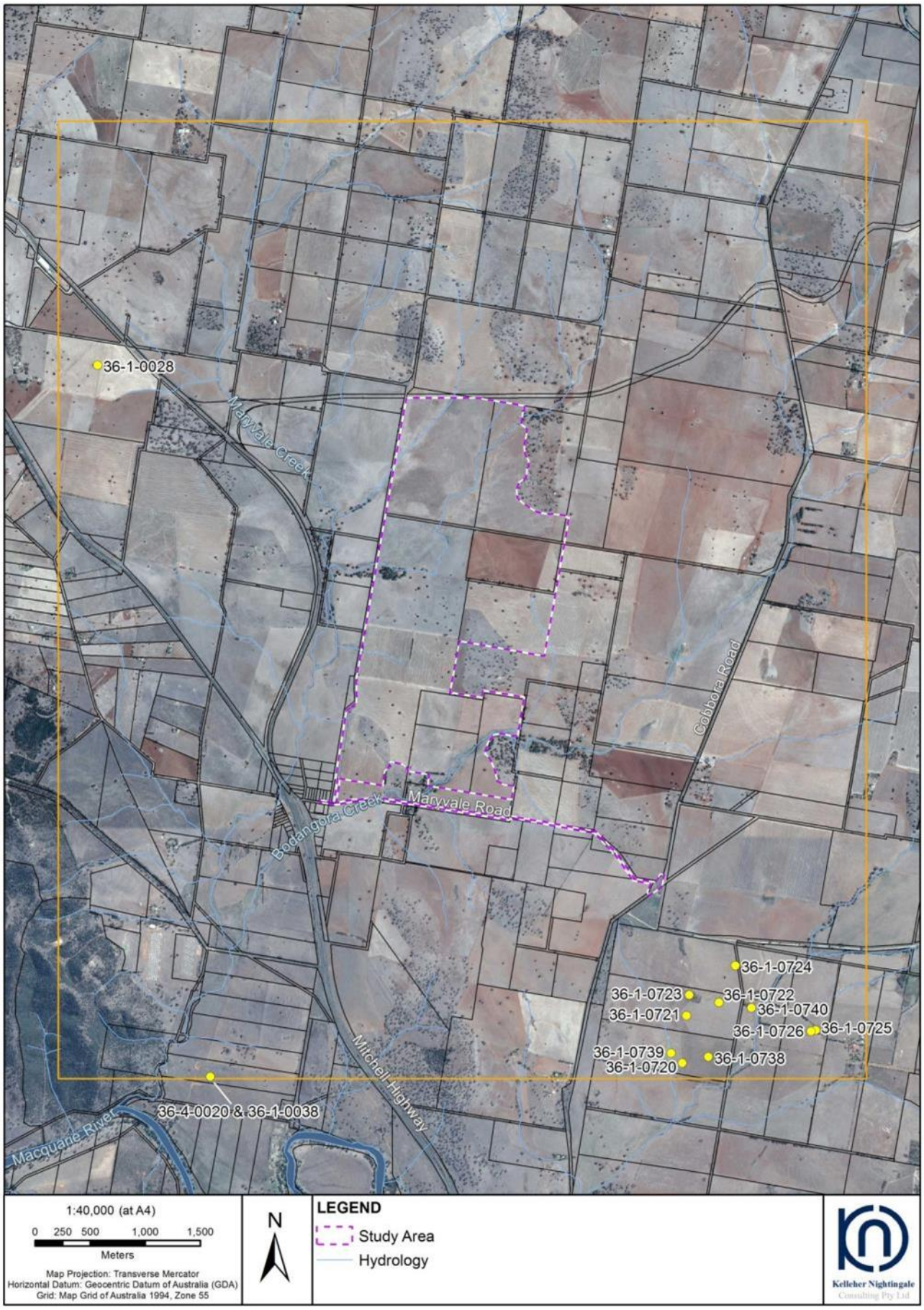

Figure 6-5: Previously Recorded Aboriginal Sites

6.3.3 Assessment of Potential Impacts

The distribution of sites within the study area indicate that Bodangora Creek and the unnamed tributary of Maryvale Creek were focal points for past Aboriginal land use. The presence of two ground stone artefacts and a culturally modified tree with a bark removal scar also indicate that the areas adjacent to larger creeks in the region were being utilised for a range of activities including the procurement of raw materials. The location of these sites is presented in Figure 6-6 and the significance of each site was assessed and is presented in Table 6-9.

Table 6-9: Identified Aboriginal archaeological sites in the study area

Site name	Assessed Significance/ Potential
Maryvale Road AFT 1	Moderate
Maryvale Road AFT 2	Low
Maryvale Road IF 1	Low
Maryvale Road TRE 1	Moderate
Seatonville Road AFT 1	Moderate
Seatonville Road AFT 2	Low
Seatonville Road IF 1	Low

The seven identified Aboriginal archaeological sites were located within the riparian corridors of Bodangora Creek and the unnamed tributary of Maryvale Creek. These corridors, including the Aboriginal sites, are outside the Solar Farm Boundary proposed impact footprint. Sites Maryvale Road AFT 1, Maryvale Road AFT 2, Maryvale Road IF 1, Maryvale Road TRE 1, Seatonville Road AFT 1, Seatonville Road AFT 2 and Seatonville Road IF 1 will not be impacted by the proposed solar farm development.

The remainder of the study area was assessed as exhibiting low archaeological potential due to combinations of archaeologically unfavourable topography, agricultural activity, previous road construction activities and contemporary disturbance of the land.

Proposed works associated with the solar farm development will not impact on areas of Aboriginal cultural heritage significance.

In the event of an unexpected find of an Aboriginal heritage item (or suspected item), the safeguards specified below would be implemented to avoid or minimise any potential impact on Aboriginal heritage items uncovered during the proposed works.

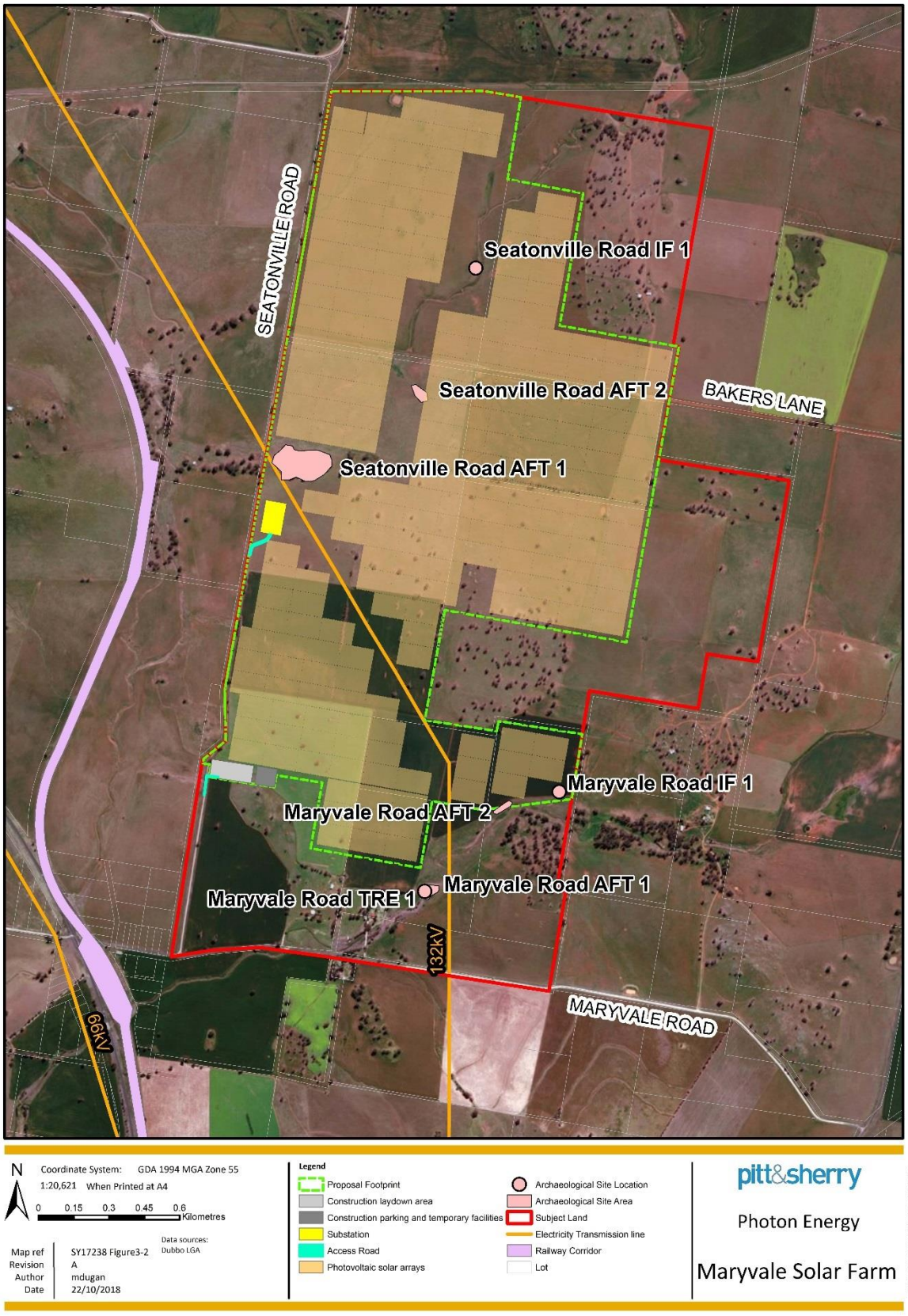

Figure 6-6: Aboriginal Heritage Sites Recorded During Survey

6.3.4 Mitigation / Management Measures

Reference	Mitigation Measures
Construction and Decommissioning Mitigation Measures	
AB1	An Unexpected Finds Protocol which addresses unexpected aboriginal heritage finds will be included in the Construction Environmental Management Plan to be completed by the construction contractor.
AB2	The Unexpected Finds Protocol will form part of the site induction and must be viewed by all relevant employees and contractors before working on site.
AB3	Aboriginal archaeological sites Maryvale Road AFT 1, Maryvale Road AFT 2, Maryvale Road IF 1, Maryvale Road TRE 1, Seatonville Road AFT 1, Seatonville Road AFT 2 and Seatonville Road IF 1, and the Culturally significant tree (all outside the footprint), should be addressed in the CEMP to ensure protection.
AB4	If suspected Aboriginal objects, such as stone artefacts are identified during works, works must cease within 10m of the affected area and an archaeologist called in to assess the finds. If the finds are found to be Aboriginal objects, the OEH must be notified under section 89A of the NPW Act. Appropriate management or avoidance should be sought if Aboriginal objects are to be moved or harmed.
AB5	In the extremely unlikely event that human remains are found, works should immediately cease and the NSW Police are to be contacted. If the remains are suspected to be Aboriginal, the OEH may also be contacted at this time to assist in determining appropriate management.

6.4 Land Use

A Land Use Assessment was prepared to determine the significance of historic, current and proposed land use of the site. The key findings of this assessment and associated mitigation measures are outlined below.

6.4.1 Assessment Methodology

Land use conflicts occur when one land user does, or is perceived to, infringe upon the rights, values or amenity of another. In rural areas, land use conflicts commonly occur between agricultural and residential uses. However, land use conflicts can also occur between different agricultural enterprises and other industries such as mining, forestry or energy production. Due to the potential for land use conflicts between the solar farm development and the existing agricultural land use a land use conflict risk assessment (LUCRA) based on the Department of Primary Industries (DPI) '*Land Use Conflict Risk Assessment Guide' (Department of Trade and Investment, 2011*) was conducted as part of this EIS (refer Appendix G).

There are four key steps in undertaking a LUCRA and these are:

- Gather information about proposed land use change and associated activities
- Evaluate the risk level of each activity
- Identify risk reduction management strategies, and
- Record LUCRA results

A Risk Ranking Matrix, (Table 2 of the LUCRA Guide) is used to rank the identified potential land use conflicts. The risk ranking matrix assesses the environmental, public health and amenity impacts according to the:

- Probability of occurrence (Table 3 of the LUCRA Guide), and
- Consequence of the impact (Table 4 of the LUCRA Guide)

6.4.2 Existing Environment

Existing Land Use

The Site and the surrounding land are zoned RU1 Primary production under the Wellington LEP 2012. Also in close proximity to the Site is land used for the railway line and Mitchell Highway which are zoned as SP2 – Infrastructure.

The surrounding areas are dominated by parcels of cleared agricultural land with scattered trees and some small woodland areas.

The Site is privately owned and currently used for agricultural purposes including cropping (wheat and Lucerne) and grazing. The Site is surrounded by a variety of land uses including:

- Road corridor to the south and west of the Site including Seatonville Road and Maryvale Road
- Rural residential to the south and east of the Site, and
- Agricultural lands to the north, east and south of the Site

Current land management on the site is focussed on agriculture (cropping and grazing). Further details regarding the soils and hydrology of the Site is detailed in Section 6.6 and 6.7.

Mineral Resources

Land in this area contains highly prospective geological units and structures and as such is targeted for copper-gold and base metal depositions. Existing mines in the region include:

- Commonwealth mine (gold-silver and base metals), approximately 11km south of the Site

- Galwadgere mine (copper and gold) approximately 28km south of the Site, and
- Kaiser mine (copper and gold) approximately 8km north of the Site

A search of Department Resources and Energy's MinView database found the site to have two current Mineral Titles. These are described in Table 6-10 Exploration licences entitle the holders to carry out exploration and prospecting for minerals within the specified area.

Table 6-10: Exploration licences currently in force over the proposed solar farm proposal boundary

Mineral Title/ Licence Number	Owner	Type of Title or Licence
EL 8357	Modelling Resources Pty Ltd – a wholly owned subsidiary of Magmatic Resources Limited.	Exploration licence
EL 6178	Modelling Resources Pty Ltd – a wholly owned subsidiary of Magmatic Resources Limited.	Exploration licence

The current mineral titles and exploration licence applications are illustrated in Figure 4-2. Consultation undertaken with these mineral titleholders is outlined in Section 4.6.

Biophysical Strategic Agricultural Land (BSAL)

The land for the Proposal has been mapped as Biophysical Strategic Agricultural Land (BSAL) by the *State Environmental Planning Policy (Mining, Petroleum Production and Extractive Industries) 2007* (Strategic Agricultural Land Map – Sheet STA_022) as identified on Figure 6-7.

Figure 6-7: BSAL Mapping with Site Boundary Shown in Green

BSAL land features quality soil and water resources and is assumed to be the best land capable of sustaining high levels of productivity. BSAL is naturally fertile and highly productive and can be used for intensive agriculture such as cultivation.

The solar farm is located on land mapped in capability Class 2 under the Land and Soil Capability (LSC) Mapping for NSW (*OEH, 2017*). Class 2 land is '*arable land suitable for regular cultivation for crops, but not suited to continuous cultivation. It has a moderate to high suitability for agriculture but edaphic (soil factors) or environmental constraints reduce the overall level of production and may limit the cropping phase to a rotation with sown pastures*' (*NSW Agriculture, 2002*).

It is noted that this soil mapping for LSC and BSAL is not extensively ground-truthed and as such, the NSW OEH and the Office of Agricultural Sustainability & Food Security have created the '*Interim Protocol for site verification and mapping of biophysical strategic agricultural land'* (*NSW OEH & OAS&FS, 2013*). The Protocol specifies 12 criteria to determine whether the land is BSAL and the land must meet all 12 criteria to be classified as BSAL. pitt&sherry have compared this BSAL criteria to the existing environment and findings from the site visit and soil sampling undertaken (refer Table 6-11).

Table 6-11: Comparison of BSAL Criteria to Maryvale Site

No.	Criteria	Maryvale	Y/N
1	Is the slope less than or equal to 10%?	The slope is less than 10%	Y
2	Is there <30% rock outcrop?	The Site has <30% rock outcrop	Y
3	Does ≤ 20% of area have unattached rock fragments >60mm diameter?	The Site does not contain large amounts of rock fragments	Y
4	Does ≤ 50% of the area have gilgais (a hollow where rainwater collects; a waterhole) >500mm deep?	Less than 50% of the areas has gilgais	Y
5	Is slope <5%?	The slope is less than 5%	Y
6	Are there nil rock outcrops?	The Site does not contain rock outcrops	Y
7	Does soil have moderate, moderately high or high fertility?	Landscape information from the Dungog soil landscape indicates that plain areas are dominated by Ferrosols, Light Sand, Red and Heavy Clay. Some Red Dermosol and dark red coarse medium sandy clay with strong pedality. Soil sampling on the Site determined that the soil pH (water) of the soils was ranged from a pH of 5.6 to a pH of 8.7 which is within a reasonable fertility range. CEC ranged from 11 to 26 which is within the moderate to high fertility range (moderate: 12 – 25, High: 25 – 40).	Y

No.	Criteria	Maryvale	Y/N
8	Is effective rooting depth to a physical barrier ≥ 750mm?	To identify broad land capability and soil constraints a soil survey was undertaken on the Site. This involved excavating six test pits and completion of a test pit log sheet to record attributes of the soil layers. The majority of the test pits were terminated at 450mm however soil landscape information from the Dungog soil landscape indicates that sands and gravels are generally deeper than 3m.	Y
9	Is the soil drainage better than poor?	Test pit and soil sampling activities observed that the soils were well drained consisting of light sandy clay.	Y
10	Does the pH range from 5 – 8.9 if measured in water or 4.5 – 8.1 if measured in calcium chloride, within the uppermost 600 mm of the soil profile?	The average pH from the soil samples taken was 6.78 measured in water and 5.78 measured in calcium chloride. The samples were taken at the surface, 80mm and 450mm.	Y
11	Is salinity (ECe) ≤ 4dS/m or are chlorides <800 mg/kg when gypsum is present, within the uppermost 600 mm of the soil profile?	Electrical Conductivity readings averaged 0.096dS/m and none of the samples were above 4dS/m	Y
12	Is effective rooting depth to a chemical barrier ≥ 75mm? (Chemical barriers include: pH, electrical conductivity, chloride content, exchangeable sodium percentage and the calcium to magnesium ratio)	The majority of the test pits were terminated at 450mm however soil landscape information from the Dungog soil landscape indicates that chemical barriers are unlikely.	Y

Table 6-11 confirms that the Site meets the criteria for BSAL classification.

Current land management on the site is focussed on grazing agriculture. Further details regarding soils at the Site and their constraints are detailed in Section 6.7.

6.4.3 Impact Assessment

Nature of the Proposed Land Use Change

The Proposal will result in a change from agricultural activities to electricity generation accompanied by grazing. The major activities associated with the land use charge are:

- Lease of the Site for a Solar Farm
- Site establishment and preparation for construction including minor clearing
- Installation of steel frames, PV panels, and underground cabling
- Construction of a 132kV substation and associated transmission line and transmission line upgrades
- Operation of the facility for approximately 25 years
- Grazing of sheep on site to maintain ground cover, and
- Routine and ad-hoc maintenance work

The change in land use is mitigated by several factors:

- The Site will occupy approximately 375ha. As such utilising only a proportion of the agricultural holdings
- The Proposal will rest the land and allow the nitrogen content of the soil to rise naturally, and
- The Proposal has a reversible nature as it can be easily decommissioned and rehabilitate returning the land to its former agricultural use at the end of the operational period

Compatibility of Proposed Land Use and Adjoining Activity

Adjoining land use includes agriculture and rural residences. There are no operating mines or extractive industries adjacent to the Site.

Two exploration licences are active across the Site and consultation with the titleholders was undertaken and is detailed in Section 4.6. The titleholders have no objections to the Proposal.

Solar farms can be seen as compatible, incompatible or compatible with implementation of appropriate mitigation measures.

The following aspects of the Proposal are considered compatible with agriculture and the rural environment:

- When groundcover is established around the solar panels the land can be used for sheep grazing as well as energy production
- The panels provide shade for animal comfort and wellbeing during warmer months
- Once operational the Proposal has limited environmental impacts and any environmental impacts are unlikely to migrate offsite and impact neighbouring land uses
- The land required for the Proposal will be wholly contained within the Site and existing electricity easements. The proposal is not expected to impact or sterilise surrounding land use (including farming of BSAL land) from routine agricultural practices
- The land will be managed via a Land Management Plan (**Appendix L**) including measures to minimise dust generation and weed and pest infestations
- The land can be rehabilitated to ensure no future land use conflicts. The Proposal will not impact future agricultural land uses on the proposal site or adjacent lands. A Rehabilitation and Decommissioning Plan has been drafted (**Appendix M**) and will be revised for implementation prior to decommissioning
- Diversification of land use providing sustainable income for the landowners
- The presence of the solar farm does not restrict the carrying out of usual agricultural practices on adjacent lands including aerial spraying, and
- The solar farm allows the land to rest and recover from intensive agricultural practices

The following aspects are considered incompatible with agriculture and the rural environment:

- Introduces changes (new built environment elements) to the existing landscape character and scenic values
- Loss of farming land (mapped as BSAL) currently used for cropping agriculture for a minimum of 25 years, and
- Risk of weed infestation from land clearing activities

Road Upgrades

The upgrades to be undertaken on Seatonville Road, Maryvale Road and Cobbora Road will result in temporary construction in an active road corridor. Operational use of this road will continue and would provide safety improvements for the community using this intersection. No land use conflicts are anticipated as a result of the upgrades.

Impact on Agricultural Land

It is proposed that grazing of sheep will continue following construction of the Solar Farm and during its operation. As such, it will still be used for agricultural purposes albeit at a reduced capacity.

Following decommissioning of the Solar Farm, a Decommissioning and Rehabilitation Plan will be implemented to ensure the land is returned to pre-development conditions to enable continuation of agricultural use.

The Proposal, is not expected to impact or sterilise surrounding land use (including farming of BSAL land) from routine agricultural practices during construction, operation or decommissioning.

Under the Wellington LEP (2012), the Site has not been identified as flood prone, wetland or riparian land. The unnamed water course running through the Site is a small first order stream and at the intersection a second order tributary and the topography is undulating which allows surface water to drain from the Site without ponding and causing flooding. Accordingly, development on the site will not impact on any flood prone land.

Use of BSAL

The land within the Site is mapped as BSAL and this has been confirmed following site survey against the BSAL criteria (Table 6-11). Temporary reduction of the Site for agricultural production would occur for the life of the Proposal, approximately 25 years.

Currently, the development footprint (375ha) equates to a very small proportion of the mapped BSAL within the Wellington LGA. Furthermore, the solar farm would only occupy a portion of the Subject Land (approximately 66%). The remainder of the land will continue to be used for agriculture.

The area of disturbance will be minimal as no large areas of reshaping or excavation are proposed and piledriving will be used to install the pre-fabricated mounting structures. However, ground disturbance will be required for installation of electrical cabling including trenching for underground cabling and installation of inverter stations. All posts and cabling, and any stabilising infrastructure (such as the concrete footings required) would be removed upon decommissioning.

6.4.4 Land Use Conflict Risk Assessment

In accordance with examples provided by Department of Primary Industries (DPI) '*Land Use Conflict Risk Assessment Guide*' (*Department of Trade and Investment, 2011*) further potential impacts upon land use have been identified in Appendix G including identifying a residual risk rating (RRR) of each impact. Appendix G identifies the potential conflict, the mitigation measures that will be employed to manage the risk and then the RRR.

6.4.5 Mitigation Measures

Reference	Mitigation Measures
Construction and Decommissioning Mitigation Measures	
L1	Managed grazing will be used to maintain the height of ground cover during operation of the solar farm.
L2	If operations cease and the Site is to be decommissioned, a remediation plan will be compiled and implemented including identification of pasture species in consultation with local agronomic experts.
L3	All the infrastructure will be removed upon decommissioning with the possible exception of the substation, transmission lines to the substation and access road to the substation.
L4	Implement the Detailed Landscape Plan (**Appendix H**)
L5	All pesticides will be used in accordance with the *Pesticides Act 1999*, such that only registered pesticides are used based on label instructions that are designed to minimise impacts on surrounding land
Operational Mitigation Measures	
L6	An OEMP will be prepared for the Proposal and will incorporate: • a land management plan including weed management, and • ongoing landscaping commitments

6.5 Visual Amenity

A Visual Impact Assessment (VIA) was undertaken by Envisage Consulting (Envisage) to investigate the potential visual impacts of the Proposal (Appendix H). The summary of the key findings of this assessment are outlined below.

6.5.1 Assessment Methodology

The impact methodology used in the VIA has been based on experience with other large-scale infrastructure projects, and visual assessment guidelines used by government authorities in Australia and internationally:

- *'Environmental Impact Assessment Guidance Note – Guidelines for Landscape Character and Visual Impact Assessment'*, 2013, NSW Roads and Maritime Services
- *'Visual Landscape Planning in Western Australia',* 2007, Western Australian Planning Commission;
- The United Kingdom's widely used '*Guidelines for Landscape and Visual Impact Assessment*,' 2013, The Landscape Institute and Institute of Environmental Management and Assessment
- '*Best Management Practices for Reducing Visual Impacts of Renewable Energy Facilities on BLM-Administered Lands*', 2013, United States Department of the Interior, and
- *'Guide to Evaluating Visual Impact Assessments for Renewable Energy Projects'*, 2014, Sullivan and Meyer, for United States Department of the Interior

An initial step in the assessment was to identify potentially-sensitive viewing locations such as residences, and publicly accessible areas such as towns and local roads. Sensitive viewpoints were verified via aerial mapping and during the site inspection which occurred on the 23 November 2017 and a further inspection on 21 June 2018.

Two main types of visual impacts are assessed in this report:

- Effect on the landscape character – the overall impact of the Proposal on an area's character and sense of place, and
- Effect on key viewpoints – the day to day visual effects of the Proposal on people's views

The level of impact to landscape character and viewpoints is based on the combination of two criteria – 'sensitivity' and 'magnitude of change', defined by Roads and Maritime Services (2013) as:

- Sensitivity - The sensitivity of a landscape character zone or view and its capacity to absorb change. In the case of visual impact this also relates to the type of viewer and number of viewers, and
- Magnitude - The measurement of the scale, form and character of a development proposal when compared to the existing condition. In the case of visual assessment this also relates to how far the proposal is from the viewer

The specific criteria used to determine sensitivity and magnitude of change are outlined in Sections 2.5.1 and 2.5.2 of the VIA (refer **Appendix I**).

The combination of sensitivity and magnitude provides the predicted impact rating of the effect on landscape character for a project, or visual impact for surrounding viewpoints, as shown in Table 6-12 (as adapted from Roads and Maritime Services, 2013).

Table 6-12: Level of Impact

Matrix of relationship between sensitivity and magnitude					
		Magnitude			
		HIGH	MODERATE	LOW	NEGLIGIBLE
Sensitivity	HIGH	High	Moderate - high	Moderate	Negligible
	MODERATE	Moderate - High	Moderate	Moderate - Low	Negligible
	LOW	Moderate	Moderate - Low	Low	Negligible
	NEGLIGIBLE	Negligible	Negligible	Negligible	Negligible

6.5.2 Existing Environment

The Site is bounded by Maryvale Road on its southern boundary and Seatonville Road on its western boundary. Maryvale Road intersects with the Mitchell Highway less than 500 m from the south-west corner of the Site. Maryvale Road offers an alternate link between the Mitchell Highway and Cobbora Road to the east. Bakers Lane, a gazetted road, bisects the Site. There is an existing Essential Energy 132kV easement which runs through Lot 2 DP 573426 in a north – west to south-east direction.

Maryvale is a rural area, being part of the NSW Central West wheat-sheep zone and is typical of the undulating, agricultural, broadacre farming areas within the mid-western region. An image of the Maryvale rural area is shown in Figure 6-8.

Figure 6-8: Typical Rural Landscape Around Wellington

The locality of Maryvale is home to 159 residents and there are 63 dwellings. Two main roads - the Mitchell Highway (the main vehicular route between Dubbo and Sydney) and Cobbora Road (which connects Wellington to the Golden Highway) - provide access for Maryvale residents to Wellington. Maryvale is also traversed by the Main Western Railway line which connects western regions of NSW to Sydney. The Mitchell Highway and the Main Western Railway line are both west of the Site.

Land in the locality has been developed for crops (Lucerne, wheat and canola) and grazing (sheep and cattle) with improved pastures, and associated infrastructure and vehicles and rural residences being typical features of the area. West of the Mitchell Highway properties are smaller in size and there is a higher density of rural lifestyle lots. The dominant background colours common to the area are the colours of the crops (seasonally changing from bright greens to pale, muted yellows) and pastures (light, bright greens to light browns and yellows), scattered tall vegetation (dark grey-green), soil (red-brown), and surrounding vegetated ridges (soft deep blue).

Farm sheds and associated farming infrastructure are made of sheet metal, concrete or timber. Some surfaces, particularly metal-clad roofs, are highly reflective. Power lines and tall transmission lines cross the paddocks and run along the road corridors. They generally appear as dark vertical lines via their steel or timber pole construction.

Approximately 6.5km to the south-east of the Site, along Goolma Road, is a large-scale intensive poultry farm. The Wellington Correctional Facility is also along Goolma Road (approximately 7.25km from the Site). The Correctional Facility and the poultry farm may be sources of artificial night lighting. Three kilometres to the east of the Site is Wellington airport. This is a small airport that only caters for private light planes.

There is an existing homestead within the southern portion of the “Waroona” property which is not within the proposed solar farm Site. The nearest neighbour is located along Combo Road, approximately 1km north-west of the Site (469 Combo Road). There are four other residences within 1.5km of the Site. These are:

- 1148 Mitchell Highway to the west of the Site, and
- 112, 121 and 265 Maryvale Road located to the south and south-east of the Site (121 and 265 Maryvale Road are owned by the landowner of “Waroona”

There are ten other residences within 2km of the Site, most being located west of the Mitchell Highway. Twenty-seven further rural residential lots are sited west of the Mitchell Highway, within 5km of the Site, along Twiggs Road, Phillipsons Lane, Ponto Falls Road, Tarwong Lane and Whiteleys Lane.

6.5.3 Assessment of Potential Impacts

Avoidance Measures

The initial visual site inspection was conducted to inform the VIA, to identify sensitive receivers and to identify site constraints to inform design. Following the site inspection, the site layout was revised to accommodate appropriate buffer distances from residents and road users on Maryvale Road. The footprint was excluded from two ridgelines located on the eastern and southern sections of the Site to reduce impacts to receivers in these directions.

Visual Intrusion

A primary concern about renewable energy is visual intrusion. Potential concerns in relation to visual intrusion include:

- Scale
- Glare
- Light refraction

- Geometric Pattern
- Risks to Aviation
- Risk to road users
- Movement
- Sky lining
- Ancillary structures.

Each of these concerns have been assessed to determine potential visual impacts associated with these aspects. Potential impacts relevant to the solar farm are discussed below.

Scale

Industrial scale solar farms such as the Maryvale Solar Farm can occupy very large land areas, have regular, strong geometry, and can on occasions be visible over long distances. However, depending on the Proposals' layout and contrast, in some cases they may appear to be like natural features, while in other cases, they may lack sufficient visual detail to be identified positively as solar facilities. Additionally, solar facilities have visual advantages in that they are generally low to the ground, have low visual contrast and can appear as shadows from a distance.

The solar footprint of the Proposal will occupy 375 ha of land, on a moderately undulating landscape. It has been identified that at least some part of the solar footprint would be seen from 47 private and 5 public viewpoints. Photomontages have been prepared for selected viewpoints surrounding the Site and provide an illustration of the scale of the Proposal.

Glare

Glare form existing solar array facilities has generally been attributable to parabolic trough facilities which concentrate thermal solar power to one point. The Solar PV modules proposed to be installed at Maryvale are different as they are designed to absorb the light rather than reflect it. As such they are non-reflective and do not use concentrating mirrors.

The NSW Government Discussion Paper: *Planning for Renewable Energy Generation – Solar Energy* (April 2010) states: '*The potential for glare associated with non-concentrating PV systems which do not involve mirrors or lenses are relatively limited*'.

Other infrastructure on site such as metal structures associated with the substation and PV panel steel mounting frames have the potential to produce glare or glint impacts, however any impacts caused would be minor due to their small size, low surface area and location away from highly visible areas.

Light Refraction

A 'mirage' effect — glittering or shimmering — can be sometimes observed at PV facilities. The effect is similar to the shimmering seen over a bitumen road on a hot day and occurs because the surface of the panels is hotter than the air around it. The 'mirage' effect can make the colour above the panels appear brighter and bluer. The 'mirage' effect is not bright enough to cause discomfort and is likely to be only observed during certain times of day and from certain viewing positions.

Given the position of the Site in the landscape this effect is likely to only be observed during certain times of day and from certain viewing positions. The implementation of the mitigation measures listed in Section 8 will reduce any potential impacts from light refraction.

Geometric Pattern

The viewer position in relation to the patterning of the PV modules also affects the appearance of the facility as viewer position determines which side of the facility is in view and which angle of the solar farm is seen. The proposed solar farm will comprise tracking panels which slowly move throughout the day, changing their angle and direction.

Risks to Aviation

As the infrastructure is relatively low to the ground the development would not pose a risk to aviation. There is no movement (visible to the naked eye) that would be associated with the solar farm infrastructure. Therefore, motion would not be an obstruction to aviation. There is no lighting or other structures that would contrast with dark night skies. The Proposal would not include mirrors or lenses or other reflective surfaces. Due to the small size of the aerodrome, it does not support commercial flights and is only used periodically for local light aircraft. The photovoltaic solar panels would appear dark grey from an aircraft and would not constitute a glare or reflectivity hazard.

Risk to Road Users

When driving past PV modules in rows perpendicular to the road, the colour of the panels could also change rapidly from black (when viewed from the south) to various shades from blue to white, lightening in appearance as the vehicle passes the facility. The rapid change in viewer position results in abrupt changes in angle and pattern of the panels. This visual change would only be seen if looking directly down the rows when travelling past at speed and would be momentary.

Figure 6-9 shows the colour change in relation to viewer position. When viewed from the front, the panels appear lighter in colour – with shades of blue to white. Looking at the back, the panels appear black as they cast shadow. The tracking panels will face north and track from east to west, so they will face the north-east in the morning, to the north-west by the afternoon.

As mentioned above potential glare/reflectivity generated from on-site infrastructure towards public roads is limited.

Figure 6-9: Royalla Solar Farm Showing Colour Change that can Occur When Viewed from the Front.

Movement

The solar PV panels will be mounted on a horizontal single axis tracking structure which will slowly follow the daily movement of the sun in a 120 degree turn from the north-east in the morning to the north-west in the afternoon. As such a greater number of potential viewpoints will see the face of the PV panels although they will be exposed to this face for a shorter period of time than if the panels were fixed in that position. The movement is usually very slow and not apparent in short-duration views.

Sky Lining

Sky lining occurs when structures are placed on ridgelines, summits, or other locations where they would be silhouetted against the sky. This elevated position would mean that a structure would be visible from larger distances. In this instance, the solar panels are to be installed on side slopes away from any prominent crests or ridgelines, therefore sky lining is not considered to be an issue for the development.

Ancillary Structures

The Proposal will require a number of ancillary structures such as inverter stations, electricity cables and the substation. The colour of these structures may contrast with the PV panels and draw the eye. As such, colour should be considered during detailed design. Inverters and other facility components that are colour-treated two to three shades darker than the background landscape colour better match the surroundings and decrease their visibility and contrast.

The transmission infrastructure proposed for the development would increase the density of electrical infrastructure in the area. However, the Site would be generally consistent with existing transmission infrastructure in the immediate vicinity of the Site and would largely occur in an existing electricity easement. Furthermore, Essential Energy's electrical infrastructure has been present in the area for a significant period of time and has the capacity to absorb the visual amenity changes without marked impact to potential receptors.

Construction

There are two main types of visual impacts generated by the proposal which are:

- Impact to landscape character of the site and the surrounding area; and
- Visual impact to the surrounding viewpoints, both public and private.

Impact to Landscape Character
The overall landscape character is rated as having a moderate sensitivity:

- The landscape does not have particularly high scenic significance however, it is an attractive, working, rural landscape, typical of the mid-western NSW agricultural area
- The patterning of the area is broadscale with large agricultural farming lots
- There is a small local rural residential population, with most residences located over 1.5km from the Site, and
- The Site is exposed to a large number of road users accessing the Mitchell Highway (500m at its closest point to the Site) and Cobbora Road (1.6km at its closest point to the Site)

During construction, there would be a number of heavy construction vehicles to deliver materials and equipment and also a higher number of light vehicles for worker transport. Construction machinery would be present in different parts of the site however considering the prevalence of farm infrastructure and machinery this change would be relatively compatible.

The overall magnitude of change to landscape character during construction is moderate due to the following factors:

- The large extent of area affected
- Construction movement, dust, traffic and exposed soils may be visible
- Local roads would be disrupted by upgrades and frequent truck movements
- Construction would be temporary, and
- The nearest private viewers are approximately 1 km from the Site

The moderate sensitivity ranking, combined with the moderate magnitude of change during construction, leads to an overall moderate level of impact.

Due to the short term and minor nature of works associated with the road upgrades the potential to impact on landscape character and viewpoints from that aspect is considered negligible.

Operation

Impacts to Landscape Character
The extent of land covered by the solar panels will be large, however the undulating nature of the Site would restrict the extent of panels and inverters seen. Additionally, the low profile of the panels, their dark colour and shadows cast, the solar farm would be unlikely to be particularly prominent, especially when viewed at a distance. The substation, located adjacent to the dense vegetated creek line would be partially screened from view, however it would comprise taller structures which may extend above the height of adjacent trees. The magnitude of change to landscape character during operation is rated as moderate due to the following factors:

- Large extent of area affected
- The Proposal would be recognisable at close proximity, although would not be visually prominent at a distance

- The scale and colour of the PV solar farm means that it would be a noticeable element in the existing rural landscape, however given its low profile and dark colour, the extent of contrast would be of a moderate level and should not excessively reduce the quality of the scene
- The scale of the solar farm would be larger than existing agricultural patterning, and
- Patterning and colour of the prevalent landscape

The moderate sensitivity ranking combined with the moderate magnitude of change post-construction leads to an overall moderate level of impact.

Impact to Viewpoints
Seventy-eight potential viewing points were initially investigated during the initial site inspection (23 November 2017). Site verification determined that 47 private viewpoints and 5 public viewpoints could potentially see some sections of the proposed solar farm.

Public Viewpoints
The Site is partially visible from the Mitchell Highway which forms part of the National Highway A32, stretching from Sydney to Adelaide. The Site is also partially visible from Cobbora Road and although a secondary road, it also caters to a high number of road users. Several local roads in the vicinity provide views for residents being Combo Road, Tarwong Lane, Twiggs Road and Phillipsons Road. The site will also be visible to train passengers.

There are no public recreation areas, scenic reserves or lookouts in the area that provide public viewing opportunities of the Proposal. There is also a small airport within 3km of the Site. Views of the Site are likely for operators and passengers of private aircraft.

Private Viewpoints
The majority of the identified viewpoints were from private residences. Private viewpoints are the most sensitive as they provide high frequency views from the private settings of people living at that residence.

Generally, residences with potential viewpoints located within 2km of the Proposal site were assessed as individual viewpoints. However, due to the large number of potential private viewers and the relatively similar visual experience from some locations, viewpoints beyond 2km were grouped based on their common experience of:

- Distance from the Proposal
- Extent of the Proposal likely to be seen, and
- Viewer position in relation to the proposed panels

Table 6-13 provides a detailed assessment of potential visual impacts from surrounding private viewpoints, with those viewpoints and the predicted visual impact level identified in Figure 6-10 and proposed vegetative screening for visual mitigation is depicted in the Concept Landscape Plan at Figure 6-11.

Vegetation, particularly trees, may screen views fully or partially, especially when close to the viewpoint. In some instances, where elevation is favourable, it is possible to plant trees of adequate height and density, within a wide planting area, to minimise or even eliminate some views. The screening planting proposed is shown on the Concept Landscape Plan which includes:

- Planting along some sections of the western Site boundary (Seatonville Road)
- Planting around the substation (within safety constraints)
- Planting along some sections of the eastern Site boundary to reduce visual impact for residents east of the Site

- Planting along some sections of the southern Site boundary to reduce visual impact for residents south of the Site
- All planting would comply with Bushfire Regulation requirements, and
- In general, planting areas would be approximately 3-5m wide (on ground) and consist of a range of local native trees and tall shrubs to create a dense screen

Table 6-13: Assessed private viewpoints and predicted visual impact levels (Source: Envisage 2018)

Viewpoint (VP)	Analysis	Distance to nearest panels seen (approx.)	Viewer position in relation to panels seen	Sensitivity (criteria in TABLE 2-1)	Magnitude of change (criteria in TABLE 2-2)	Impact level (Criteria in TABLE 2-3)	Could landscape screening reduce impact?	Revised impact level with screen planting (5+ years post construction)
VP1: 469 Combo Road (Lot 157 DP 754318) A photomontage has been prepared for this viewpoint (Figure 6-14: VP1 469 Combo Road Likely View Post Construction).	The viewpoint is close to the Site boundary A private home, slightly elevated in relation to the Site, with mostly unimpeded views Likely to see a moderately large area of panels (around 40%) Unlikely to see substation due to lower elevation and creekline vegetation	1km	North-west • Throughout the morning, a rear view of the panels would be seen • During the late afternoon, the front of the panels would be seen	HIGH • Private view in close proximity to the Site boundary • Mostly unimpeded view	MODERATE • Would see large area of land covered by panels • However, panels are low profile (up to 4m high) • Solar farm would be a noticeable part of the view	MODERATE-HIGH	• Screen planting along Seatonville Road is likely to reduce the visual impact. However, trees planted along Seatonville Road may take longer than 5 years to have an effective screening impact due to the slightly lower elevation of Seatonville Road compared to the Site and VP1	MODERATE

Viewpoint (VP)	Analysis	Distance to nearest panels seen (approx.)	Viewer position in relation to panels seen	Sensitivity (criteria in TABLE 2-1)	Magnitude of change (criteria in TABLE 2-2)	Impact level (Criteria in TABLE 2-3)	Could landscape screening reduce impact?	Revised impact level with screen planting (5+ years post construction)
							• Trees planted along Seatonville Road would reduce views of the closest rows of panels along Seatonville Road • Panels may still be visible in the background; however, screening the closest panels is likely to reduce the visual immediacy of the panels	
VP57: 1148 Mitchell Highway	Private residence located on western side of a ridge between Site and Mitchell Highway	1.3km	North-west	MODERATE • Private views just over 1km away	MODERATE	MODERATE	Unlikely	MODERATE

Viewpoint (VP)	Analysis	Distance to nearest panels seen (approx.)	Viewer position in relation to panels seen	Sensitivity (criteria in TABLE 2-1)	Magnitude of change (criteria in TABLE 2-2)	Impact level (Criteria in TABLE 2-3)	Could landscape screening reduce impact?	Revised impact level with screen planting (5+ years post construction)
	Views mostly directed to the south Less than a quarter of the Site likely to be visible. The southern section of the solar farm most likely to be within view, including the construction compound The substation would be unlikely to be seen		• View of panels would be angled to south-east and not facing panels directly • Side-on view of the panels	• Restricted view due to landform	• The Site is not central in the view or visually prominent • Solar farm likely to be recognisable although not a dominant feature of the view			
VP7: 576 Cobbora Road	Private residence Has extensive views Almost half of the Site potentially visible Is located close to Cobbora Road which has heavy traffic Unlikely to see substation	1.8km	South-east • Mostly a side-on view of panels • The face of the southernmost panels may be seen	MODERATE • Private view in moderate proximity less than 2km away	MODERATE • Moderate extent of panels seen	MODERATE	• Planting along the eastern Site boundary likely to reduce impact	MODERATE-LOW

Viewpoint (VP)	Analysis	Distance to nearest panels seen (approx.)	Viewer position in relation to panels seen	Sensitivity (criteria in TABLE 2-1)	Magnitude of change (criteria in TABLE 2-2)	Impact level (Criteria in TABLE 2-3)	Could landscape screening reduce impact?	Revised impact level with screen planting (5+ years post construction)
Group A: VP55, VP56, VP58, VP59, VP60, VP74	Private residences west of Mitchell Highway Wide views to east including Site. Over half of the Site visible (up to 75%) Elevated position in relation to Site Would see panels and substation. Distance varies: 1.5km (VP60), 1.6km (VP58, VP74), 1.75km (VP55), 1.8km (VP59) and 2km (VP56) Would see construction compound. Distance to construction compound is closer (1.3km from nearest residence)	1.5 - 2km	West • Would see rear of panels in the morning • Would see face of panels in the afternoon	MODERATE • Private views in moderate proximity up to 2km away • View includes Highway and railway in the foreground	MODERATE • Relatively large extent of view affected • Site is central in the view • However, panels are low profile (up to 4m high) • Solar farm would be recognisable but not prominent	MODERATE	• Screen planting along Seatonville Road in the vicinity of the substation likely to reduce views to substation	MODERATE-LOW
Group E: VP49, VP50, VP51, VP52, VP53, VP54, VP75, VP78, VP79	Private residences on western side of Mitchell Highway Elevated with wide views to east including Site. Almost all of the Site (up to 90%) may be visible	2.2 - 3.2km	West • Would see rear of panels in the morning	MODERATE • Wide, mostly unimpeded views • Less than 5km away	MODERATE • Large extent of solar farm potentially seen	MODERATE	• Views to substation likely to reduce with screen planting	MODERATE-LOW

Viewpoint (VP)	Analysis	Distance to nearest panels seen (approx.)	Viewer position in relation to panels seen	Sensitivity (criteria in TABLE 2-1)	Magnitude of change (criteria in TABLE 2-2)	Impact level (Criteria in TABLE 2-3)	Could landscape screening reduce impact?	Revised impact level with screen planting (5+ years post construction)
	Would see construction compound Would see substation Distance varies: 2.2km (VP54), 2.5km (VP53), 2.75km (VP50, VP78), 2.8km (VP52, VP75), 3.1 (VP51) and 3.2km (VP49)		• Would see face of panels in the afternoon		• Viewer position is elevated • Solar farm would be noticeable, although not dominant			
VP12: 151 Argyle Road	Private residence on elevated ridge Would see a relatively large proportion of solar farm (up to 50%) Would not see substation	3.2km	South-east • Would see the face of the panels located in the morning • Would have a rear view of panels in the afternoon	MODERATE • Private unimpeded views • in moderate proximity (less than 5km)	MODERATE • The viewer position is elevated • The Site would be a recognisable although distant feature in the view	MODERATE	• Planting along eastern Site boundary likely to reduce impact	MODERATE-LOW
VP36: 55 Gibbs Lane	Private residence approx. 3km from Site boundary, with potential views of panels at 3.4km away (due to landform)	3.4km	North-west	MODERATE	MODERATE	MODERATE	Unlikely	MODERATE

Viewpoint (VP)	Analysis	Distance to nearest panels seen (approx.)	Viewer position in relation to panels seen	Sensitivity (criteria in TABLE 2-1)	Magnitude of change (criteria in TABLE 2-2)	Impact level (Criteria in TABLE 2-3)	Could landscape screening reduce impact?	Revised impact level with screen planting (5+ years post construction)
	Viewpoint is elevated at 380m ASL (solar farm ranges from 320-360m ASL) Approximately half of the Site potentially visible Substation is likely to be obscured by existing vegetation		• Would see face of panels at angle in afternoon • Rear of panels in morning	• Private views in moderate proximity, mostly unimpeded	• Large proportion of Site potentially visible • Viewpoint has extensive views • However, Site is not a main feature of view			
VP2: 1480 Mitchell Highway (Lot 2 DP 803536)	The viewpoint is a private home, which is elevated approx. 20m above the Site Has mostly unimpeded views and up to 80% of the Site potentially visible The Site features centrally in the view Unlikely to see substation due to lower elevation adjacent creekline	3.5km	West • During the afternoon, the face of panels would be seen	MODERATE • Private, unimpeded views less than 5km away	MODERATE • The viewer position is elevated • A large proportion of solar farm likely to be seen	MODERATE	• Screen planting along Seatonville Road may take longer than 5 years to have a screening impact due to elevation	MODERATE

Viewpoint (VP)	Analysis	Distance to nearest panels seen (approx.)	Viewer position in relation to panels seen	Sensitivity (criteria in TABLE 2-1)	Magnitude of change (criteria in TABLE 2-2)	Impact level (Criteria in TABLE 2-3)	Could landscape screening reduce impact?	Revised impact level with screen planting (5+ years post construction)
A photomontage has been prepared for this viewpoint (Figure 6-17: VP2 1480 Mitchell Highway Likely View Post Construction).			• Throughout the morning, the back of the panels would be seen				• Proposed tree planting is likely to reduce visual impact of Proposal by a minor extent due to the elevation of this viewpoint • Proposed tree planting is likely to screen only the rows of panels closest to Seatonville Road. Panels would still be seen in the background	

Viewpoint (VP)	Analysis	Distance to nearest panels seen (approx.)	Viewer position in relation to panels seen	Sensitivity (criteria in TABLE 2-1)	Magnitude of change (criteria in TABLE 2-2)	Impact level (Criteria in TABLE 2-3)	Could landscape screening reduce impact?	Revised impact level with screen planting (5+ years post construction)
VP10: 112 Maryvale Road	Private residence close to Maryvale Road, located on lower lying land near creekline Is the closest private viewpoint to the solar farm Located less than 500m south of the nearest proposed solar panels Elevated land north of the creekline limits potential views of the solar farm Very small area of panels likely to be visible (up to 5%) Possibly the first and second rows of panels (approximately 180m) on top of ridge north of the viewpoint Substation would not be seen	500m	South • Would see down the rows of panels • May notice differing colours of panels from the one viewpoint	MODERATE • Private views in close proximity • However, extent of views restricted by landform and intervening vegetation	LOW • Extent of area affected in view is small • The ridge where panels would be seen is not a focal point from the residence	MODERATE-LOW	• Screen planting along the southern Site boundary near the top of the ridge likely to reduce views of the panels	LOW
VP Combo Road	Linear viewpoint Exposure to Site increases and decreases with movement along the Road	175m	Ranges from north-west to north-east	LOW	MODERATE • Site is not central to the view	MODERATE-LOW	Unlikely	MODERATE-LOW

Viewpoint (VP)	Analysis	Distance to nearest panels seen (approx.)	Viewer position in relation to panels seen	Sensitivity (criteria in TABLE 2-1)	Magnitude of change (criteria in TABLE 2-2)	Impact level (Criteria in TABLE 2-3)	Could landscape screening reduce impact?	Revised impact level with screen planting (5+ years post construction)
	Almost all of the Site would be visible, although not all at one time At its closest point, panels would be 175m away Substation likely to be seen from some points along the road		• When travelling east, the face of the panels would be seen in the morning and the rear of the panels seen in the afternoon • When travelling south and west, a side-on view of the panels would be seen	• Public views to a small number of road users	• Views are temporary			

Viewpoint (VP)	Analysis	Distance to nearest panels seen (approx.)	Viewer position in relation to panels seen	Sensitivity (criteria in TABLE 2-1)	Magnitude of change (criteria in TABLE 2-2)	Impact level (Criteria in TABLE 2-3)	Could landscape screening reduce impact?	Revised impact level with screen planting (5+ years post construction)
VP Mitchell Highway A photomontage has been prepared for this viewpoint. Refer Section 8.3	The Mitchell Highway is a linear viewpoint Distance varies. Is approximately 1.1km from the Site at its closest point View from the Highway is wide. Almost all of the Site would be visible for a brief period, although not all at one time Main Western Railway runs between Highway and the Site Exposure to Site increases and decreases with movement along the Highway Substation likely to be seen from some points along the Highway Construction compound would be visible	1.1km	Ranges from north-west to south • Side-on view of the panels would be seen when travelling north • When travelling south, in the morning, the back of the panels would be seen, during the late afternoon, the face of the panels would be seen	MODERATE • Accessed by a large number of people • Major entry to Wellington and tourist route	LOW • The Site is to the side of the view and not a focal point or central to the view • Views are transient and occur temporarily as travellers move along the Highway • Not all of the Proposal would be seen at one time	MODERATE-LOW	• Screening along the western Site boundary (Seatonville Road) is likely to reduce views to the substation • From some locations on the Highway, proposed planting would reduce visual impact by screening views of the Proposal	LOW (applies to some sections of Mitchell Highway. More elevated sections of the Highway would remain as MODERATE-LOW)

Viewpoint (VP)	Analysis	Distance to nearest panels seen (approx.)	Viewer position in relation to panels seen	Sensitivity (criteria in TABLE 2-1)	Magnitude of change (criteria in TABLE 2-2)	Impact level (Criteria in TABLE 2-3)	Could landscape screening reduce impact?	Revised impact level with screen planting (5+ years post construction)
	Colour changes from seeing a side-on view of the panels while the viewer is moving are possible, although distant						• From more elevated sections of the Highway, proposed planting would only reduce visual impact by a minor extent. • From the elevated locations, tree planting is likely to screen only the rows of panels closest to Seatonville Road. Panels would still be seen in the background	
VP62: 1003 Mitchell Highway	Private residence west of Mitchell Highway	1.5km	South-west • Would see panels side-on	MODERATE	LOW	MODERATE-LOW	Unlikely	MODERATE-LOW

Viewpoint (VP)	Analysis	Distance to nearest panels seen (approx.)	Viewer position in relation to panels seen	Sensitivity (criteria in TABLE 2-1)	Magnitude of change (criteria in TABLE 2-2)	Impact level (Criteria in TABLE 2-3)	Could landscape screening reduce impact?	Revised impact level with screen planting (5+ years post construction)
	Would see very little of the Site (up to 10%) due to landform and vegetation Would see construction compound which would be closer than panels at 1.3km away Unlikely to see substation			• Private views in moderate proximity	• The site is not visually prominent from this viewpoint • Viewer would see a small portion of the solar farm			
VP6: 801 Cobbora Road	Private residence It is possible that a very small section of the solar farm (approximately 5%) would be seen. The eastern-most panels along Bakers Lane would be visible if the panels extend to the top of the ridge Substation would not be visible	1.7km	East • If seen, the face of the panels would be visible in the morning • The back of the panels would be visible in the afternoon	MODERATE • Private view in moderate proximity • However, views are limited	LOW • Very small extent seen • Site is elevated above the viewer	MODERATE -LOW	• Screen planting on the eastern Site boundary likely to reduce impact	LOW

Viewpoint (VP)	Analysis	Distance to nearest panels seen (approx.)	Viewer position in relation to panels seen	Sensitivity (criteria in TABLE 2-1)	Magnitude of change (criteria in TABLE 2-2)	Impact level (Criteria in TABLE 2-3)	Could landscape screening reduce impact?	Revised impact level with screen planting (5+ years post construction)
VP13	Private residence Would see a small area of panels (5-10%) Views limited due to elevation and intervening vegetation	2.3km	East • Would see the face of the panels located in the morning • Would have a rear view of panels in the afternoon	MODERATE • Private views less than 5km away • Limited extent of view	LOW • Small extent of panels seen • Site is not prominent in the view	MODERATE-LOW	• Screen planting along the eastern Site boundary likely to reduce impact	LOW
Group C: VP72, VP73	Private residences Views directed to the south, away from the Site May see a small area of panels due to elevation (up to 20%) May see construction compound View of substation unlikely Distance from Site varies: 2km (VP73) and 2.4km (VP72)	2 – 2.4km	West • Would see the rear of the panels located in the morning • Would see the face of panels in the afternoon	MODERATE • Private views less than 5km away • Limited extent of view	LOW • Small extent of panels seen • Site is not prominent in the view	MODERATE-LOW	Unlikely	MODERATE-LOW

Viewpoint (VP)	Analysis	Distance to nearest panels seen (approx.)	Viewer position in relation to panels seen	Sensitivity (criteria in TABLE 2-1)	Magnitude of change (criteria in TABLE 2-2)	Impact level (Criteria in TABLE 2-3)	Could landscape screening reduce impact?	Revised impact level with screen planting (5+ years post construction)
Group B: VP64, VP65, VP66	Private residences west of Mitchell Highway Wide views to east including Site Would see up to 50% of the Site Would see panels and substation Would see construction compound Distance varies: 2km (VP64), 2.3km (VP65) and 2.5km (VP66)	2 - 2.5km	South-west • Mostly a side-on view of panels	MODERATE • Private view in moderate proximity (up to 2.5km away)	LOW • Small extent of view affected • Site does not feature centrally in the view • Solar farm may be recognisable, although not prominent	MODERATE-LOW	• Screen planting along Seatonville Road at the location of the substation likely to reduce views to substation	LOW
Group D: VP29, VP30	Private residences on elevated land Residences provide wide views. However, very little of the Site (approximately 5%) is within the view Distance varies: 2.6km (VP29) and 2.9km (VP30	2.6 - 3km	North-east	MODERATE • Private views less than 5km away	LOW • Viewer would see a very small extent of area afffected	MODERATE-LOW	• Screen planting along the eastern Site boundary likely to reduce views to panels	LOW
VP5:	Private residence elevated above Site	2.75km	North	MODERATE	LOW	MODERATE-LOW	Unlikely	MODERATE-LOW

Viewpoint (VP)	Analysis	Distance to nearest panels seen (approx.)	Viewer position in relation to panels seen	Sensitivity (criteria in TABLE 2-1)	Magnitude of change (criteria in TABLE 2-2)	Impact level (Criteria in TABLE 2-3)	Could landscape screening reduce impact?	Revised impact level with screen planting (5+ years post construction)
847 Combo Road	Viewpoint is within 2km of the Site boundary, however, the closest view of the panels would be 2.75km away due to landform and vegetation Landform and vegetation restricts the extent of Site potentially visible to approximately 30% Panels likely to be seen beyond nearby ridges and intervening vegetation Unlikely to see substation		• A side-on view of panels would be seen • May notice differing colours of panels from the one viewpoint	• Private residence in moderate proximity (less than 5km away)	• The viewer position is elevated • However, the Site unlikely to be visually prominent in the view • Proposal would not be a dominant feature of the scene			
Group F: VP67, VP68, VP69, VP70	Private residences on western side of Mitchell Highway Viewer position is elevated with wide views to north-east including Site Up to 80% of the Site visible Would see construction compound Would see substation	2.9 – 3.3km	South-west • Mostly a side-on view of panels	MODERATE • Wide, mostly unimpeded views • Less than 5km away	LOW • Relatively small extent of total view affected	MODERATE -LOW	Unlikely	MODERATE-LOW

Viewpoint (VP)	Analysis	Distance to nearest panels seen (approx.)	Viewer position in relation to panels seen	Sensitivity (criteria in TABLE 2-1)	Magnitude of change (criteria in TABLE 2-2)	Impact level (Criteria in TABLE 2-3)	Could landscape screening reduce impact?	Revised impact level with screen planting (5+ years post construction)
	Distance varies: 2.9km (VP69), 3km (VP67), 3.2km (VP70) and 3.3km (VP68)				• Solar farm may be recognisabl ealthough not prominent			
Group G: VP40, VP42, VP43, VP44, VP46, VP48	Private residences west of the Mitchell Highway Wide views available Over half of the Site (up to 75%) potentially visible Unlikely to see substation Possibly see construction compound Distance from Site varies: 3.2km (VP48), 3.6km (VP44), 3.7km (VP43), 3.8km (VP42), 4km (VP46) and 4.6km (VP40)	3.2 - 4.6km	West • During the afternoon, the face of panels would be seen • Throughout the morning, the back of the panels would be seen	MODERATE • Private views less than 5km away • Site features in view beyond Mitchell Highway	LOW • Although a large proportion of the Site potentially visible, the Site comprises a relatively small area of view available	MODERATE -LOW	Unlikely	MODERATE-LOW

Viewpoint (VP)	Analysis	Distance to nearest panels seen (approx.)	Viewer position in relation to panels seen	Sensitivity (criteria in TABLE 2-1)	Magnitude of change (criteria in TABLE 2-2)	Impact level (Criteria in TABLE 2-3)	Could landscape screening reduce impact?	Revised impact level with screen planting (5+ years post construction)
VP Phillipsons and Twiggs Roads	Phillipsons Road and Twiggs Road are unsealed public roads carrying local traffic Traffic loads are light and road users are in transit Some tall trees along the road reserves, however, there are wide views to the east including the Site Exposure to Site increases and decreases with movement along the roads. Almost all of the Site would be visible for short periods, although not all at one time Substation and construction compound likely to be seen from some points	1.1km	South-west	LOW • Public views for a small number of road users	LOW • Views are temporary • The Site is not a focal point or central to the view • Site would be glimpsed between trees	LOW	• Screening along the western Site boundary (Seatonville Road) likely to reduce views to the substation	Negligible
VP Cobbora Road	Public road to the west of Site. Linear viewpoint. Distance varies. Is approx. 1.6km from the Site at its closest point	1.6km	West	LOW • Public views for a high number of viewers	LOW • Site is not central to the view	LOW	Unlikely	LOW

Viewpoint (VP)	Analysis	Distance to nearest panels seen (approx.)	Viewer position in relation to panels seen	Sensitivity (criteria in TABLE 2-1)	Magnitude of change (criteria in TABLE 2-2)	Impact level (Criteria in TABLE 2-3)	Could landscape screening reduce impact?	Revised impact level with screen planting (5+ years post construction)
	Approximately half of the Site may be visible for brief periods, although not all at one time. Exposure to Site increases and decreases with movement along the road. Views are generally only available for an approx. 2km stretch directly west of the Site		• When travelling north or south, viewers would have a side-on view when approaching Site • Viewers would see face of panels when closest to Site	• Views only possible from relatively short section of road	• Small extent of viewing area of road users would be affected			
VP Tarwong Lane	Linear viewpoint Unsealed public roads carrying local traffic Traffic loads are light and road users are in transit Almost all of the Site would be visible for brief periods, although not all at one time	2.4km	West • Would see the rear of the panels located in the morning	LOW • Public views for a small number of road users	LOW • Views are temporary • The Site is not a focal point or central to the view	LOW	Unlikely	LOW

Viewpoint (VP)	Analysis	Distance to nearest panels seen (approx.)	Viewer position in relation to panels seen	Sensitivity (criteria in TABLE 2-1)	Magnitude of change (criteria in TABLE 2-2)	Impact level (Criteria in TABLE 2-3)	Could landscape screening reduce impact?	Revised impact level with screen planting (5+ years post construction)
	Exposure to Site increases and decreases with movement along the roads Substation and construction compound likely to be seen from some points		• Would see face of panels in the afternoon					
VP37: 180 Combo Road	Private residence located adjacent Main Western Railway line Up to 40% of the Site potentially visible, although at a long distance Substation unlikely to be seen	4 km	North-west • Potentially see face of panels in the afternoon	LOW • Moderate proportion of the solar farm • However, view directed to the north	LOW • Site is not central in the view	LOW	Unlikely	LOW
VP16	Private residences on elevated land with wide views Possible that approximately 30% of the solar farm potentially visible, although very distant	6.2km	South-east • Face of panels not directed to viewer	LOW • Private views over 5km from Site	LOW • The Site is not distinct within the view	LOW	Unlikely	LOW

Viewpoint (VP)	Analysis	Distance to nearest panels seen (approx.)	Viewer position in relation to panels seen	Sensitivity (criteria in TABLE 2-1)	Magnitude of change (criteria in TABLE 2-2)	Impact level (Criteria in TABLE 2-3)	Could landscape screening reduce impact?	Revised impact level with screen planting (5+ years post construction)
			• Location of panels would be generally dark					
Group H: VP24, VP28	VP24 is a private residence on elevated land with wide views VP28 is representative of the residences at Bodangora, which are also on elevated land with wide views The Site is visible, however, is not prominent at this distance It is possible that the solar farm would be seen, although very distant Distance varies: 6km (VP28) and 7.7km (VP24)	6 – 7.7km	East • Panels may be seen as white in morning and dark in the afternoon	LOW • Private views over 5km from Site	LOW • The Site is not visually prominent within the view	LOW	Unlikely	LOW
VP8: 265 Maryvale Road	This residence is owned by the prospective leaseholder of the solar farm. Hence this viewpoint is not considered further in this report.	650m	N/A	N/A	N/A	N/A	N/A	N/A

Viewpoint (VP)	Analysis	Distance to nearest panels seen (approx.)	Viewer position in relation to panels seen	Sensitivity (criteria in TABLE 2-1)	Magnitude of change (criteria in TABLE 2-2)	Impact level (Criteria in TABLE 2-3)	Could landscape screening reduce impact?	Revised impact level with screen planting (5+ years post construction)
VP9: 121 Maryvale Road	This residence is owned by the prospective leaseholder of the solar farm. Hence this viewpoint is not considered further in this report.	275m	N/A	N/A	N/A	N/A	N/A	N/A

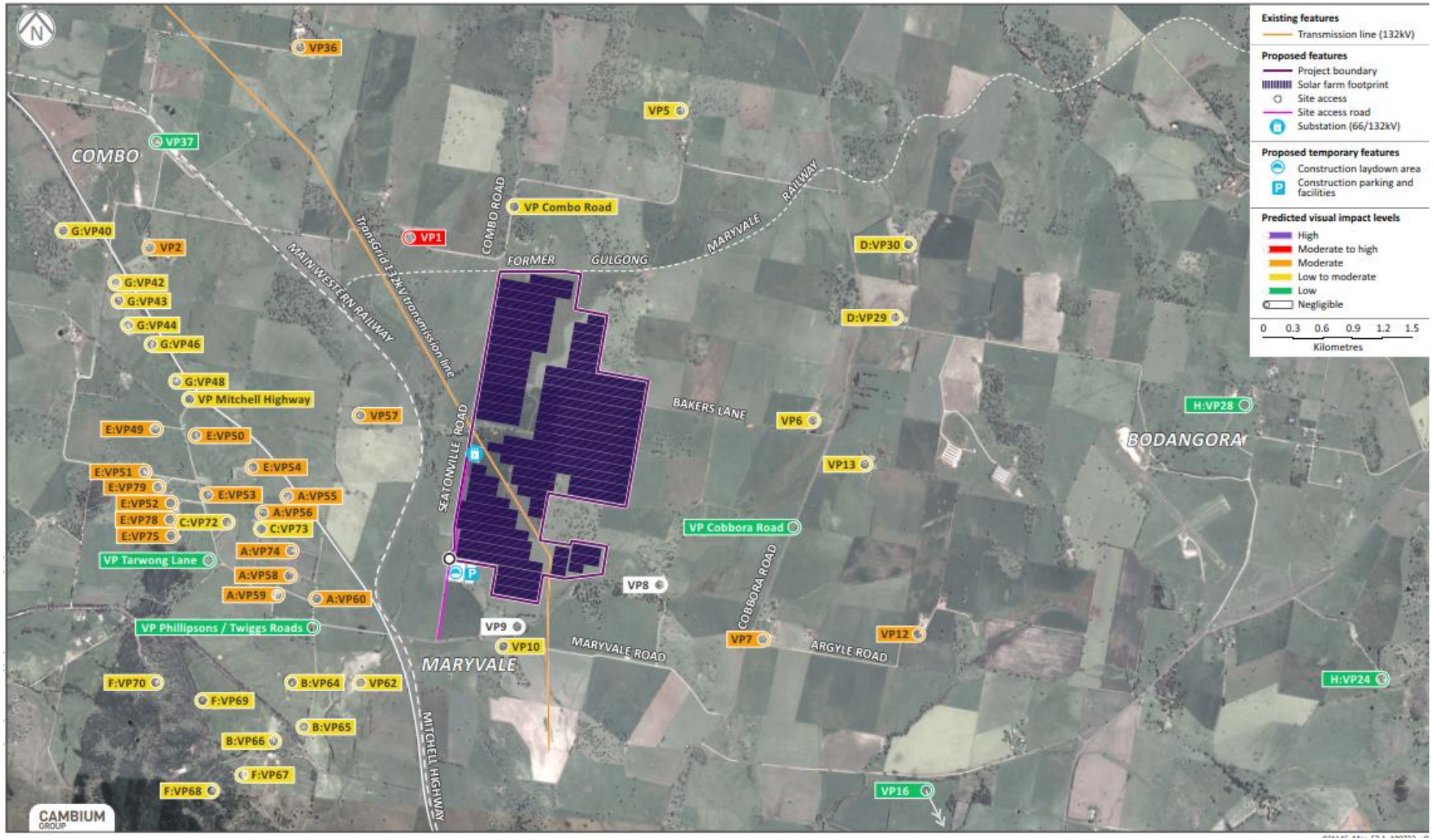

Figure 6-10: Viewpoints and Impact Rating

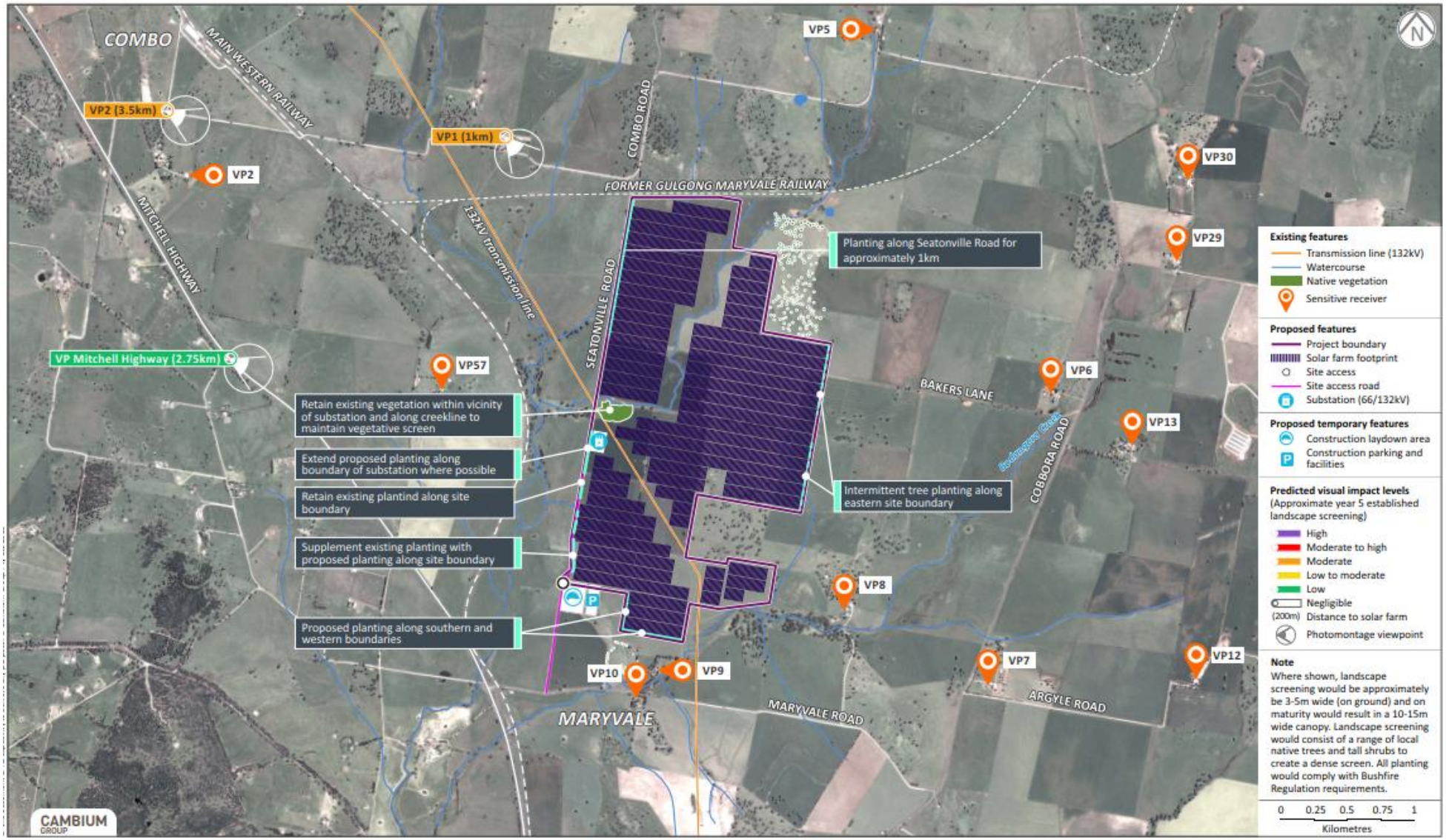

Figure 6-11: Proposed Concept Landscape Plan - Proposed Screening for Visual Mitigation

Photomontages

Photomontages have been prepared for VP1, VP2 and VP Mitchell Highway. The selected viewpoints were based on the potential level of visual impact and concerns raised by landowners. The viewpoint from the Mitchell Highway (at the intersection of Mitchell Highway and Tarwong Lane) is also representative of the large number of residences located west of the Highway. The photomontages represent a momentary point in time and for consistency illustrate the position of the panels at approximately 9.00am in the morning, mid-summer, when the tracking panels would be oriented east (+60 degrees).

A plan showing the location of photomontage viewpoints is shown at Figure 6-12. For each viewpoint, three images are provided:

- The existing view toward the Proposal
- Analytical - using the same image as the existing view, the analytical image shows the location of the proposed solar farm, and
- Photomontage - this image shows the likely view following construction of the proposed solar farm

Images of viewpoint 1 (VP1), 469 Combo Road, are shown at Figure 6-13, Figure 6-14, and Figure 6-15**.** Images of viewpoint 2 (VP2), 1480 Mitchell Highway, are shown at Figure 6-13, Figure 6-17, and Figure 6-15**.** Images of the Mitchell Highway VP are shown at Figure 6-19, Figure 6-20 and Figure 6-21**.**

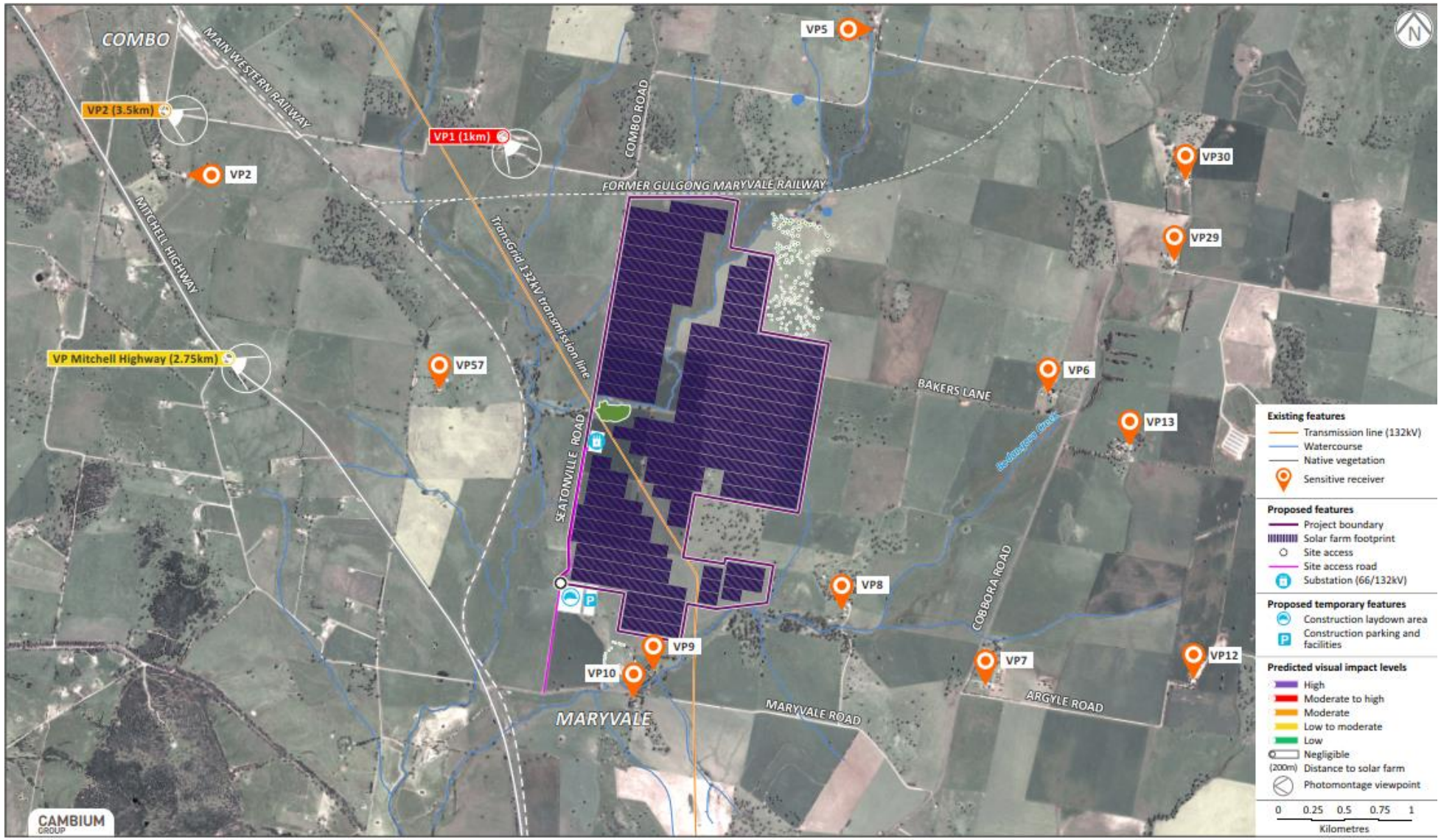

Figure 6-12: Photomontage Viewpoint Locations

Figure 6-13: VP1 469 Combo Road Existing View

Figure 6-14: VP1 469 Combo Road Likely View Post Construction

Figure 6-15: VP1 469 Combo Road Likely View with Landscape Screening 5 Years After Construction

Figure 6-16: VP2 1480 Mitchell Highway Existing View

Figure 6-17: VP2 1480 Mitchell Highway Likely View Post Construction

Figure 6-18: VP2 Likely View with Landscape Screening 5 Years After Construction

Figure 6-19: Mitchell Highway VP Existing View

Figure 6-20: Mitchell Highway VP Likely View Post Construction

Figure 6-21: Mitchell Highway VP Likely View with Landscape Screening 5 Years After Construction

In summary, the initial assessment of impact to private viewpoints found there will be:

- One private viewpoint with a **moderate-high** impact
  - This residence was within 1km of the Site
  - Has mostly unimpeded views, and
  - Would see a large proportion of the solar farm
- 20 private viewpoints with a **moderate** impact
  - These residences are within 3.5km of the Site
  - Have wide views including the Site
  - Viewer position was generally elevated
  - Would see a large proportion of the solar farm
- 22 private viewpoints with a **low-moderate** impact
  - These residences have restricted views of the Site
  - Or, they see a relatively small proportion of the Site
  - Or, they would see a small area of solar farm
  - Or, the solar farm would encompass only a small area of the view available, and
- Four private viewpoints with a **low** impact
  - The Site was not distinct from these residences or central to the view
  - Included residences over 5km from the Site and viewpoints that would only view a small extent of the solar farm

A summary of the levels of impact for each private viewpoint is given in Table 6-14.

Table 6-14: Summary of Identified Potentially Affected Private Viewpoints

Impact level	Number of viewpoints	Residential/private viewpoints identified as potentially impacted	Number of viewpoints following screening
High impact	0	-	
Moderate – high impact	1	VP1	1
Moderate impact	20	VP2, VP7, VP12, VP36, VP49, VP50, VP51, VP52, VP53, VP54, VP55, VP56, VP57, VP58, VP59, VP60, VP74, VP75, VP78, VP79	3
Low - moderate impact	22	VP5, VP6, VP10, VP13, VP29, VP30, VP40, VP42, VP43, VP44, VP46, VP48, VP62, VP64, VP65, VP66, VP67, VP68, VP69, VP70, VP72, VP73	30
Low impact	4	VP16, VP24, VP28, VP37	13

The assessment of impact to public viewpoints found there will be:

- Two public road corridors with a **moderate-low** impact: VP Mitchell Highway and VP Combo Road
- Three public road corridors with a **low** impact: VP Cobbora Road, VP Tarwong Lane, VP Phillipsons/Twiggs Roads
- Visual impact from the air has been assessed as **low**

Following the anticipated growth and screening effects of proposed mitigation planting (approximately 3-5 years), for some private viewpoints the impact rating would reduce so that there would be:

- 1 private viewpoint rated as moderate-high
- Four private viewpoints rated moderate
- 30 private viewpoints rated moderate-low

Remaining private viewpoints were all rated low.

6.5.4 Mitigation / Management Measures

Reference	Mitigation Measures
Construction and Decommissioning Mitigation Measures	
V1	Minimise impact through use of siting and design features. Group ancillary facility structures where possible to minimise sprawl. Stabilise new access tracks formed within the Site required for operations, but do not seal with bitumen or other dark coating.
V2	Minimise and repair ground disturbance. Minimise grading across the Site and undertake the minimum levelling necessary to install panel supports. Rehabilitate exposed ground surfaces as soon as possible and implement erosion and sediment controls to avoid issues associated with dust generation and water pollution.
V3	Minimise vegetation removal. Retain existing trees near the substation and along creek line on the western boundary. Maintain a buffer of 40m between infrastructure and waterway 2. Install temporary fencing around vegetation to be retained and demarcate as a no-go zone.
V4	Develop a Detailed Landscape Plan as part of the CEMP to implement the Concept Landscape Plan, which includes visual screening, as indicated in Figure 6-11.
V5	Retain as much existing grass cover beneath solar panels as possible.
V6	Progressively stabilise disturbed area with pasture grasses. Develop a remediation plan to include the following actions: • recontour, cultivate, seed, and stabilise the majority of disturbed surfaces with pasture grass species following the removal of infrastructure, and • re-establish any previously removed native vegetation with appropriate, similar species
V7	Use colour to reduce contrast. Treat the support structures of PV panels and ancillary structures such as inverters, with a non-reflective finish. Paint or colour-treat facility components to better match the surroundings and decrease their visibility and contrast. Choose a colour two to three shades darker than the background colour.
Operational Mitigation Measures	
V8	Minimise impact through use of siting and design features. Signage required at the Site should be of sufficient size to be readable at driver height within short range (0-20m) and contain only information sufficient for basic facility and company identification, for safety, navigation, and delivery purposes. Large scale signage will not be installed.

Reference	Mitigation Measures
V9	Avoid Night Sky Impacts. Permanent evening lighting will be limited to compulsory lighting required for the substation. Substation lighting will be turned on if an intrusion is detected or if staff are on site undertaking works outside of daylight hours. Amber colour lights will be used rather than bluish-white lighting.
V10	An OEMP will be prepared for the Proposal and will incorporate a complaints management process.
V11	Monitor performance of screen planting areas six-monthly for first three years then annually. Replant as necessary if plants die, and supplement planting with alternative species if plants are not adapting to the Site.
V12	Keep non-reflective finishes and colour-treated coatings in good repair. Reapply if surface is subject to fading or flaking

6.6 Surface Water, Hydrology and Groundwater

A Surface Water, Hydrology and Groundwater Assessment was prepared to determine the significance of water resources on the site. The key findings of this assessment and associated mitigation measures are outlined below.

6.6.1 Assessment Methodology

Surface Water

Surface water drainage patterns were identified using published resources such as the Department of Lands Dubbo 1:25,000 topographic map series and recent aerial photography available from Google Earth. Site survey information and observations provided additional information on natural waterways, flowlines and water storages such as farm dams that exist on site.

Given the site is relatively distant from the nearest major watercourse, the Macquarie River approximately 3.5km south of the property, a qualitative water quality assessment was undertaken that includes identification of appropriate water quality protection measures.

Groundwater

Information on existing groundwater resources was compiled from published information including the Department of Primary Industries (Office of Water) water monitoring network, online maps and the Wellington LEP to determine groundwater vulnerability in this locality. A qualitative groundwater assessment is presented in Section 6.6.33.

6.6.2 Existing Environment

Surface Water Drainage

The Proposal is within the Macquarie – Bogan catchment within the Murray-Darling Basin. The catchment covers an area of more than 74,000km^2 with the headwaters of the Macquarie River originating in the Great Dividing Range south of Bathurst and flowing in a north-westerly direction for 960 km until it joins the Barwon River near Brewarrina. The Bogan River originates in the Harvey Ranges near Peak Hill and flows roughly parallel to the Macquarie River across the north-western plains before joining the Barwon River downstream of Brewarrina.

The Macquarie River at Wellington has a catchment area of approximately 14,130km^2 and a mean daily flow of 2,712 megalitres (ML). The Macquarie River is located approximately 3.5km south of the Site.

The Site is generally flat (2-3% slopes) and regularly cultivated with only a few contour banks that serve to reduce velocities of surface water flows and reduce the erosion potential of these flows. Several small dams catch flows from the waterways running through the Site.

The waterways within the Site are ephemeral in nature. Flows depend on adequate rainfall and overland runoff from the catchment. The waterways are often reduced to small water holes in the drier months. Waterways within and surrounding the Site are identified in Figure 6-22.

Under the Wellington LEP (2012), the Site is not identified as flood prone. The nearest mapped flood areas are along the Macquarie River 3.5km south of the Proposal. Accordingly, development on the Site would not be expected to impact on flood prone land.

Figure 6-22: Topography and Hydrology Map

In the north half of the Site there are two mapped waterways. Both are 2nd order waterways although the westernmost waterway is smaller than the eastern-most waterway. Both flow south-west through the Site and are unnamed tributaries to Maryvale Creek which is located on land adjacent to the Site but outside the Subject Land. Flows are directed into these waterways via culverts through the disused rail embankment immediately to the north of the Site.

Bodangora Creek, a 3rd order waterway, flows through the south- east corner of the Site and originates to the east. Both Bodangora and Maryvale Creeks are tributaries of the Macquarie River.

The main channels of Maryvale and Bodangora Creeks are mapped in the LEP as riparian lands, however, neither of these sections of watercourses flows through the Proposal Site except a small section of Bodangora Creek in the south-east corner of the Site that would not be subject to development or disturbance.

Groundwater

The Proposal is located within the Lachlan Fold Belt groundwater zone which comprises of fractured rock aquifers. The aquifers associated with this geology have a low to moderate level of connection to surface water sources and they also have a low impact on instream flows in this area. It has been determined that it can take years to decades for surface water and groundwater to interact in these areas. (Office of Water, 2012).

A search of the Department of Primary Industries (Office of Water) groundwater database identified several groundwater bores outside, but near to the Site boundary. The Office of Water work summary reports documented water bearing zones at depths ranging from 11.60 – 16.80m while standing groundwater levels ranged from 4.3 – 6.4m below ground surface.

The Wellington LEP (2012) has mapped this Site as a groundwater vulnerable area. Under this planning scheme the objectives of this designation are as follows:

- To maintain the hydrological functions of key groundwater systems, and
- To protect vulnerable groundwater resources from depletion and contamination as a result of development

This is done by considering:

- The likelihood of groundwater contamination from the development (including from any on-site storage or disposal of solid or liquid waste and chemicals)
- Any adverse impacts the development may have on groundwater dependent ecosystems
- The cumulative impact the development may have on groundwater (including impacts on nearby groundwater extraction for a potable water supply or stock water supply), and
- Any appropriate measures proposed to avoid, minimise or mitigate the impacts of the development

Groundwater Dependent Ecosystems

A search of the Bureau of Meteorology (BoM) Groundwater Dependent Ecosystems Atlas identified that parts of the site are identified as containing groundwater dependent ecosystems (GDE) (Figure 6-23). The dataset expresses the potential for groundwater interaction/use of native vegetation ecosystems across Australia.

The GDE mapping does not accurately reflect the current site conditions as it maps numerous areas of GDE on the Site that have been cleared and no longer contain native vegetation. Nonetheless, those parts of the Site that have been mapped as containing remnant native woodland according to recent vegetation surveys, do align with the mapped GDEs. On this basis, it is assumed that the remnant woodland is GDE and reliant in part on groundwater for its survival. All of the remnant woodland (and GDE) on the Site is outside the proposed solar farm footprint and would not be impacted by the development.

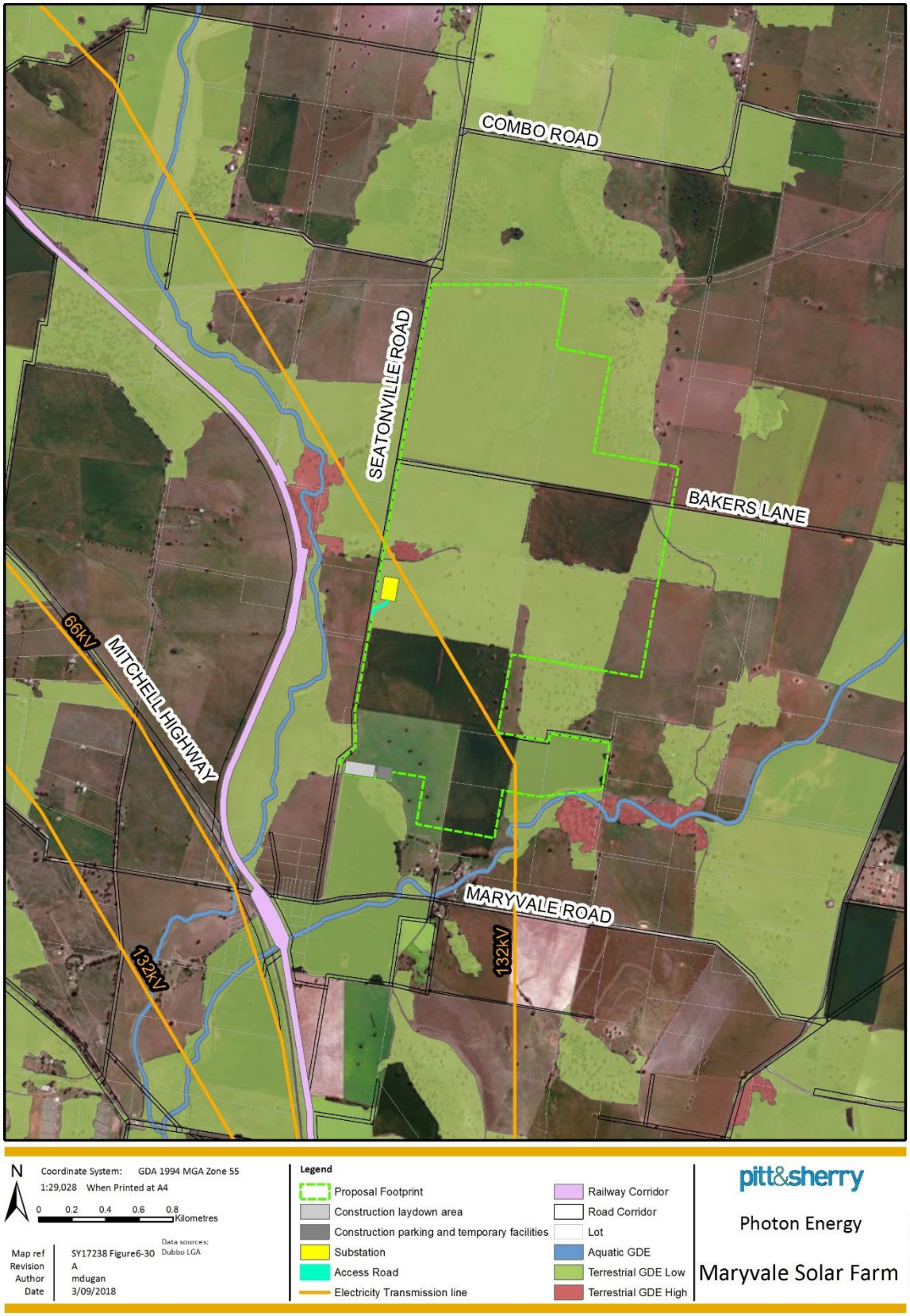

Figure 6-23: Groundwater Dependent Ecosystems

Water Use and Access Licenses

Agricultural activities undertaken on the Site are currently supported by dam water supply. This water use will continue for the remaining areas of the Subject Land not subject to the Proposal.

A search of the NSW Water Register identified no water licence issued under the Water Act 1912 or an approval issued under the Water Management Act 200 to the parcels included in the Site. These included Lot 2 DP 573426, Lot 1 DP 1095725, Lot 2 DP 1095725, Lot 1 DP 1006557, and part of Lot 182 and Lot 122 DP754318.

MSF plan to truck all construction and operational phases water requirements into the site from external provider/s.

6.6.3 Impact Assessment

Waterways

The westernmost unnamed 2nd order waterway in the north of the Site is a small but incised drainage line, approximately 1.5m wide channel and half metre deep. As the size of this waterway is relatively small, and the associated catchment size is approximately 80ha, this waterway would be suitably graded into a shallow and broad swale and revegetated, then developed with PV units.

The easternmost 2nd order waterway is well-defined and a significant watercourse, approximately 20m wide and 2-3m deep with a catchment area of approximately 500ha. During the site visit It was evident that the original channel has been redirected along a large contour drain. It appears to be functioning with limited erosion, however some areas the banks were observed to be unstable with erosion. This waterway would be left as a primary flow channel, stabilised with vegetation where necessary and maintained with a minimum 40m buffer from the solar farm development.

Water Quality

Construction
Construction activities have the potential to disturb soils and impact upon surface water flows and quality. Soils would be subject to disturbance during site preparation, access and construction activities. The Site would be managed during construction with erosion and sediment control best practices in accordance with Managing Urban Stormwater: soils and construction 4th Edition, (Landcom, 2004), aka the 'Blue Book". Construction would be staged to include progressive stabilisation of disturbed areas and soils.

The easternmost 2nd order waterway in the north half of the Site would be provided protection at the outset of construction by the implementation of the 40m buffer along its length to ensure vegetative cover is retained and to maintain water quality during rainfall events and flows in the waterway.

Operation
Day to day activities would revolve around routine monitoring of the solar farm performance, undertaking required maintenance activities and managing the ongoing agricultural activities, none of which involve significant land disturbance, use of hazardous chemicals or other activities that could impact water quality.

Water use

Construction
Construction of the proposal will require limited potable water for staff amenities. Potable water would be trucked to the Site on an as needs basis and stored within temporary water tanks at the staff amenities area.

During construction, there is a need for non-potable water mainly for dust suppression. The volume of non-potable water required during construction may reach up to approximately 50,000 L/day, during hot windy

weather conditions that lead to maximum dust suppression demand. Conversely, during cool or wet conditions the water demand would be minimal. Based on an estimated average daily water demand of 25,000 L/day throughout the construction period, this equates to an annual water use of less than 10 ML.

Water for dust suppression during construction, for the intersection upgrade works and any additional water requirements for the Site would be sourced through a local contractor and delivered to Site by water truck.

Operation
During operation, water would be required for stock watering and vegetation management. Water for these purposes is proposed to be supplied from the existing dam. Water may also be required for panel cleaning on an ad hoc basis. The water demands of the solar farm operation are small and likely to be less than the current demands from agriculture on the Site. It is estimated that annual operational water usage would be approximately 1.5 ML/ per annum.

Groundwater and Groundwater Dependent Ecosystems

Construction
Impacts to groundwater during construction are considered unlikely due to the depth of groundwater anticipated across the site. Excavation on site will not exceed 4m associated with pile driving for the mounting structures and open trenching will not be deeper than approximately 1.2 m. As such, works on site are not anticipated to intercept or impact upon groundwater

Operation
During operation, there is no planned increase on groundwater abstraction and hence no change to groundwater conditions are expected because of the proposal. Consequently, the proposed solar farm would not impact on groundwater resources directly or indirectly.

The management of the Site will be subject to a Land Management Plan (refer Appendix L) and this will document measures for pasture management.

6.6.4 Mitigation Measures

Reference	Mitigation Measures
Construction and Decommissioning Mitigation Measures	
SW1	A Soil and Water Management Plan (SWMP) will be prepared and implemented by the Contractor as part of the CEMP, this will include use of onsite water for dust mitigation measures.
SW2	Minimise the footprint of disturbance at any one time by implementing progressive construction and remediation works
SW3	Design solar panel arrays to allow sufficient space between panels to establish and maintain ground cover beneath the panels and assist in reducing potential sediment impacts on water quality
SW4	Ensure all refuelling activities are undertaken in a bunded area at least 40m from any waterways.
SW5	Additional mitigation measures will be considered during detailed design.
Operational Mitigation Measures	
SW6	Implement the Land Management Plan to ensure at least 80% groundcover is restored and maintained (Refer **Appendix L**)

6.7 Soils, Geology and Contamination

A Soils, Geology and Contamination Assessment was prepared to determine the significance of soils of the site (Appendix G). A summary of the key findings of this assessment and associated mitigation measures are outlined below.

6.7.1 Existing Environment

Landform

The study area is located in the Central West subregion. The main rivers in this subregion are the Macquarie, Castlereagh and Bogan rivers, all tributaries of the Murray-Darling Basin. This subregion extends from the plains around Dubbo across to the low-lying plains of the Macquarie and Castlereagh rivers and north-west to the Barwon River.

The Wellington Valley is divided by the Little, Bell and Macquarie rivers and their various creeks and tributaries which generally run in south east to north west direction. Elevated highpoints within 10 kilometres of the Site include a hilly area to the south-west (relief approximately 300-400m AHD) and Mount Duke (540m AHD), Mount Arthur (525m AHD) and Bushrangers Hill (406m AHD) further south.

Landform elements consist mostly of hillslopes and stream channels. The landform pattern has very low relief (9-30m) and very gentle to steeper slopes along with erosional stream channels that are usually closely spaced and form integrated channel networks. The hillslopes are generally gently inclined between 2 to 6 % with steeper slopes affected by sheet erosion when left unvegetated.

Geology

The Site lies within the eastern part of the Lachlan Fold Belt and this consists of north to north westerly trending Cambrian to Early Carboniferous sedimentary and volcanic rocks which have been subject to folding. A variety of granites are present in the area and generally occur as a central basin which is surrounded by hills which have formed from contact with metamorphic rocks. The granites can also occur as elevated plateau features such as rock outcrops or tors. The valleys between ranges of this area are usually either granite or softer material such as shale, phyllite or slate.

The Dubbo 1:100,000 Geological Series Sheet (Department of Planning and Environment (DP&E)) has mapped the area as 'Qc' (Colluvial polymictic gravel, sand, silt and clay; may include some eluvial in situ regolith deposits) and Θco – Oakdale Formation (Basalt, basaltic andesite, latite lava and intrusions, volcaniclastic breccia, conglomerate, sandstone and siltstone, minor allochthonous limestone).

The Department of Primary Industries (Office of Water) water monitoring database lists groundwater bores near the Proposal Site. The Geologists/Drillers Logs reveal basalt water bearing zones between approximately 7 and 15m depth.

The geology of the Site is categorized as shown in Figure 6-24: Geology of the Maryvale Area (Extract from Dubbo 1:100000 Geological Map).

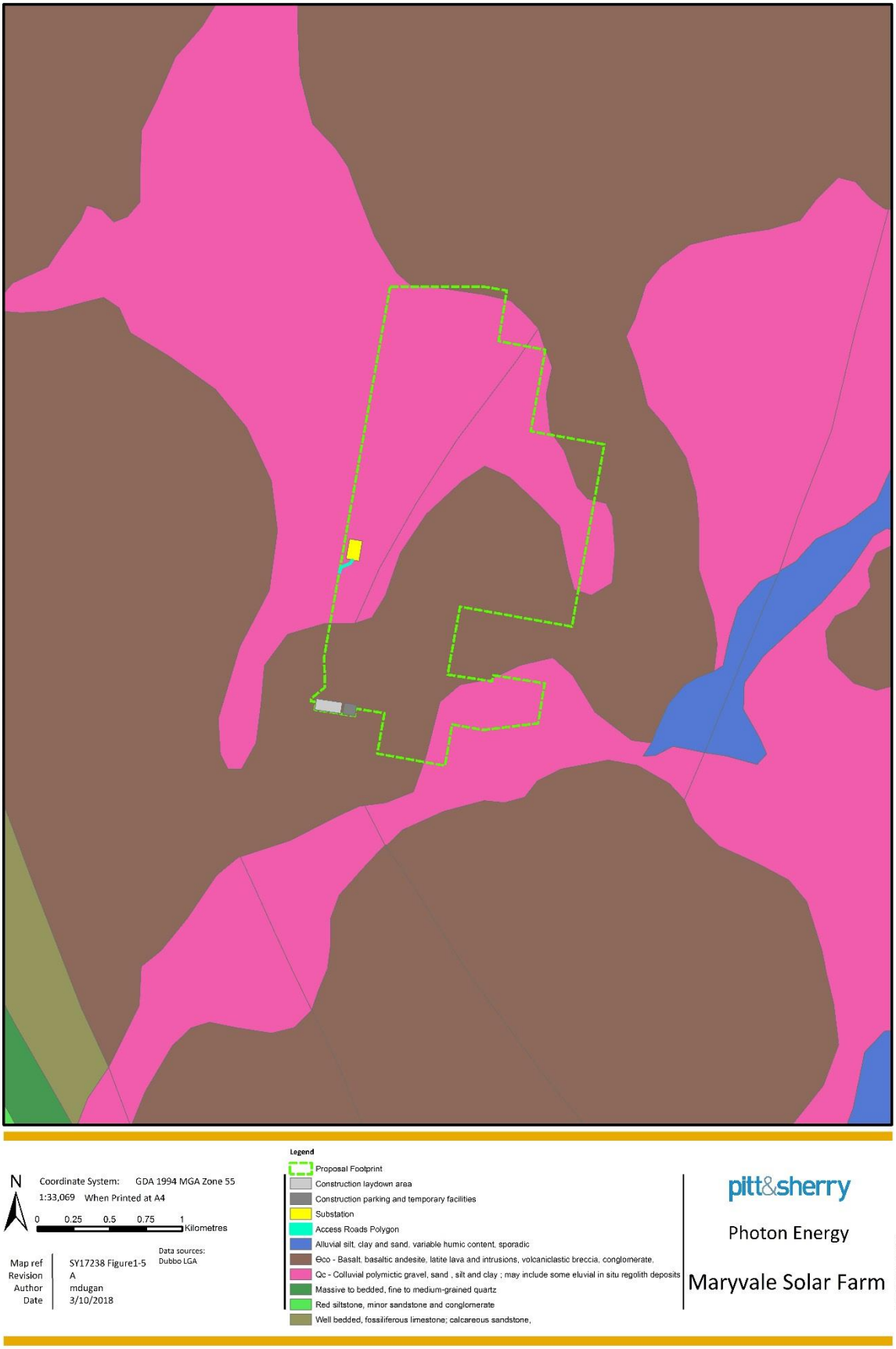

Figure 6-24: Geology of the Maryvale Area (Extract from Dubbo 1:100000 Geological Map)

Soil Landscape

The Site is mapped within the Bodangora Soil Landscape in the DLWC Dubbo 1:250,000 Sheet (1998). This is an area of approximately 391 km^2 and the soils are predominantly Euchrozems and Terra Rossa soils with minor occurrences of non-calcic brown soils on the upper slopes. The majority of soils on cleared land have been extensively disturbed by agricultural activities such as clearing for grazing of sheep and cattle and rotational cultivation for the growing of cereal crops such as wheat, oats and canola, and fodder crops such as lucerne.

Murphy *et.al* (1998) describe the chemical fertility of this soil landscape as moderate with common deficiencies such as Nitrogen and Phosphorous. The physical fertility is generally moderate to high, surface soils are friable and relatively stable to soil structure decline. The soil profile is permeable and waterholding capacity is high to moderate.

The erosion hazard has been described as slight to moderate, especially when the soils have been cultivated or the amount of groundcover is low. The soils on site do not indicate that substantial amounts of salts are present in this part of the landscape. A review of the Wellington LEP 2012 did not indicate that the Site is at risk of acid sulphate soils or salinity. A review of the eSpade indicates that the Site is not currently mapped as being a risk area for ASS.

Based on the site geomorphology, drainage and observed soils, it is highly unlikely that ASS/PASS would exist or pose a problem at or near this Site. The activities proposed on the Site will have a minimal impact in relation to disturbance of ASS or PASS. The majority of works will occur in the upper 800mm of soil and there is minimal risk of disturbing or exposing PASS to oxidation.

The soils on the Site are classified as being Class II or III Rural Land Capability. This gives them a general rating of being suitable for cropping

Table 6-15 details the qualities and limitations for soils found in the Bodangora Soil Landscape.

Table 6-15: Soil Qualities and Limitations

Qualities	Limitations
Complex soils	Long slopes (high erosion hazard)
Chemical fertility	Moderate soil fertility, N and P required with continued land use and S if canola is grown. Soils generally not susceptible to acidification.
Physical fertility	Moderate to high soil physical fertility, surface soils are friable and relatively stable to soil structure decline. Although they may still set hard if surface cover is low. Subsoils have no limitations for root growth. The soil profile is permeable and waterholding capacity is high to moderate.
Erosion hazard	Soils are only slightly to moderately erodible but slopes are 3 to 10% and relatively long (1,000 to 3,000 m), so there is a high erosion hazard under cropping, especially if soils are in a cultivated condition and surface cover is low. This is seen in the remnants of severe erosion that has occurred in the past. Soil conservation earthworks and or conservation farming practices are necessary to control erosion.
Urban capability	The moderate to high shrink-swell potential of the subsoils of the Euchrozems are the main limitation to urban development.
Rural Land Capability III	This landscape has highly productive agricultural land with most of the area being Class II or Class III cropping land. Small areas of Class IV land are associated with upper slopes and ridges or crests.

Potential contamination

A search of the NSW contaminated land register was conducted on 21 August 2018. There are no listings in the vicinity of the Site.

Land uses which generally lead to an area being deemed contaminated land include heavy industry and intensive agriculture. The Subject Land has previously been used for cultivation and grazing of livestock. Both these land uses present a low risk of contamination from fuels, herbicides, pesticides and other farm chemicals.

6.7.2 Soil Survey and Analysis

Soil Survey

To identify broad land capability and soil constraints a soil survey was undertaken on the Site. A desktop analysis was conducted to determine approximate sites for the soil survey to be undertaken. This analysis considered the site in terms of topography, drainage, access and possible variation of soil types to ensure the samples were representative of the site.

The soil survey included:

- Excavation of six test pits using a shovel and crowbar to expose the soil profile to a depth of approximately 500mm
- Completion of a test pit log sheet to record attributes of each soil layer in the field, including layer depth, field texture, colour, structure and other relevant data. A photo was taken of each soil profile. These are included in Figure 6-25 and the soil log sheets are included as Appendix I
- Collecting a representative sample (approx. 1kg) of each soil layer. Samples were placed in sealed plastic bags and labelled appropriately, and
- Analysing soils to assess soil fertility and a range of general constraints to land development.

Figure 6-26 shows the approximate location of the test pits in relation to the solar farm boundary

Test Pit 1

Test Pit 2

Test Pit 3

Test Pit 4

Test Pit 5

Figure 6-25: Test Pit Photos

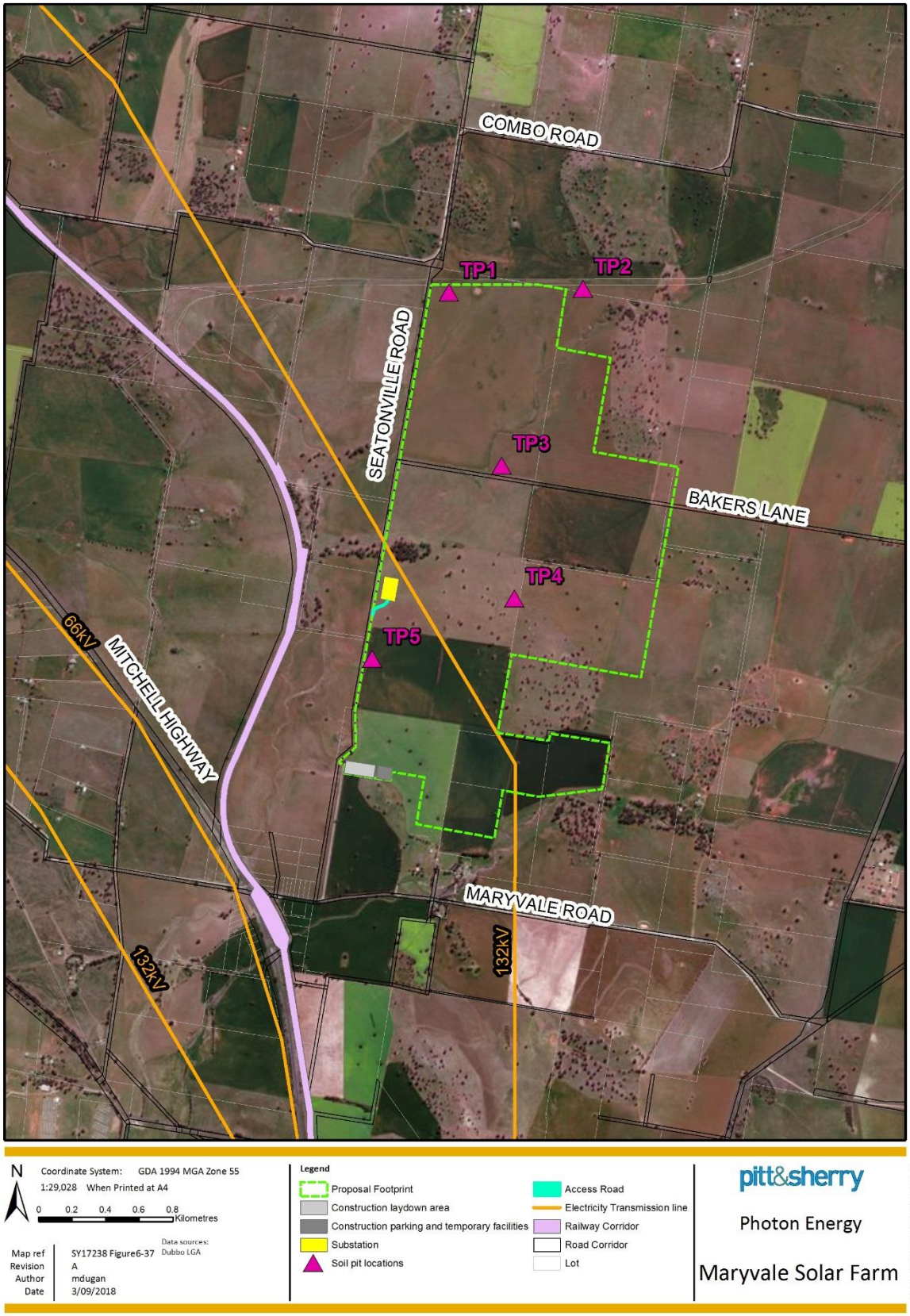

Figure 6-26: Test Pit Locations

Soil Description

The topography of the Site is undulating (Figure 6-22) and used for grazing of livestock and cultivation for dryland crops including wheat and other cereals. The soils observed are typical of the slopes and plains associated with the Macquarie Valley around Wellington. As is the case with many soils used for cultivation and growing of crops, soil fertility and structure can be depleted over a period of years. A number of representative soil samples were sent to the NSW Department of Primary Industries laboratories in Wollongbar and Scone for analysis of a range of physical, chemical and fertility indicators. Table 6-16 provides a brief summary of the soil materials sampled.

The following general observations were made:

- The site soils can be characterized as euchrozems and some smaller areas of non-calcic brown soils
- Soils on site display a moderate amount of shrink / swell in response to moisture
- The site presents a slight to moderate hazard for rill and gully erosion, and
- Sheet erosion may be exacerbated by surface sealing when left unvegetated. This can lead to reduced infiltration and increased runoff

Table 6-16: Soil Sample Descriptions

Sample Name	Sample Depth (mm)	Description
TP1/1	0-100	Light sandy clay loam, massive, brown
TP1/2	100-300	Medium heavy clay, weak peds, reddish-brown
TP2/1	0-200	Light clay loam, weak peds
TP2/2	200-600	Medium clay, well-structured, reddish brown
TP3/1	0-100	Clay loam, weak peds, brown
TP3/2	100-450	Heavy clay, well-structured, chocolate brown
TP4/1	0-80	Sandy loam, loose apedal, light brown
TP4/2	80-400	Medium clay, moderate peds, reddish brown
TP5/1	0-100	Loam, well-structured/medium peds, reddish brown
TP5/2	100-400	Medium clay, well-structured, Light reddish-brown

Soil analysis

Table 6-17 provides a summary of the laboratory testing results. Certificates of analysis containing the complete laboratory results are contained in Appendix I. All soil samples were tested for pH and electrical conductivity (EC). A more thorough analysis of soil fertility and erosion hazard was conducted on samples from three of the five test pits, these being representative of the soils across the site which are relatively uniform. This included:

- Available phosphorous (Colwell)
- Phosphorous buffer index
- Available sulfur (KCl_{40})
- Exchangeable cations
- Walkley & Black organic carbon
- Total Nitrogen
- Organic Content, and
- K factor (erodibility)

Table 6-17: Summary of Laboratory Soil Testing Results

Analytes	Units	LOR	TP1/1	TP1/2	TP2/1	TP2/2	TP3/1	TP3/2	TP4/1	TP4/2	TP5/1	TP5/2
pH (Water)	pH units	0.04	5.8	6.4	6.5	7.1	6.9	8.7	6.3	7.2	5.6	7.3
pH ($CaCl_2$)	pH units	0.04	4.8	5.5	-	-	5.9	7.6	-	-	4.7	6.1
Electrical Conductivity	dS/m	0.0010	0.061	0.069	0.035	0.029	0.2	0.34	0.072	0.044	0.072	0.04
Sulfur (KCl_{40})	mg/kg	2.0	9.3	5.8	-	-	7.3	5.8	-	-	3.3	3.1
Bray Phosphorus	mg/kg	0.060	3.6	1.5	-	-	5.8	0.4	-	-	10	0.68
Organic Carbon	%	0.050	0.94	0.85	-	-	0.97	0.42	-	-	1.3	0.49
Total Nitrogen	%	0.020	0.11	0.094	-	-	0.13	0.039	-	-	0.12	0.05
Aluminium	cmol(+)/kg	0.10	<0.1	<0.1	-	-	<0.1	<0.1	-	-	0.18	<0.1
Calcium	cmol(+)/kg	0.030	7.6	12	-	-	7.5	6.2	-	-	8.7	13
Potassium	cmol(+)/kg	0.010	0.7	0.57	-	-	0.61	0.24	-	-	1.1	0.86
Magnesium	cmol(+)/kg	0.0070	2.9	6.1	-	-	11	13	-	-	3.1	9.6
Sodium	cmol(+)/kg	0.030	0.052	0.1	-	-	2.1	6	-	-	0.063	0.51
CEC (effective)	cmol(+)/kg	0.20	11	18	-	-	21	26	-	-	13	24
Calcium/ Magnesium		-	2.6	1.9	-	-	0.68	0.47	-	-	2.8	1.4
Percent Aluminium Saturation	% of ECEC	-	N/A	N/A	-	-	N/A	N/A	-	-	1	N/A
Exchangeable Calcium	% of ECEC	-	67	64	-	-	35	24	-	-	66	55
Exchangeable Potassium	% of ECEC	-	6.3	3.1	-	-	2.8	0.94	-	-	8.2	3.6
Exchangeable Magnesium	% of ECEC	-	26	33	-	-	52	51	-	-	24	40
Exchangeable Sodium Percentage	% of ECEC	-	0.46	0.56	-	-	9.9	23	-	-	0.48	2.1
Organic Content	(%)	-	0.95	0.65	-	-	1.07	0.49	-	-	1.35	-
clay	(%)	-	13	34	-	-	30	28	-	-	10	-
silt	(%)	-	23	26	-	-	23	21	-	-	26	-
f sand	(%)	-	38	25	-	-	27	28	-	-	46	-
c sand	(%)	-	19	12	-	-	16	22	-	-	16	-
gravel	(%)	-	7	3	-	-	4	1	-	-	2	-
K-Factor	-	-	0.05	0.034			0.033	0.035			0.055	

Soil Acidity

Acidity or soil pH is a measure of the concentration of hydrogen ions in the soil solution and the lower the pH of soil, the greater the acidity. It is recommended that pH (water) should be maintained at above 5.5 in the topsoil and 4.8 in the subsurface as well maintained soil pH will maintain the soil resource and increase crop and pasture choices, while also avoiding production losses associated with high and low pHs. Laboratory analysis of the soils sampled indicates a pH (water) range of 5.6 (slightly acid) to 8.7 (slightly alkaline).

Alternately pH in a Calcium Chloride solution can also be used as an indication of pH. As a rough guide the $CaCl_2$ reading will be 0.8 units lower than the water pH and values < 5.5 indicate that the soils are becoming acid. This is especially the case when the cation exchange capacity (CEC) levels are above 15. Acid soils restrict the availability of major nutrients such as phosphorus and nitrogen to the plants.

Soil Salinity

Electrical conductivity (EC) is a measure used to determine the salinity levels in soils. The EC range for non-saline soils to extremely saline soils are listed in Table 6-18.

Table 6-18: Salinity Rating

Rating	Electrical Conductivity of a saturated soil Extract (ECe)
Non-saline (very low to Low)	<2
Slightly saline (Medium)	2 -4
Moderately saline (High)	4 – 8
Highly saline (Very High)	8-12
Extremely saline (Extreme)	>12

There are no indicators of salinity present on the Site including no:

- Visible signs of scalds
- Poor crop growth in low-lying areas where water cannot drain freely due to poor layout and drainage
- Waterlogging-tolerant plant species becoming dominant, or
- Die back of native vegetation

The laboratory analysis shows a range of 0.029 to 0.34 dS/m in a 1:5 water solution. When adjusted for the sandy loam textures for ECse, these soils are all non – saline soils.

Contributions to the water table from infiltration of rainfall can have a detrimental effect by bringing salts contained within the soil to the surface and causing saline outbreaks. To further assess this issue for the proposal, a salinity specialist from the NSW Local Land Services at Wellington was consulted on the 8th May 2018. Advice received indicated that the establishment of perennial pastures and the managed grazing of livestock would assist in lowering groundwater levels due to the uptake of infiltration water by grazed pasture plants. The infiltration rates would also be lower than those that currently occur when the soil is exposed after cultivation.

Salinity should not be a high risk given the Site's location in the landscape and the infiltration rates will be the same as present or lower. The substantial replanting of deep rooted trees and shrubs as part of the landscape plan will also assist with the uptake of soil water on Site, as will the selection of suitable pasture species.

Sodicity

Sodicity is related to the amount of sodium (Na) held in a soil within the cation exchange complex. Sodium is a cation (positive ion) that is held loosely on clay particles in soil and is one of many types of cations that are bound to clay particles. Other cations include calcium, magnesium, potassium and hydrogen. Problems occur in soils where there is an imbalance of sodium relative to other cations and this can occur with relatively low levels of sodium. If the exchangeable sodium percentage (ESP) is more than about 5% of all cations bound to clay particles, the soil is said to be sodic and above 10% is strongly sodic (Hazelton & Murphy, 2007).

The general problem with sodic soils is that high levels of sodium cause the soil to be dispersible and unstable when moisture is applied making them highly susceptible to erosion, particularly water erosion. Dispersion causes structural decline and surface crusting, leading to increased runoff susceptibility and reduced water infiltration.

Similarly, soils with high levels of magnesium levels in the cation exchange, referred to as magnesic soils, can exhibit signs similar to sodic soils. For soil to exhibit sodic symptoms due to high magnesium it is generally accepted that every 8 to 10 % of magnesium is equivalent to 1 % of sodium. Exchangeable sodium and magnesium rates are listed in Table 6-19.

Table 6-19: Exchangeable Sodium and Magnesium in the Cation Exchange Complex (%)

Sample	Exchangeable Sodium (%)	Exchangeable Magnesium (%)	Ratio Mg/Na
TP1/1	0.46	26	2.6
TP1/2	0.56	33	1.9
TP3/1	9.9	52	0.68
TP3/2	23	51	0.47
TP5/1	0.48	24	2.8
TP5/2	2.1	40	1.4

The soil test results demonstrate most soils samples had an ESP level below 2.1, which taken alone are non-sodic. TP3, located near a watercourse, was noted to be sodic coupled with the relatively high exchangeable magnesium percentage (approximately 50). The relatively low organic carbon levels (organic matter = organic carbon * 1.72) typically less than 1.3, indicates these soils would be subject to crusting and potentially high runoff if surface sealed.

The lower organic carbon values from the soil tests could be a result of repeated cropping over a number of years. Another indicator of potential instability is if the Ca/Mg ratio is less than 2. A value of one, or close to one indicates extreme susceptibility to surface crusting/sealing and values <2 indicate there may be issues from raindrop impact particularly if freshly cultivated and bare. The Ca/Mg ratio on site ranges between 0.47 and 2.81 which indicate this should not pose a problem if a vegetative cover is maintained and buffers are implemented around waterways where indicated.

K Factor – Erosion Factor

A number of factors can contribute to the erosion hazard at any particular site. The Revised Universal Soil Loss Equation (RUSLE) is one method commonly employed in NSW to estimate erosion hazard and allows risk assessment and comparison across various sites. It represents the product of various factors including rainfall erosivity, soil erodibility, landscape factors (e.g. slope gradient and length) and land management practices including surface cover and condition.

Soil erodibility (RUSLE K-factor) is a key factor in assessing erosion hazard. K-factor relates to both the susceptibility of a soil to erosion and the rate of erosion-causing water runoff. It is chiefly affected by soil texture but also structure, organic matter content and profile permeability.

Six of the test pit samples (i.e. soil samples from topsoils and subsoils) were analysed for K factor, and the results showed a range of 0.033 to 0.055 (refer Table 6-19) which indicates the soils tested have moderate to high K-factor values.

Further details regarding soils at the site and their constraints are detailed in Section 6.4.3.

Fertility and Nutrients

Phosphorus

Phosphorus levels vary widely across the site. They range from 10 mg/kg (TP5/1) to 0.4 mg/kg (TP3/2). Without knowing the full history of the sampling sites, it may be assumed that some parts of the site have had applications of fertiliser containing phosphorous applied to improve the health and production of crops grown on the site.

Nitrogen

Soil nitrogen was determined as total nitrogen by combustion. This method is not very relevant to mineral availability for plants as 95 – 99% of the total nitrogen is tied up as organic matter. This means that only 1 – 5% of soil nitrogen is in the mineral forms (NH_4^+, NO_3^-, NO_2^-) and available to plants. Availability of this nitrogen is determined by the mineralisation of organic nitrogen. There is a general rating for total soil nitrogen as a guide to what mineral nitrogen may be available to plants. Cross referencing this with the soil tests, <0.05 is very low and 0.05 to 0.15 is low. This means the soils generally have low to very low mineral nitrogen levels for plant growth with the results showing a range of 0.05% to 0.13%.

Sulfur

The level of sulfur generally recommended for crop growth needs to be greater than 8 to 10 mg/kg. The site soils display values between 3.1 mg/kg to 9.3 mg/kg. Given the relatively low range of some of the soils tested is indicative of marginal sulfur deficiency at some locations across the Site.

Erosion Hazard Analysis

Soil disturbance is expected principally during the construction stage of solar farm development. A site-specific erosion hazard assessment has been undertaken to help assess the magnitude of risk associated with soil erosion and sedimentation of waterways.

Managing Urban Stormwater: Soils and Construction (Landcom, 2004; the "Blue Book") outlines a method for estimating erosion hazard using the Revised Universal Soil Loss Equation (RUSLE). Erosion hazard can be estimated by comparing the site specific RUSLE value with guideline values published in Figure 4.6 in the Blue Book.

Table 6-20 summarises the Revised Universal Soil Loss Equation (RUSLE) factors and assumed values for the site.

Table 6-20: Revised Universal Soil Loss Equation.

Factor	Value	Description
R-factor	1400	Rainfall erosivity: related to average rainfall energy and intensity. Data taken from R-factor maps published in Annex B of the Blue Book
K-factor	0.055	Soil erodibility: conservative value calculated from soils data including texture, structure, organic matter content and permeability (refer Rosewell 1993)
LS-factor	1.68	Slope length/gradient factor: describes the combined effect of slope length and gradient on soil loss. Conservative slope length = 100m; slope gradient = 6% (Refer table A1 in the Blue Book)
P-factor	1.3	Practice-factor: related to site management practices and surface condition, and their relationship to runoff generation. A factor of 1.3 is standard on construction sites.
C-factor	1.0	Cover factor: describes the effect of surface cover in reducing exposure of soils to erosion. A nominal value of 1.0 is adopted for construction sites where soils are bare and compacted.
Annual estimated soil loss	168	Soil loss (in T/ha/yr) calculated by RUSLE equation, as $A = R \times K \times LS \times P \times C$
Soil Loss Class	2	The Blue Book describes seven soil loss classes ranging from 1 (very low, 0-150 T/ha/yr) to 7 (extremely high,>1500 T/ha/yr). The Blue Book also prescribes management requirements dependent on soil loss class.

The annual estimated soil loss for the Proposal footprint is 168 tonnes per hectare per year, which equates to a 'low erosion hazard'. A conventional suite of erosion and sediment controls should be sufficient to manage the erosion and sedimentation risks associated with construction activities.

6.7.3 Assessment of Potential Impacts

Construction

The potential to impact upon soils on the site is greatest during construction. During this period the soils will be subject to disturbance associated with site preparation, access and construction activities. Works with potential to impact soils include:

- Site establishment and preparation for construction
- Disturbance within the construction laydown area (approximately 2ha area) including works to level the surface. The construction laydown area will likely be capped with gravel to create a hardstand surface. This will be removed when the construction phase is complete
- Installation of environmental controls
- Minor vegetation clearing (grasses and shrubs) including
  - Targeted clearance of low laying vegetation around trenching areas to steel post installation to minimise disturbance to existing ground cover and
  - Clearance of larger vegetation such as bushes and shrubs
- Preliminary civil works including
  - Drainage works
  - Setting up foundations for the substation and
  - Earthing works (see below)

- Installation of steel post and rail foundation system for the solar panels
- Installation of underground cabling (trenching) and installation of inverter stations
- Construction of 132kV substation, including
  - Site Establishment and clearing (if required)
  - Bulk earthworks via a range of plant that may include scrapers, bulldozers, excavators, rollers, trucks and loaders and
  - Detailed civil works including drainage, earthing, foundations etc. generally using excavators, piling rigs, trucks and cranes

If these activities are not adequately managed, impacts that could result include the following:

- Erosion of exposed soil and stockpiled materials
- Dust generation from excavation and vehicle movements over exposed soil
- Compaction and surface sealing of exposed soils, leading to increased erosion and runoff and poor vegetation condition
- Poor storm water quality due to erosion and increased sediment loads, causing turbid stormwater runoff and impacts on receiving waters, and
- Contamination of soil due to spillage of hazardous chemicals such as fuels, oils, and other hazardous substances

Soils have the potential to be unstable which could lead to increased wind and water erosion across the site. With the existing relatively flat topography, well established vegetation cover and by using standard erosion and sediment control measures, the potential for erosion and the movement of sediments could be managed effectively given the relatively low erosion hazard as assessed by RUSLE calculations. Erosion and sediment control plans would be implemented in accordance with *Managing Urban Stormwater: Soils and Construction Vol 1.* (*Landcom 2004*).

Overall the soils do not present any major physical or chemical constraints that cannot be managed. In summary:

- The soils are quite deep and relatively well drained
- pH's are generally within the acceptable range. If pH becomes an issue, the addition of ameliorants such as organic mulches and lime can assist in reducing alkalinity or acidity
- Soils are generally non-saline
- K factors suggest soil erodibility is moderate to high, though the overall erosion hazard is low due to climate and landform factors, and
- Fertility can be improved through targeted addition of nutrients and ameliorants

Panels within the solar array area are designed to sit above the ground and ground cover would be maintained underneath and around the panels (excluding formal access tracks) throughout the operational phase of development. The objective is to maintain the current vegetation (or alternative grass cover) throughout the construction phase as far as possible, which will minimise the erosion hazard. Apart from the permanent hardstands (for the substation, inverter stations and parking areas) and formal access tracks, areas disturbed by construction would be revegetated promptly and progressively including throughout the solar arrays.

Synthetic dust suppressants, can be employed effectively to manage wind erosion and reduce dust. Run-on from upslope sources would be managed via small diversions away from disturbed areas and stockpiles.

Disturbed areas would be managed through best practice erosion and sediment control measures and will form a key part of the erosion and sediment control plan.

Further geotechnical investigations and detailed design of structures would be undertaken post approval. Nothing in the data collected to date suggests there are significant risks for building structural work though possible high shrink swell soils will need to be considered for design of foundations. Compacted structures such as roads and drains should present no issues if constructed well. Banks and drains should be revegetated as quickly as possible.

Internal drainage of the site will remain as it is with buffer zones being implemented to ensure existing waterways and flowlines are not impacted by construction activities. Additionally, there will not be any major new stormwater diversions (e.g. contour banks) or watercourses.

Operation

The potential for the Solar Farm to impact on site soils during operation of the farm is minimal after all areas disturbed during construction have been rehabilitated and groundcover has been established. 4WD vehicles will generally be used to access the site for maintenance of the Solar Farm and management of grazing livestock. These activities will not involve significant levels of soil disturbance and potential impacts can be minimised by maintaining groundcover.

The maintenance of a protective groundcover and general soil management and monitoring measures will be included in a Land Management Plan (refer Appendix M). This Plan will address operation of the solar farm and general farm management activities to achieve several key goals relevant to environmental management and social responsibility:

- Maintain sustainable soil and plant systems to preserve the agricultural values of the land, including BSAL values
- Promote and continue productive agriculture alongside electricity generating operations, and
- Minimise impacts to surrounding farmlands and the rural community

The ground cover within the Site would be affected by shading to varying degrees depending on time of year and time of day but is not expected to inhibit the maintenance of an effective groundcover.

It is anticipated that the soils will benefit from a break in cultivation activities and that on decommissioning of the solar farm will be in an equivalent or improved condition to support continued agricultural activities such as cropping. During solar farm operation, the soils will not be affected by regular cultivation or the constant addition of mineral fertilisers. An improvement in accumulated organic matter can be anticipated under a permanent pasture scenario and this will assist in improving fertility as well as soil structure.

Where sheep are used to graze the area to cut down maintenance costs (i.e. to reduce the need for slashing, mowing and herbicides), the area needs to be established to improved grasses and legumes with adequate fertiliser before any construction works. Strategic electric fencing and watering points would also need to be established to assist with management of grazing livestock.

The specifics of livestock management are included in the Draft Land Management Plan (refer Appendix L) to address stock movement to control vegetation and weeds, stock movement in times of flood and drought and whether they would breed lambs to offset some costs.

To improve soil stability and reduce the potential for erosion and surface crusting, soils would benefit from increased organic matter. The best way of improving organic matter levels and provide ground cover to prevent erosion is with actively growing pastures and fertiliser application (N, P and S).

Pastures would be established to provide competition to reduce the potential for weed propagation. Well managed pasture is a cost-effective alternative to slashing and herbicides for weed control and will be more practical within a solar farm setting. Apart from the improved grasses suggested below, there would have been some useful native grass and legume species existing prior to them being cultivated out. Over time, some of these may recruit from seedbanks along roadsides and nearby forested areas.

Local agronomists would be consulted on the best up to date pasture recommendations for the Maryvale area and on these soils.

No impacts in addition to those mentioned for construction are anticipated for soils during the decommissioning phase.

6.7.4 Mitigation Measures

Reference	Mitigation Measures
Construction and Decommissioning Mitigation Measures	
S1	A Soil and Water Management Plan (SWMP) will be prepared and implemented as part of the CEMP, in accordance with Managing Urban Stormwater: Soils and Construction (Landcom, 2004). This will include an erosion and sediment control plan for the Site and intersection for implementation during construction.
S2	Minimise the footprint of disturbance during construction and employ progressive rehabilitation strategies to reduce the erosion hazard.
S3	During trenching activities and backfilling, as far as practicable separate topsoil and subsoil and when backfilling return the soil layers in their original order where practicable to do so.
S4	Employ dust management measures on unsealed roads, stockpiles and other areas of loose or disturbed soil prone to dust generation. Controls may include covering of stockpiles, watering roads and synthetic soil stabilisers. Dust management techniques shall be outlined in the SWMP.
S5	Maintain erosion and sediment controls until construction works are complete.
S6	Install stabilised site entrances that all construction vehicles will use to access the site. The stabilised entrance and traffic management protocols in the CEMP shall be designed to minimise tracking of sediment onto adjoining roads from departing vehicles.
S7	Undertake site inspections at least weekly and following significant rainfall events to observe the condition and operation of erosion and sediment controls and water management systems and schedule any required maintenance.
S8	Undertake soil amelioration and vegetation improvement works in line with the requirements of a Land Management Plan. This should include undertaking required land or vegetation improvement works at an appropriate stage during solar farm development. For example, soil amelioration and fertilising might be most practically undertaken prior to solar panel installation. For similar reasons the desired pasture should be sown before solar panel installation.
S9	Design arrays to allow sufficient space between panels for essential maintenance activities and to facilitate maintenance of an effective ground cover beneath the panels to reduce erosion and help suppress weeds.
S10	Develop and implement a protocol for management of an unexpected finds of soil contamination.
S11	Stabilise batters required for ancillary infrastructure.

Reference	Mitigation Measures
Operational Mitigation Measures	
S12	Implement a Land Management Plan that addresses the ongoing land management and maintenance activities (refer **Appendix L**). This would address: • Ongoing agronomic management of the land including stock, water, vegetation and soils management • Measures required to maintain healthy soil and plant systems and maintain the agricultural capability of the land • Stock management programs and infrastructure (e.g. fencing, watering points) • Soil amelioration, pasture management and weed control, and • Monitoring programs for soil fertility and groundcover

6.8 Bushfire Risk

A Bushfire Impact Assessment (BIA) was undertaken by Eco Logical Australia Pty Ltd (Eco Logical) to investigate the potential construction and operational bushfire hazards of the Site (Appendix J). A summary of the key findings of this assessment and associated mitigation measures are outlined below.

6.8.1 Existing Environment

The area surrounding the site is mostly modified agricultural land utilised primarily for cropping and grazing with very little native vegetation. The main crops in the area are wheat and Lucerne. There is some remnant woodland and scattered trees on adjoining lands that will not be impacted by the development. Scattered trees located throughout the Site would be removed however a remnant patch of Yellow Box woodland would be retained.

The surrounding vegetation is not mapped as bushfire prone land however there is still a bushfire risk.

The following assets are located on Site or within 2km and are at risk from a bushfire that may propagate within the solar farm or from an external threat:

- Agricultural crops
- Stock (sheep and cattle)
- Fences
- Residences, and
- Radio receivers

Fire History

Mapped fire records from the Rural Fire Service (2006 to 2016) indicate that there were 12 bushfires within 20km of the site during this period. Thea area impacted by these fires was all less than 66ha comprising mostly crops or pasture fires.

The area is regarded as low risk for bushfires; fires are usually small and controlled by direct attack (Peter Fothergill RFS, pers. comm.).

The main sources of ignition in the district are accidents such as escaped burns, machinery and hot works (e.g. welding).

Fire Climate

Data from the Bureau of Meteorology weather station at Wellington (site 065034 D&J Rural), which is approximately 10 km from the solar farm site, indicates the frequency of occurrence of grassland fire weather and is summarised in Table 6-21 . A Grassland Fire Danger Index (GFDI) of 25 to 49 (Very High fire danger) occur on average 1.0 days per year, while days of GFDI >50 are very rare with only three Severe/Extreme days recorded in 38 years. GFDI could not be calculated for 18.4% of the 3 pm records because of incomplete data and a random distribution of missing records should be assumed (i.e. 1.2, not 1.0, days per year of GFDI 25-49).

Table 6-21: Average Number of Days Per Year of Daily Grassland Fire Danger Rating and GFDI Categories at 3 pm at Wellington (D&J Rural)

Fire Danger Rating & GFDI	Average Days per Year
Catastrophic (150+)	0.0
Extreme (100 – 149)	0.03
Severe (50 – 99)	0.1
Very High (25 – 49)	1.0
High (12 – 24)	4.4
Low – Moderate (0 – 11)	285.2
Incomplete	65.4
Total	356.1

High fire danger conditions, or worse, occur in the months of December, January, February and March and rarely, if at all, in the other months (refer

Table 6-22).

The wind directions associated with Very High or worse grassland fire danger are predominantly west but significant fire weather from all other wind directions can occur. Days of significant grassland fire danger with a southwest wind direction that would carry a fire towards the town of Wellington are very rare (approximately 1.3 per decade).

Table 6-22: Number of Days in Each Month of Daily Fire Danger Rating and GFDI Categories at Wellington (D&J Rural)

	Incomplete	Low – moderate (0-11)	High (12 – 24)	Very High (25 – 49)	Severe (50 – 99)	Extreme (100 – 149)	Catastrophic (150+)
January	284	821	65	17	0	0	0
February	194	843	31	5	1	0	0
March	257	872	38	9	1	1	0
April	200	940	0	0	0	0	0
May	174	1004	0	0	0	0	0
June	144	996	0	0	0	0	0
July	121	1057	0	0	0	0	0
August	266	912	0	0	0	0	0
September	194	946	0	0	0	0	0
October	239	939	0	0	0	0	0
November	202	938	0	0	0	0	0
December	277	855	37	9	0	0	0
Totals	**2552**	**11123**	**171**	**40**	**2**	**1**	**0**
Note: The table is based on daily records at 3pm from 1980 to 2017							

Fire Behaviour

The main source of fuel for bushfires is crops and pasture surrounding the Site and there will be instances when these are non-flammable because they are either fallow, too green to burn or recently planted. However, there will also be periods when some crops are cured and highly flammable. Given this variability, the 'cut/grazed pastures' fire spread model has been chosen to predict behaviour.

The fire behaviour potential for this site is detailed in **Appendix K**. The rate of spread and fire intensity values indicate that:

- Fires in cured pastures and crops at this site can be very fast moving and intense
- Direct attack on such a grass fire will usually fail at GFDI >49, and
- Under extreme weather conditions a grass fire can be expected to reach a maximum rate of spread within 30 minutes or less

Based on this behaviour potential a firebreak width for 99% probability of holding a head fire of between 7.5 to 13.9m. The rate of spread and fire intensity for 'eaten out pastures' are considerably lower however significant fires can still develop.

Bushfire scenarios were considered and are detailed within **Appendix K**. The risk of a major fire spreading from the solar farm in the direction of the township of Wellington is low based on the wind direction associated with significant fire weather, but still possible.

6.8.2 Potential Impacts

Construction and Decommissioning

Bushfire impacts associated with the Proposal relate to the risk of the solar farm causing a bushfire or the risks of bushfire affecting the solar farm. Potential ignition sources associated with construction and decommissioning of the Proposal would include:

- Site preparation activities involving the use of other petrol-powered tools, and slashing machinery which could cause sparks
- Operating a petrol, LPG or diesel-powered motor vehicle (or other plant and equipment) over land containing combustible material
- Storage of fuels and dangerous goods
- Smoking from site personnel
- Electrical faults during testing, and
- Existing ignition sources such a lighting and cropping equipment

With the exception of electrical faults, the activities listed above are undertaken regularly in this rural environment. The main sources of ignition in the existing environment will remain however, as the area will be used for grazing the ignition risk from crop harvesting equipment on site will be reduced significantly.

The risks of bushfire within the site are limited by the following factors:

- The site is not located on bushfire prone land
- The majority of the site is cleared so there is a limited amount of fuel for the fire
- The solar array, which would occupy the majority of the site, would be largely constructed of glass, silicon, steel and aluminium which all have very low flammability
- All electrical components would be designed and managed to minimise potential for ignition, and

- Water storage dams are already located on site

The ignition risks can be minimised further by installing electrical equipment in accordance with Australian standards and the implementation of the mitigation measures outlined in Section 6.8.3.

No bush fire impacts in addition to those mentioned for construction are anticipated during the decommissioning phase.

Operation

During operation, crops and pasture surrounding the site are the main fuel for bushfires. Activities associated with operation of the Proposal and existing activities in the area that may cause or increase the risk of bush fire include:

- Storage of any dangerous goods (such as pesticides) will be within the maintenance storage container, however fuel will be stored in a bunded above ground tank outside the container
- Powerline failure or contact with vegetation within clearances
- Electrical infrastructure such as inverters, transformer and electrical cabling as they represent ignition risks
- Substation overheating
- Operating a petrol, LPG or diesel-powered motor vehicle (or other plant and equipment) over land containing combustible material, and
- Existing ignition sources such a lightning and cropping equipment

The PV solar panels are non-reflective and present no risk of ignition from the concentration of solar energy.

Ignitions from other electrical equipment is theoretically possible from electrical faults such as arc faults, short circuits, ground faults, overheating and reverse currents. It is conceivable that arcs or melted components resulting from a fault could ignite grass fuels under or surrounding installations and start a bushfire. This risk can be managed by the mitigation measures specified in Section 6.8.3.

Potential hazards to fire fighters

The RFS is the primary response agency for fighting grass and structural fires within the Site. As such, the fire-fighters likely to respond to a bushfire in this area would be volunteers and/or individual property owners; the latter are mostly equipped with one or more of their own small fire units. The RFS have stated that fire fighters in the district are equipped with breathing apparatus if required and all fire fighters are trained in Basic firefighting to deal with electrical fires. Some of the brigades adjacent to the Maryvale site are also trained as village fire fighters that deal with structure fires.

The risks to fire-fighter safety associated with a fire burning the solar panels and associated equipment include:

- Electrocution – solar panels would be energised under any natural or artificial light conditions
- Conduction of electrical current through water is also a risk when operational personnel spray the high-powered engine hose at the inverter or the components of the solar PV system, and
- Inhalation of potentially toxic fumes and smoke from any plastic components such as cables or other decomposed products of the panels, although the majority of the site, would be largely constructed of glass, silicon, steel and aluminium

Each inverter station will be fitted with an isolation switch allowing for the isolation of individual inverter stations. The turning off of sections or all of the solar farm can be done on site at the control room or remotely

from MSF's control centre. When the inverter station is turned off then the solar panels will be isolated and disconnected from the grid. This will mitigate risks to fire fighters by reducing their risk of electrocution.

Firefighting water supplies
Given the safety concerns for fire-fighters, fire-fighting equipment for fire-fighters will not be located on site because the equipment could not be utilised safely and effectively. One tank outside the Asset Protection Zone (APZ) with a capacity of 20,000L will be located near the substation.

The recommended bushfire mitigation measures as described in Section 6.8.3 are also depicted in Figure 6-27.

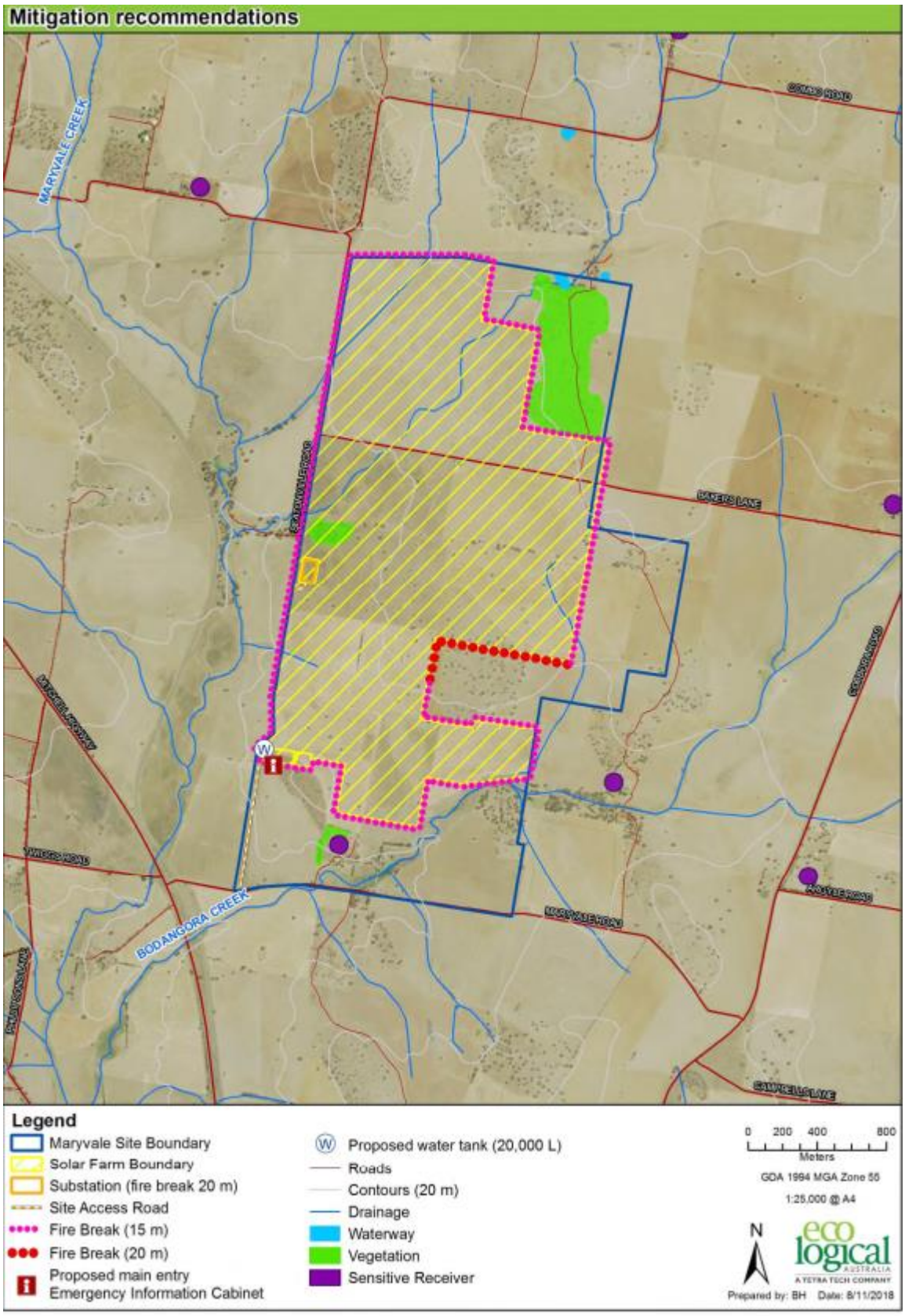

Figure 6-27: Bushfire Mitigation Measures

6.8.3 Mitigation Measures

Reference	Mitigation Measures
Design	
BF1	All electrical components would be designed and managed to minimise potential for ignition.
BF2	The design would consider that the permanent access road must be trafficable by Category 1 fire appliances.
BF3	Design should consider shielding of solar farm components including burial of cables underground and shielding of above ground cables and circuitry.
BF4	Research undertaken into the ignition, flammability and toxicity risks of the solar farm components once the design is finalised.
Construction and Decommissioning Mitigation Measures	
BF5	Maximise use of construction components using materials such as glass, silicon, steel and aluminium rather than plastic.
BF6	Develop an Emergency Response Plan (ERP) in consultation with the NSW RFS District Fire Control Centre prior to construction. The ERP should include: • Foreseeable on-site and off-site fire events • Clearly states work health safety risks and procedures to be followed by fire-fighters, including – Personal protective clothing – Minimum level of respiratory protection – Minimum evacuation zone distances – A safe method of shutting down and isolating the PV system – Any other risk control measures required to be followed by fire fighters • Any other risk control measures required to be followed by fire-fighters • Evacuation triggers and protocols, and • Suppression response strategies and tactics, including aerial suppression options/management
BF7	Two copies of the ERP should be permanently stored in a prominent 'Emergency Information Cabinet' to be located at the main entrance point to the solar farm, external to any security fence or locked gate, and a copy provided to local emergency responders.
BF8	An APZ will be constructed around the solar farm with the following requirements: • The APZ will be 15 m wide around the entire perimeter of the solar farm footprint, and 20 m wide for areas abutting the remnant vegetation and landscaping areas • The external edge of the APZ setback at least 25 m from the external edge of PV panels or other components • The APZ must be either a mineral earth fire break (i.e. dirt or gravel) • No trees or shrubs to be planted on the internal side of the fire break including that associated with the landscape plan • APZ preferably located external to any security fence • Access track located on the internal edge of the APZ that is trafficable by Category 1 fire appliances, and • The substation should have a 20m APZ with no internal vegetation (gravel surface)
BF9	The APZ or a fire break is to be constructed as part of the first stage of the development.

Reference	Mitigation Measures
BF10	Construction between 1 December and 31 March would be undertaken in accordance with the following: • All plant, vehicles and earth moving machinery will be cleaned of any accumulated flammable material (e.g. soil and vegetation) • A suitable fire appliance (e.g. fire extinguisher) is present on site with at least two personnel trained in bushfire fighting • On days when Very High fire danger or worse is forecast for Wellington, the "fires near me" app is to be checked hourly for the occurrence of any fires likely to threaten the site, and • All operations involving machinery will cease while the GFDI is or forecast to be 35 or greater
BF11	Installation of electrical equipment such as, junction boxes, inverters, transformer and electrical cabling, is to be in accordance with AS 3000:2007 Electrical installations and undertaken by qualified professionals.
BF12	Install a water supply tank with a capacity of 20,000L outside the APZ near the substation.
BF13	Ensure any trees or shrubs planted are outside the APZ and meet the following criteria: • Use species suitable for the environment that have low fire spotting characteristics (e.g. smooth bark), and • Maintain a 20m APZ width adjacent any vegetation
BF14	At the end of construction and prior to operation contact the Local Emergency Management Committee to establish emergency management procedures with relevant authorities for the safety hazards presented by the site.
BF15	At the end of construction and prior to operation brief the local volunteer fire brigades and neighbouring farmers.
Operational Mitigation Measures	
BF16	Fit PV arrays with an earthing and lightning protection system connected to the main earth link.
BF17	Vegetation fuel levels internal to the APZ and throughout the solar farm will be maintained by grazing, slashing or mowing.
BF18	Remove any vegetation that occurs within the substation compound.
BF19	The solar farm will be monitored via off-site control centres to ensure systems are working correctly, investigate any alarms and monitor panel performance.
BF20	Suspend site maintenance operations when GFDI is or forecast to be 35 or greater.
BF21	Brief the local volunteer fire brigades and neighbouring farmers at regular intervals e.g. annual pre-season fire meetings.

6.9 Noise

A Noise Impact Assessment (NIA) was undertaken by Muller Acoustic Consulting Pty Ltd (MAC) to investigate the potential acoustic impacts of the Proposal (Appendix K). A summary of the key findings of this assessment and associated mitigation measures are outlined below.

6.9.1 Assessment Methodology

The NIA was prepared in accordance with the following policies and guidelines where relevant:

- NSW DECCW Interim Construction Noise Guideline 2009 (ICNG)
- NSW EPA Industrial Noise Policy 2017 (INP)
- NSW EPA Road Noise Policy 2011 (RNP)
- Standards Australia AS 2436–2010(2016) (AS2436) – Guide to Noise and Vibration Control on Construction, Demolition and Maintenance sites
- Standards Australia AS1055–1997 (AS1055) – Description and Measurement of Environmental Noise
- Standards Australia AS IEC 61672.1–2004 (AS61672) – Electro Acoustics - Sound Level Meters Specifications Monitoring or Standards Australia AS1259.2-1990™ (AS1259) – Acoustics – Sound Level Meters – Integrating/Averaging as appropriate to the device, and
- Standards Australia AS/IEC 60942:2004/IEC 60942:2003 (IEC60942) – Australian Standard – Electroacoustics – Sound Calibrators

A quantitative noise assessment has been undertaken in accordance with the ICNG. The quantitative assessment method involves predicting noise levels and comparing them with the levels in the ICNG. The process for industrial noise management is summarised as follows:

- Determine the Project Noise Trigger Levels (PNTLs) (i.e. criteria) for a development. These are the levels, above which noise management measures are required to be considered. They are derived by considering shorter-term intrusiveness due to changes in the noise environment and maintaining the noise amenity of an area
- 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
- Compare the predicted or measured noise level with the PNTLs, assessing impacts and the need for noise mitigation and management measures
- 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
- Set statutory compliance levels that reflect the best achievable and agreed noise limits for the development, and
- Monitor and report environmental noise levels from the development

Table 6-23 (reproduced from Table 2 of the ICNG) sets out the noise management levels (NMLs) for residences and how they are to be applied.

The initial step in the assessment was to identify potentially-sensitive receivers. Sensitive receivers were verified via aerial mapping and during the site inspection which occurred on the 22nd November 2017.

To quantify existing background noise levels, long-term unattended and short-term operator attended noise measurements were performed at representative receptors located near the Proposal between Wednesday 22nd November 2017 to Thursday 30 November 2017. Background noise levels are given in Section 6.9.2.

Table 6-23: Noise Management Levels at Residential Receivers

Time of Day	Management Level LAeq (15 minutes) *	How to Apply
Recommended standard hours: Monday to Friday 7 am to 6 pm Saturday 8 am to 1 pm No work on Sundays or public holidays	Noise affected 52 + 10 dB	The noise affected level represents the point above which there may be some community reaction to noise. Where the predicted or measured LAeq (15 min) 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 works to be carried out, the expected noise levels and duration, as well as contact details.
	Highly noise affected 75 dB(A)	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 works near schools, or mid-morning or mid-afternoon for works 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 Evening 47 dB(A) Night 42 dB(A)	A strong justification should typically be required for works 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 5dB (A) above the noise affected level, the proponent should negotiate with the community. For guidance on negotiating agreements see Section 7.2.2 of the ICNG.
* Noise levels apply at the property boundary that is most exposed to construction noise, and at a height of 1.5 m above ground level. If the property boundary is more than 30 m from the residence, the location for measuring or predicting noise levels is at the most noise-affected point within 30 m of the residence. Noise levels may be higher at upper floors of the noise affected residence.		

Noise modelling was used to determine the impact of project noise emissions to neighbouring receivers for typical construction activities and operations (Table 6-24).

Table 6-24: Construction Equipment Sound Power Levels (Lw) dBA re 10^{-12} W

Noise Source/Item	Utilisation %	Quantity	Lw/Item		Total Lw
	TRENCHING & EARTHWORKS				
Backhoe	100	1	104		104
Light vehicle	50	2	76		76
Total – Trenching & Earthworks					**104**
	PILING				
Piling Rig (Hydraulic)	100	1	113		113
Tele-handler	80	1	106		105
Light Vehicle	50	1	76		73
Total – Piling					**114**
	ASSEMBLY				
Mobile Crane/ HIAB	100	1	104		104
Tele-handler	100	1	106		106
Light vehicle	50	2	76		76
Hand tools/power tools	25	1	102		96
Welder	25	1	105		99
Total – Assembly					**109**
	TRANSPORT (On site)				
Heavy vehicle	100	1	104		104
Tele-handler	100	1	106		106
Total – Transport					**110**

Operational noise predictions were modelled for a typical worst case operational scenario over a 15-minute assessment period based on the operational assumptions and sound power levels (Table 6-25).

Table 6-25: 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] All tracking motors in operation	1 minute per 15-minute period	5630	78	99
Transmission Kiosk/ inverter stations – each consisting of the following				
Inverter[2]	Constant	36	75	96
Transformer[2]	Constant	36	70	91
Capacitor Battery	Constant	36	75	96
Transmission Kiosk - Total[2, 3]	Constant	36	79	100
Substation	Constant	1	90	90

Noise Source/Item	Activity	Quantity	Lw/ Item	Total Lw
Light Vehicle [2]	Vehicles arrive and depart from site (5 minutes duration)	2	76	79

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.
Note 3: -5dB applied to account for power station/ kiosk vented enclosure.

6.9.2 Existing Environment

Surrounding area

From observations whilst on site, the noise environment at existing residential receptors is best described as 'rural' in accordance with the INP, being an area with an acoustical environment that is dominated by natural sounds, having little or no road traffic noise and generally characterised by low background noise levels.

Potentially affected sensitive receivers

A total of ten sensitive receivers were identified as having the potential to be affected by noise. The identified receivers are presented in Table 6-26 and identified in Figure 6-28.

Table 6-26: Sensitive Receiver Locations

Noise Receiver ID	Sensitive Receiver ID	Type	Description	Eastings	Northings
R1	1	Rural Residential	469 Combo Road	115117	6403695
R2	4		433 Combo Road	114891	6403975
R3	5		Beulah Mount 847 Combo Road	116088	6404460
R4	5		Calliope 847 Combo Road	117748	6404446
R5	6		801 Cobbora Road	119335	6402004
R6	8		265 Maryvale Road	117866	6400320
R7	7		576 Cobbora Road	118986	6399956
R8	57		1148 Mitchell Highway	113163	6402429
R9	9		87-121 Maryvale Road	116533	6399867
R10	10		112 Maryvale Road	116358	6399612

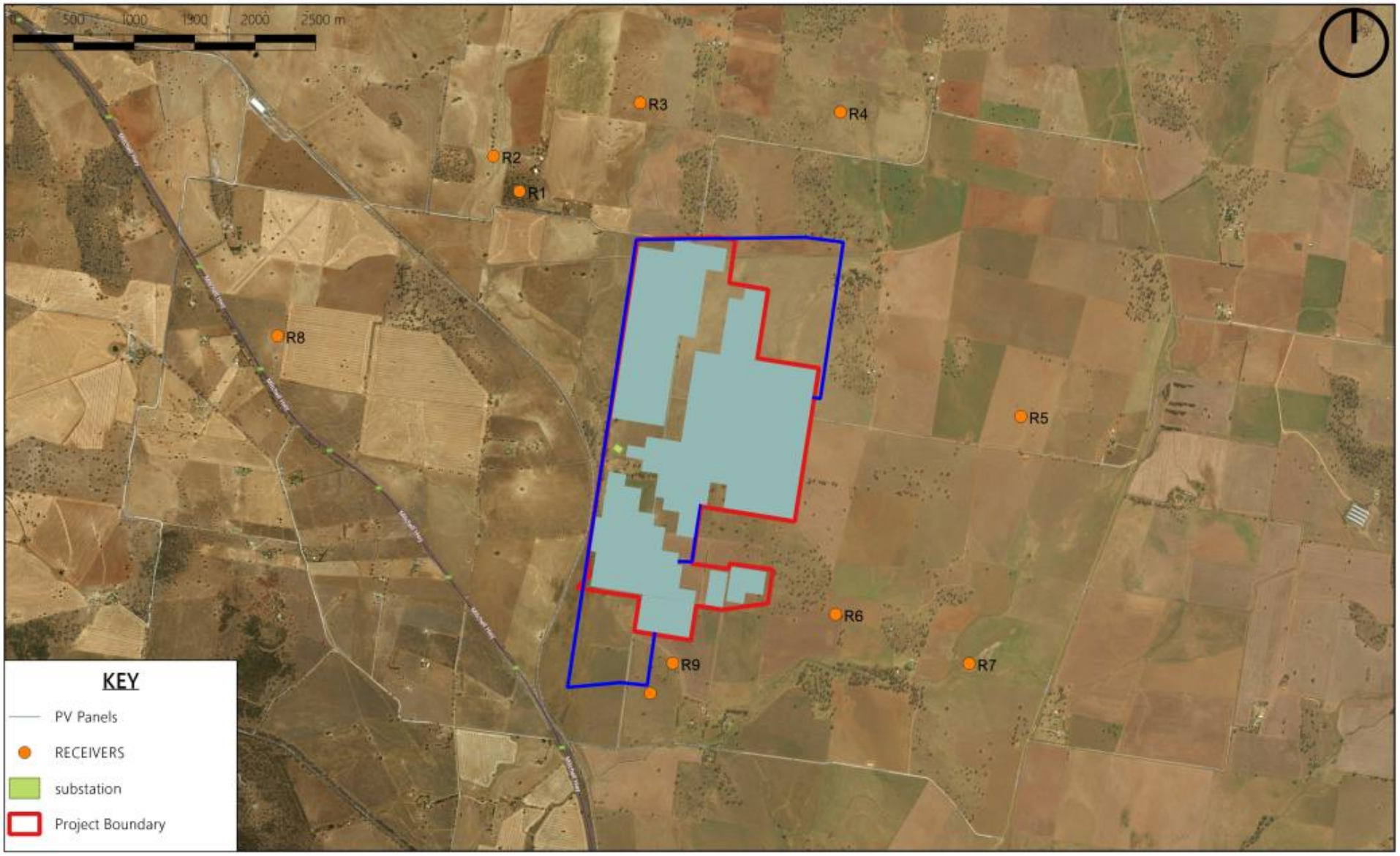

Figure 6-28: Potentially Affected Sensitive Receiver Locations

Background noise levels

Criteria for the assessment of construction and operation noise are usually derived from the existing noise environment of an area. To quantify existing noise levels, long-term unattended and short-term operator attended noise measurements were performed at representative receptors located within and near the Site. These locations are presented in Table 6-27. L1 is located on the northern extent of the Subject Land, currently used for agriculture and is representative of receptors to the north of the Subject Land that are not influenced by road traffic on the Mitchell Highway and the Main Western Railway. L2 is adjacent to Maryvale Road and is representative of those receptors that are influenced by road traffic and railway noise.

Noise measurements were carried out using a Svantek Type 1, 977 noise analyser from Wednesday 22nd November 2017 to Thursday 30 November 2017.

Table 6-27: Noise Monitoring Locations

ID	Unattended Noise Monitoring Locations	Site Description	Coordinates (MGA 56)	
			Eastings	Northings
L1	Project Site	Adjacent to Seatonville Road & Combo Road	116159m E	6403297m S
L2	121 Maryvale Road	Receivers adjacent to roads and railway	116235m E	6399805m S

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 Assessment Background Levels (ABLs). The results of the unattended noise measurements, including derived RBLs are summarised Table 6-28.

Table 6-28: Unattended Noise Monitoring

Unattended Noise Monitoring Location	Time Period	Measured background Level RBL LA_{90}, dBA	Measured Ambient Noise Level LAeq, dBA
L1 Project Site	Day	25	48
	Evening	30	49
	Night	24	38
L2 Maryvale Road	Day	33	50
	Evening	39	57
	Night	35	46
Note: Monday to Saturday: Day 7am to 6pm; Evening 6pm to 10pm; Night 10pm to 7am. On Sundays and Public Holidays, Day 8am to 6pm; Evening 6pm to 10pm; Night 10pm to 8am; RBL = Rated background Level			

Measured levels at L2 are noticeably higher than those at L1. This is due to the proximity to Maryvale Road and the influence of road traffic noise and some contribution from the Main Western Railway.

6.9.3 Assessment Criteria

Construction Noise Management Levels

Predicting noise levels and comparison to the Noise Management Level (NML) are important indicators of the potential level of construction noise impact. Table 6-23 provides the ICNG recommended LAeq(15min) NMLs and how they are to be applied. Construction NMLs for construction activities at all residential receivers are 45dB LAeq,15min (RBL +10dB). Although construction activities are only planned for standard hours, the relevant NML standard construction hours and out of hours' periods are summarised in Table 6-29.

Table 6-29: Construction Noise Management Levels

Location	Assessment Period	RBL, dBA	NML dB LAeq, 15 min
Residential Receptors	Day (Standard hours)	35	45 (RBL + 10 dBA)
	Evening (OOH Period 1)	30	35 (RBL + 10 dBA)
	Night (OOH Period 2)	30	35 (RBL + 10 dBA)
Residential Receivers (Road-Rail)	Day (Standard Hours)	35	45 (RBL+10dBA)
	Evening (OOH Period 1)	30	35 (RBL+5dBA)
	Night (OOH Period 2)	30	35 (RBL+5dBA)

Operational Noise Criteria

The Industrial Noise Policy (INP) sets out noise criteria to control the noise emission from industrial noise sources. Mechanical and operational noise from the development shall be addressed following the guideline in the INP.

The calculation is based on the results of the ambient and background noise unattended monitoring, addressing two components:

- Controlling intrusive noise into nearby residences (Intrusiveness Criteria), and
- Maintaining noise level amenity for particular land uses (Amenity Criteria)

The intrusiveness criterion can be summarised as LAeq, 15 minute ≤ RBL background noise level plus 5 dB(A) (refer Table 6-30). The amenity criterion and Project Amenity Noise Levels (PANL) define the acceptable noise levels that will protect against noise impacts such as speech interference, community annoyance and to some extent sleep disturbance, these are outlined in Table 6-30, Table 6-31. The Project Noise Trigger Levels (PNTLs) is the lower of either the Intrusiveness Noise Level or the PANL (refer Table 6-30). For this assessment the night time PNTL of 35dB LAeq(15min) is the limiting criteria.

Table 6-30: Intrusiveness, Amenity and Project Noise Trigger Levels

Receiver	Time Period[1]	Measured RBL dB LA_{90}	Adopted RBL[2] dB LA_{90}	Intrusiveness Noise Level dB LAeq, 15 min	Recommended ANL dB Aeq,period	PANL dB LAeq, 15 min[2]	PNTL dB LAeq, 15 min
Residential Receivers	Day	25	35	40	50	53	40
	Evening	30	30	35	45	48	35
	Night	24	30	35	40	43	35
Residential Receivers (Road-rail)	Day	33	35	40	50	53	40
	Evening	39	35[3]	40	45	48	40
	Night	35	35	40	40	43	40

Note 1: Monday to Saturday: Day 7am to 6pm; Evening 6pm to 10pm; Night 10pm to 7am. On Sundays and Public Holidays, Day 8am to 6pm; Evening 6pm to 10pm; Night 10pm to 8am.
Note 2: Where the measured daytime RBL is less than 35dBA, 35dBA is adopted, and where the measured RBL is less than 30dBA for the evening and night, 30dBA is adopted.
Note 3: Where the measured evening or night RBL is higher than the daytime RBL, the NPI recommends that the intrusive noise level for evening be set at no greater than the intrusive
noise level for daytime and the intrusive noise level for night-time should be no greater than the intrusive noise level for daytime or evening.

Road Traffic Noise Criteria

Road traffic noise impact is assessed in accordance with the NSW Road Noise Policy (RNP) (DECC 2011). The criterion (Table 3 – Road Traffic Noise Assessment Criteria for Residential Land Uses) divides land use developments into different categories and lists the respective criteria for each case. For this assessment, the 'local road' category, as specified in the RNP, was adopted for Seatonville Road and the 'sub arterial road' category Maryvale Road and Cobbora Road. The functional classification of Maryvale Road is a 'Collector Road" in accordance with the Roads and Maritime Services Noise Criteria Guideline (April 2015). However, the RNP does not provide separate noise criteria for Collector Roads and applies the sub-arterial category to all roads that are not classified as local roads. The category that is relevant to the proposal is listed in Table 6-31.

Table 6-31: NSW Road Noise Policy – Traffic Noise Assessment Criteria

Road Category	Road Name	Type of project / land use	Assessment Criteria	
			Day (7am – 10pm)	Night (10pm – 7am)
Freeway/arterial/sub-arterial road	Maryvale Road Cobbora Road	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
Local Roads	Seatonville Road	Existing residences affected by additional traffic on existing local roads generated by land use developments	55dBA LAeq, 1hr external	50dBA LAeq, 1hr external
Note: For road noise assessments, the day period is from 7am to 10pm (i.e. there is no evening assessment period as there is with operational noise). Night is from 10pm to 7am.				

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.

In addition to meeting the assessment criteria, any significant increase in total traffic noise at receivers must be considered. Receivers experiencing increases in total traffic noise levels above those presented in Table 6-32 due to the addition of project vehicles on Maryvale Road should be considered for mitigation. Relative increase criteria are not applicable to local roads (i.e. Seatonville Road).

Table 6-32: Increase Criteria for Residential Land Uses

Road Category	Type of project / land use	Total Traffic Noise Level Increase, dBA	
		Day (7am to 10pm)	Night (10pm to 7am)
Freeway/arterial/sub-arterial roads and transitways	New road corridor /redevelopment or existing road/land use development with the potential to generate additional traffic on existing road.	Existing traffic LAeq,15hr +12dB (external)	Existing traffic LAeq9hr +12dB (external)

6.9.4 Assessment of Potential Impacts

Construction

Table 6-33 summarises the maximum noise levels from construction that are likely to be experienced at the nearby affected receiver locations during the construction works. The results show that the construction noise is predicted to be below the NMLs at all receivers and would only be experienced when these construction activities occur simultaneously along the northern boundary.

Table 6-33: Predicted Construction Noise Levels

Receiver ID	Description	Predicted Operational Noise Level dB LAeq,15min	Limited Night time PNTL dB LAeq,15min	Compliant
R1	469 Combo Road	40	45	Yes
R2	433 Combo Road	37	45	Yes
R3	Beulah Mount 847 Combo Road	38	45	Yes
R4	Calliope 847 Combo Road	36	45	Yes
R5	801 Cobbora Road	34	45	Yes
R6	265 Maryvale Road	39	45	Yes
R7	576 Cobbora Road	32	45	Yes
R8	1148 Mitchell Highway	29	45	Yes
R9	87-121 Maryvale Road	41	45	Yes
R10	112 Maryvale Road	38	45	Yes

Operation

The operational noise predictions have been modelled for a worst-case scenario over a 15-minute period including noise generated from tracking motors, inverter stations, the substation and light vehicles required for operation. Light vehicles and machinery are already used onsite and within the surrounding area so noise levels associated with the operation of the solar farm should have similar or less than current noise levels. Table 6-34 summarises predicted noise levels for night time operations. These do not exceed the maximum noise level screening criterion of 40dB LAeq(15min) and/or 52dB LAmax.

Table 6-34: Predicted Operation Noise Levels

Receiver ID	Description	Predicted Operational Noise Level dB LAeq,15min	Limited Night time PNTL dB LAeq,15min	Compliant
R1	469 Combo Road	<25	35	Yes
R2	433 Combo Road	<25	35	Yes
R3	Beulah Mount 847 Combo Road	<25	35	Yes
R4	Calliope 847 Combo Road	<25	35	Yes
R5	801 Cobbora Road	<25	35	Yes
R6	265 Maryvale Road	<25	35	Yes
R7	576 Cobbora Road	<25	35	Yes
R8	1148 Mitchell Highway	<25	35	Yes

Receiver ID	Description	Predicted Operational Noise Level dB LAeq,15min	Limited Night time PNTL dB LAeq,15min	Compliant
R9	87-121 Maryvale Road	<25	35	Yes
R10	112 Maryvale Road	<25	35	Yes

Road Traffic

The main transport route to the site is via Cobbora Road to Maryvale Road and Seatonville Road. During construction, typical daily traffic volumes are expected to be 75 heavy vehicles (semi-trailers) and 20 light vehicles (including mini buses for employee transport). Table 6-35 demonstrates predicted noise levels for construction traffic noise levels would comply with the relevant RNP criteria.

Table 6-35: Predicted Construction Road Traffic Noise Levels

Road Name	Nearest Offset Distance to Receiver	Predicted Noise Level	RTN Criteria	Comply
Maryvale Road	20m	54dB LAeq,1hr	55dB LAeq,1hr	Yes
Cobbora Road	38m	43dB LAeq,15hr	60dB LAeq,15hr	Yes

The assessment indicates that operational noise predictions for relevant noise criteria would be satisfied at all receivers. Notwithstanding this, it is recommended that the proponent actively minimise potential noise emissions from the Proposal. The Proposal is committed to managing noise emissions within the community and will adopt suitable procedures to minimise noise emissions.

6.9.5 Mitigation/ Management Measures

The following mitigation and management measures are recommended to minimise potential noise impacts.

Reference	Mitigation Measures
Construction and Decommissioning Mitigation Measures	
N1	Prepare a construction noise management protocol for the site to manage noise emissions.
N2	Implement a formal complaint handling procedure to manage any potential concerns from the community. This will include: • Details of a readily accessible contact person; and • A well-documented process that includes an escalation procedure so that (if required) there is a path to follow should the complainant not be satisfied and • Details regarding setting up a complaint register Each complaint would need to be investigated and appropriate noise amelioration measures put in place to mitigate future occurrences, where the noise in question is in excess of allowable limits.
N3	Works are to be carried out during standard work hours (i.e., 7am to 6pm Monday to Friday; 8am to 1pm Saturdays). Any construction outside of these normal working hours would only be undertaken in the event of an emergency or with prior approval from relevant authorities. For non-

Reference	Mitigation Measures
	emergency works outside standard hours, residents and other sensitive land use occupants should be informed of the works between 5 and 14 days before commencement.
N4	Toolbox and induction of personnel prior to start of shift to discuss noise control measures that may be implemented to reduce noise emissions to the community, construction hours and nearest sensitive receivers.
N5	All plant should be shut down when not in use. Plant to be parked/started at farthest point from relevant assessment locations
N6	Avoid the operation of noisy equipment near noise sensitive areas and where possible, loading and unloading would be conducted away from sensitive areas.
N7	Noise levels will be considered when procuring equipment.
N8	All plant is to utilise a broadband reverse alarm in lieu of the traditional hi frequency type reverse alarm.
N9	Ongoing community consultation for residences within close proximity of the works. The information would include details of: • The proposed works and when these will occur • The duration and nature of the works • Details of what to do should they have a noise complaint, and • Updates on the progress of works
N10	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)
N11	Signage is to be placed at the front entrance advising truck drivers of their requirement to minimise noise both on and off-site.
Operational Mitigation Measures	
N12	Complete a one-off noise validation monitoring assessment to quantify emissions from site and confirm emissions meet relevant criteria.
N13	Prepare an operational noise protocol that can be implemented to address any community concerns regarding noise emissions for future operations of the Proposal.

6.10 Air Quality

An Air Quality Assessment was prepared to investigate the potential air quality impacts of the Proposal. A summary of the key findings of this assessment and associated mitigation measures are outlined below.

6.10.1 Existing Environment

Local Climate

The closest Bureau of Meteorology weather station is in Wellington at D&J Rural (Site No.065034) which is located approximately 10 km to the south-south-east of the Proposal. Long-term climatic data from this site has been reviewed to characterise the local climate in the proximity of the Proposal.

Review of the data indicates that January is the hottest month with a mean maximum temperature of 32.1 degrees Celsius (°C) and July is the coldest month with a mean minimum temperature of 2.2°C. Humidity levels exhibit some variability and seasonal flux across the year. Mean 9am humidity levels range from 83 % in June and July to 54 % in December. Mean 3pm humidity levels vary from 57 % in June to 34 % in December.

The annual average rainfall for Wellington is approximately 617 mm with rainfall peaking during the summer months and declining during autumn and winter. The data indicates that January is the wettest month with an average rainfall of 59.2 mm and September is the driest month with 44.8 mm. Mean 9am wind speeds range from 8.0 km per hour (km/h) in October to 3.9 km/h in June. Mean 3pm wind speeds range from 11.7km/h in October to 7.0km/h in May. The most common winds are from the east and south-west sectors.

Local Air Quality

The main sources of particulate matter emissions in the area surrounding the site emissions from anthropogenic activities such as motor vehicle exhaust, locomotive emissions, wood heater emissions and various commercial, agricultural and industrial activities. Motor vehicle emissions include those from nearby roads including the Mitchell Highway and Maryvale Road. Some of the smaller local roads and farm access roads in the vicinity of the site are unsealed, including most of Maryvale Road and Seatonville Road and traffic on these would contribute to air quality impacts from dust.

Regional air emission sources include agricultural activities and light industrial activities. The National Pollution Inventory details that there are no recorded sources of substance emissions in the Wellington area and accordingly there are no Sites that report data to the NPI.

6.10.2 Impact Assessment

Construction

During construction of the proposal the primary emissions will be dust generated from material handling, vehicle movements, land preparation and windblown dust generated from exposed areas. The ground disturbance from pile foundations is estimated to equate to less than 1% of the total site area. Additional ground disturbance would result from trenches for cabling and footings for another infrastructure and vegetation removal. These sources of dust are temporary in nature for the duration of the construction period. Particulate emissions would also be generated from the exhaust of construction vehicles and plant.

The total amount of dust generated from the construction process is unlikely to be significant given the limited dust generating activities for a limited period. Additionally, as construction would be staged areas would be stabilized before moving on to a new area thereby limiting the extent of any exposed ground. Dust suppression measures are to be used during construction to minimise the potential for dust generation. As such, air quality impacts during construction are anticipated to be minor.

No air quality impacts in addition to those mentioned for construction are anticipated during the decommissioning phase.

Operation

The generation of renewable energy during operation of the Proposal would not generate any emissions or affect air quality, excluding minor emissions from vehicles associated with maintenance activities. The existing groundcover is to be retained following construction, reducing the potential for wind borne dust.

During operation, the Proposal is expected to have a positive impact on regional and national air quality as the plant would not generate any emissions and would reduce Australia's reliance on fossil fuels for electricity generation.

6.10.3 Mitigation / Management Measures

The following mitigation and management measures are recommended to minimise potential air quality impacts.

Reference	Mitigation Measures
Construction and Decommissioning Mitigation Measures	
A1	Activities shall be assessed during adverse weather conditions and modified as required to reduce dust generation (e.g. cease activity where reasonable levels of dust cannot be maintained).
A2	Engines to be switched off when not in use for any prolonged period.
A3	Water and/or use of a diluted organic polymer agent for suppression of dust on exposed areas, roads and stockpiles when required.
A4	Temporarily excavated soil and other materials that exhibit significant dust lift off would be wet down, stabilised or covered to manage dust.
A5	Development of a complaint procedure to promptly identify and respond to complaints.
A6	Vehicles and plant would be fitted with suitable pollution reduction devices wherever possible and maintained according to manufacturer's specifications.
Operational Mitigation Measures	
A7	Establish and maintain ground cover in accordance with the Land Management Plan (Appendix L) for the site.

6.11 Non- Indigenous Heritage

A Cultural Heritage Assessment was prepared to determine the archaeological significance of the site. The key findings of this assessment and associated mitigation measures are outlined below.

6.11.1 Assessment Methodology

A desktop study was undertaken to identify any historic heritage (Non-indigenous) items or places in proximity to the Subject Land. The desktop study included a review of the following resources:

- Wellington Local Environmental Plan 2012
- Australian Heritage Database
- Australian Heritage Places Inventory
- NSW State Heritage Register, and
- EPBC Protected Matters Search (World Heritage Properties and National Heritage Places)

A site inspection was conducted by pitt&sherry to identify any structures or items that have the potential to be of heritage significance.

6.11.2 Existing Environment

The Proposal is located approximately 12km north of the Wellington town centre where the majority of historic heritage items in the area are located.

Historical setting

Prior to European settlement the area was home to the Wiradjuri people who had lived and moved through the district for at least 20,000 years. European explorers such as John Oxley arrived in the area in 1817. One of the first major settlements within the region was a convict agricultural station, the 'Wellington Convict and Mission Site – Maynggu Ganai[1]' which shaped Wellington as the centre of ongoing contact between the Wiradjuri and British settlers west of the Blue Mountains (1820). Within three years of establishing the settlement, approximately 300 acres of surrounding land had been cultivated, marking the beginning of this region's major land use as agricultural (pastoral). The convict station later became the first inland Aboriginal mission in Australia and is an early example of the forced institutionalisation of Aboriginal children.

Wellington was officially gazetted in 1846. In 1840 a private village known as Montefiores was established on the northern side of the Macquarie River with Cobb & Co using the village as a coach stop. Wellington became a municipality in 1879 with the railway reaching the town in 1890, the local population reached 1,340 in 1881 and mining operations had ceased in the district by 1914. The now former Wellington Shire Council was established in 1949.

Heritage Items

The results of the database searches indicate that there are no heritage items or areas listed under the NSW Heritage Register, Commonwealth Heritage Register or Register for the National Estate within the vicinity of the Proposal Area.

The heritage items listed in these registers are located approximately 9km or more from the Proposal (refer Table 6-36) in the town of Wellington.

[1] http://www.environment.nsw.gov.au/heritageapp/ViewHeritageItemDetails.aspx?ID=5051556

Table 6-36: Historic items within the vicinity of the site

Register	Item Name	Item ID	Significance level	Location	Distance from the Site
World Heritage List	None identified	N/A	N/A	N/A	N/A
National Heritage List	None identified	N/A	N/A	N/A	N/A
Commonwealth Heritage List	None identified	N/A	N/A	N/A	N/A
NSW State Heritage Register	Wellington Post Office	01415	Local	21 Maughan St Wellington	9.5 km
NSW State Heritage Register	Wellington Convict and Mission Site	01859	Local	Curtis St Wellington	11.8 km
NSW State Heritage Register	John Fowler 7nhp steam Road Locomotive	01867	State	9 Amaroo Drive Wellington	11.8 km
NSW State Heritage Register	Blacks Camp	01865	Local	University Road Wellington	11.2 km
Wellington LEP	Mount Arthur Reservoir	I58	Local	100 Brennans Way	7.7 km
Wellington LEP	Macquarie Farm – (former Wellington Police Station)	I53	Local	1 Lay Street	7.6 km

The survey of the Site revealed no existing or derelict structures or items of potential heritage significance within the Site or ancillary works areas. Historical aerial photographs of the site were unavailable.

6.11.3 Assessment of Potential Impacts

Database assessments and the site assessment did not identify any items of heritage significance within or near the site.

The Proposal is not expected to directly impact on any non-indigenous heritage values. Due to the distance from the nearest heritage item, impacts from vibration and earthworks will not impact on any heritage items. Similarly, due to the distance from listed heritage sites there are no expected impacts to views associated with heritage items from the Proposal.

No historic heritage impacts in addition to those mentioned for construction are anticipated during the decommissioning phase.

No operational impacts to items of historic heritage value are expected as a result of the proposal. As such no operational mitigation measures are proposed.

6.11.4 Mitigation / Management Measures

Reference	Mitigation Measures
Construction and Decommissioning Mitigation Measures	
H1	An Unexpected Finds Protocol which addresses unexpected non-indigenous heritage finds will be included in the Construction Environmental Management Plan to be completed by the construction contractor.
H2	The Unexpected Finds Protocol will form part of the site induction and must be viewed by all relevant employees and contractors before working on site.
H3	If an item (or suspected item) of heritage is discovered during construction, all work in the area of the find will cease immediately and the Unexpected Finds Protocol implemented including notifying an officer from the Heritage branch of OEH immediately (in accordance with section 146 of the *Heritage Act 1977*) and seeking advice for management of the object.

6.12 Socioeconomic

A Socioeconomic Assessment was prepared to investigate the potential socioeconomic impacts of the Proposal. A summary of the key findings of this assessment and associated mitigation measures are outlined below.

6.12.1 Existing Environment

At the 2016 census, the former Wellington LGA had a population of approximately 9,000 and an area of 4113km^2. The population of the former Wellington LGA is projected to grow to 9,550 people by 2036 (Dubbo Regional Council Area Population Projections, 2016).

The median age of people in 2016 in Wellington was 44 years, children aged 0 – 14 years made up 19.7 % of the population and people aged 65 years and over made up 24.9 % of the population (*ABS, 2017b).* In Wellington, 82.4% of people were born in Australia. The other most common countries of birth were England 12 %, New Zealand 1.1 %, Philippines 0.4 %, India 0.3 % and Netherlands 0.2%. Aboriginal and/or Torres Strait Islander people made up 27.8 % of the population. The most common ancestries in Wellington were Australian 39 %, English 28.2 %, Irish 8.2 %, Scottish 4.9 % and Australian Aboriginal 2.3 % (*ABS, 2017b*).

In 2016, 1,362 people in Wellington reported being in the labour force in the week before Census night. The most common occupations in the Wellington area are provided in Table 6-37.

Table 6-37: Comparison of Employment Data Averages from Wellington, NSW and Australia

	Wellington	%	NSW	%	Australia	%
Occupation (Employed people aged 15 years and over)						
Community and Personal Service Workers	256	21.6	350,261	10.4	1,157,003	10.8
Labourers	175	14.8	297,887	8.8	1,011,520	9.5
Technicians and Trades Workers	166	14.0	429,239	12.7	1,447,414	13.5
Professionals	153	12.9	798,126	23.6	2,370,966	22.2
Sales Workers	126	10.6	311,414	9.2	1,000,955	9.4
Clerical and Administrative Workers	118	10.0	467,977	13.8	1,449,681	13.6
Machinery Operators and Drivers	91	7.7	206,839	13.5	670,106	6.3
Managers	83	7.0	456,084	13.5	1,390,047	13.0
Industry of employment (Top responses)						
Aged care residential services	68	6.1	67,209	2.0	211,621	2.0
Correctional and Detention Services	62	5.5	7,878	0.2	27,656	0.3
Takeaway Food Services	59	5.3	56,957	1.7	189,447	1.8
Supermarket and Grocery Stores	53	4.7	74,487	2.2	254,275	2.4

	Wellington	%	NSW	%	Australia	%
Local Government Administration	50	4.5	43,378	1.3	142,724	1.3

At the 2011 Agricultural Census, Wellington had a gross value of agricultural production of $60.7 million which equated to 0.52 % of the gross value of production in NSW (NSW Trade and Investment).

Social Infrastructure and Facilities

Community services and facilities are present within Wellington which cater for the needs of the local community (refer Table 6-38).

Table 6-38: Community Services, facilities and Attractions Available in Wellington LGA (Dubbo Regional *Council*)

Type	Facilities and Services in Wellington
Sport and recreational facilities	• Pool – 50m outdoor / Two children's pools • Playing Fields • Netball Courts • Tennis Courts • Showground • Golf Course • Skate Park • Lake Burrendong State Park – land and water-based activities • Parks and Reserves including picnic facilities, playgrounds and walking trails • Lawn Bowls Wellington bowling club
Cultural and Entertainment Facilities	• Wellington Civic Centre • Licensed Clubs & Hotels • Art Galleries • Wellington Library
Religious facilities	• Wellington Anglican Church • Wellington Catholic Church • Wellington Baptist Church • Wellington Uniting Church • Salvation Army
Children's Services	• Wellington Youth Services • Wellington Community Children's Centre Inc • Pre-schools and long day care • Family day care • Playgroups
Community Services	• Counselling • Community housing • Community transport • Information and Neighbourhood Services
Education facilities	• One Secondary School (Public) • Two Primary Schools – (Public) • Two Primary Schools (Catholic and Christian) • Pre-schools • Interest / Activity based tuition – music, dance
Health and medical facilities	• Wellington Hospital - < 50 beds including Emergency • Wellington Aboriginal Health Services • General Practitioners

Type	Facilities and Services in Wellington
	• Dental • Allied and Alternative Health Services including – Psychology / Counselling, Optometrist, Homeopathy • Ambulance station
Aged Care Facilities	• Bellhaven Aged Care Facility (47) Beds • Maranatha House (73 Beds) • Home and Community Care Services and Transport • Meals on Wheels • Wellington Senior Citizens Centre
Emergency Services	• SES: Wellington Local Headquarters • Wellington Police station • Wellington Fire Station • Ambulance station • NSW Rural Fire Service
Events	• Wellington Antique Vintage Fair • Wellington Boot Racing Carnival weekend • Annual Wellington Show • Cob Loaf Festival
Tourism and Attractions	• Wellington Caves • Lake Burrendong State Park • Burrendong Arboretum • Mt Arthur Reserve (walking trails) • Oxley Historical Museum • Osawano Japanese Gardens • Galleries • Parks and Reserves • Macquarie River • Cobb & Co Heritage Trail
Retail and Services	• Wellington is a sub-regional centre providing a range of retail, commercial, professional and personal services • Wellington shopping centre is anchored by Coles and Woolworths supermarkets with a range of smaller speciality retailers

Key economic activities within Wellington (Dubbo LGA)

Key economic and employment sectors in the Wellington district include agriculture, retail trade, healthcare and social assistance, education and training, accommodation and food services, and construction.

Agriculture

Agriculture is the dominant land use and economic activity in the Wellington district. Most of the land employed for agricultural use is used for dryland cropping and livestock production. There are a diverse range of services available in Wellington to support the agricultural sector, such as:

- Spraying
- Contract harvesting
- Agricultural consultants
- Veterinary services, and
- Silos and storage

The majority of farming enterprises in the Wellington district are mixed farms, which helps to spread financial risk and improve land management. The crops produced are determined by the climate / weather, expected availability of water, market demand and commodity prices. Common crops include: cereals, oilseeds, and legumes. Livestock production in Wellington includes mainly cattle and sheep with other enterprises producing other meats and poultry.

Retail
Retailing is concentrated in the centre of the township of Wellington, while outlying villages such as Mumbil and Stuart Town also rely on the retail facilities in Wellington. The performance of the retail sector is very closely tied with the performance of the agricultural sector. Uncertainty and/or contractions in this sector translates almost immediately to a contraction in retail expenditure. The retail sector in Wellington is comprised primarily of small businesses or businesses employing between one and four people. Types of retail businesses in Wellington include fast food outlets, automotive sales and repairs, clothing and footwear, speciality retail and fresh food.

Healthcare and social assistance
Within Wellington the main service areas are health care, aged care and child care. Health care services are concentrated in Wellington and like most inland rural areas, the town has struggled to attract and retain doctors, dentists, nurses and health care professionals.

Education and Training
Educational facilities are listed in Table 6-38 above.

Accommodation and Food Services
Dubbo Regional Council lists 33 accommodation and food service businesses within Wellington.

Construction
Types of construction businesses in Wellington include design and assessment, site preparation, building and construction and trade installation (e.g. plumber or electrician).

Accommodation within Wellington Township

There are many accommodation options within Wellington including, motels, hotels, B&B's and caravan parks. There is also the possibility to rent a house through an accommodation website such as Stayz.

Renewable Energy Projects in the Region

The Wellington and Dubbo area is becoming a sought-after area for the establishment of renewable energy projects including solar farms. A number of other wind and solar farms have been developed or proposed in the Wellington locality. These are detailed in Section 7 and include:

- Two separate solar farm sites 2km and 5 km north of Wellington
- A solar farm 15 km to the south west of the Site
- A solar hub site 25 km north west of Dubbo
- A large wind farm 10 km north east of the site, and
- A proposed large wind farm 15 km east of the Site

6.12.2 Community Views

Attitudes to Renewable Energy Proposals in NSW

In November 2015, NSW OEH published a paper entitled *Community Attitudes to Renewable Energy in NSW'* (*NSW OEH, 2015*). OEH surveyed 2,000 individuals over the age of 18 across seven regions of NSW with strong results around recognition and knowledge or renewable energy in particular solar and wind.

The OEH survey results showed that nine-in-ten people supported the use of renewable technology to generate electricity in NSW and approximately five-in-ten people strongly supported it. There was also a widely-held view that NSW should be producing more of its electricity from renewables rather than maintaining current levels or producing less. Most people surveyed supported the use of both wind farms (81 %) and solar farms (89 %).

The principal advantages respondents saw in renewables were:

- Benefits to the environment
  - Cleaner/creating less 'pollution' or fewer greenhouse gases
  - More sustainable, reducing reliance on non-renewable resources such as coal
  - Benefits in the preservation of the landscape and agricultural land, e.g. by not digging up the landscape, and
- Lower cost, or at least the potential for reduced cost in the long run

The principal disadvantages people saw in renewables were:

- Higher cost, particularly in the set-up phase
- Concerns about efficiency and reliability, and
- Effects on wildlife, e.g. bird mortality associated with wind farms

It was clear that along with the environment, cost was a pivotal element in community thinking about renewables. The most prevalent community view was that renewable energy was a good idea provided it did not generate additional costs to electricity.

Attitudes Towards Local Wind and Solar Farms

The survey also sought people's attitudes to having renewable energies in their local region and even closer, within 1–2km of where they lived. The majority of respondents still supported or strongly supported wind and solar farms within their local region or within 1-2km of where they lived. However, as the renewable energy got closer to the respondent there was a corresponding increase in opposition and decrease in support (Figure 6-29). At closer proximity, more respondents would strongly support a solar farm than a wind farm.

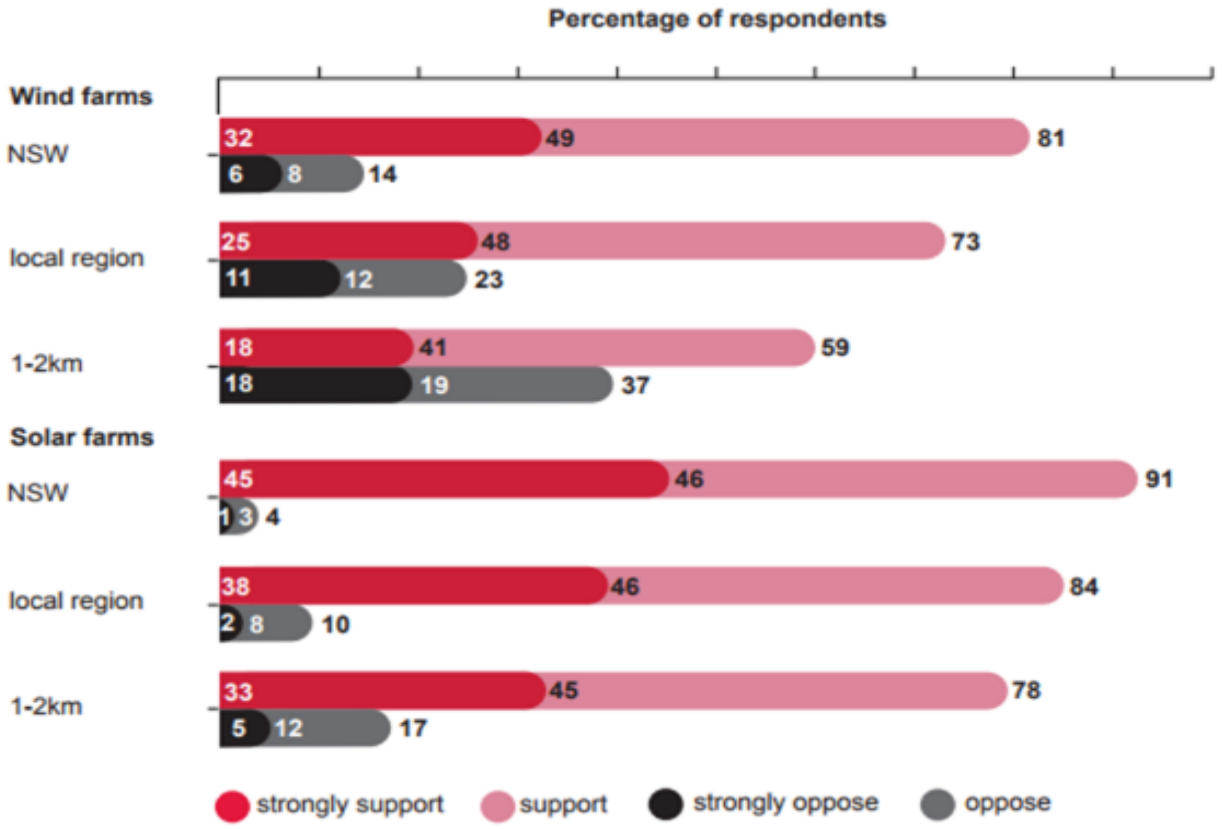

Figure 6-29: Support for and Opposition to Building Wind/Solar Farm in Three Proximities – in NSW, Within the Respondent's Local Region, and Within 1-2km of where the Respondent Lived.

Community Feedback on this Proposal

The feedback from the community in relation to this Proposal has identified few concerns around the potential impacts on local residents as well as support for renewable energy. Further detail on the feedback including concerns raised and consultation undertaken is outlined in Section 4.

6.12.3 Cost Benefit Analysis

Renewable Energy Sector

Employment in the renewable energy sector is considered a positive driver for the economy. The Australian Bureau of Statistics estimated that renewable energy projects that were progressed in 2016 for construction in 2017 represent more than $6.9 billion of investment, 3,725 direct jobs and 3,150 MW in new power generation capacity (*Clean Energy Council, 2016*).

Case Studies

Data from the recently constructed Nyngan and Broken Hill Solar Farms provide an example of the cost benefit analysis. These projects have a combined capacity of 150 MW (AC).

Nyngan and Broken Hill solar farms will generate 360,000 megawatt hours of electricity each year and represent a total investment of $440 million. During construction, they will provide 450 direct jobs (*First Solar, N.D.*) and contribute to regional development in the following ways:

- On-site jobs involved in the delivery of the projects
- Off-site jobs involved in the supply of materials for the projects, and
- Off-site jobs involved in the design, management and support of the projects

Other local benefits were identified from the Nyngan and Broken Hill Solar Projects with data indicating that approximately 56 % of the procurement budget was spent on local good and services (local defined as Australia) including $66 million spent on cables, mounting structure and power conversion equipment from local companies. The total value of local subcontractor procurement for services provided on the Nyngan and Broken Hill projects is over $76 million (*First Solar, N.D.*).

Maryvale Solar Farm

The Proposal will generate 379 gigawatt hours (GWh) of electricity each year. The Proposal represents a total investment of $188 million and is estimated to provide 150 direct construction jobs at peak period and up to 10 operational jobs. Section 6.12.4 below details how the Proposal will contribute to regional development. The solar farm will provide a source of clean, renewable electricity.

The key benefit of the Proposal is the production of renewable electricity reducing our greenhouse gas emissions and reliance on fossil fuels. The production of renewable electricity will help contribute to NSW Governments Renewable Energy Action Plan and other schemes and agreements made.

The proposal will have a positive effect on the National Energy Grid. On an annual basis, the Proposal will produce enough electricity to meet the needs of approximately 36,900 average Australian Homes (based on *AER data (AER 2013-14*)). Additionally, the Proposal will reduce greenhouse gas (GHG) emissions by over 325,000 tonnes of CO2 equivalent per annum, assuming a rate of 0.948 tonnes per MWh of electricity. Particulate and heavy metal emissions will also be reduced.

6.12.4 Impacts

The Proposal will change the character of a portion of the Subject Land to electricity generation coupled with grazing and cultivation. The change in land use is mitigated by several factors:

- The site will be producing energy while maintaining use for grazing
- The solar farm will cover 66% of the site and the remaining area will continue to be used for agriculture including grazing and cropping, and
- The reversible nature of the development means it can easily be decommissioned and the land returned to its former agricultural use at the end of the operational period (25 years).

The change in land use can be seen as positive or negative depending on the individual. Some solar farms have been met with opposition as they can be considered to conflict with existing environment and scenic values. They have also been supported as they provide opportunity for jobs and economic stimulus within the region, provide long term energy stability and assist in the protection of the environment by creating renewable sources of energy.

Other adverse social impacts include:

- Increased traffic on local roads and hazards associated with construction traffic. These potential impacts are assessed in detail in Section 6.2
- Influx of workers during construction putting pressure on local accommodation and health services (see below)
- Amenity impacts including visual, noise and air quality during operation. These potential impacts are assessed in detail in Sections 6.5, 6.9 and 6.10, including relevant mitigation measures to reduce and manage these impacts

The proposal will also create benefits for the region by:

- Increased employment – there is the potential for local employment to be generated during the construction phase where suitable local contractors and labour hire are available

- Stimulation and diversification of the local economy creating greater resilience, and
- Developing regional skills in renewable energy technology

Socioeconomic Benefits

The influx of employees to the Wellington township is likely to result in the following expenditure for the local economy per employee:

- Accommodation – Approximately $110 per night per room, (based on figures from '*trip advisor.com'* from the 5 motels in Wellington at four points during the year)
- Food – Approximately $80 to $280 per week (based on figures from the Australian Government: Study Australia)
- Entertainment – Approximately $80 to $150 per week (based on figures from the Australian Government: Study Australia)
- Petrol – Approximately $65 per week, Transport is likely to be provided by the Proposal or via private means but petrol would need to be purchased locally (based on figures from a 2017, Canstar Blue survey of over 2,000 motorists)

Dubbo Regional Council has identified the retail, construction and service sectors as businesses whose performance is dependent on performance in the agricultural sector and investment in the region. Due to the influx of people to the area for construction the solar facility is expected to have a positive economic influence on retail, construction and service sectors in Wellington.

Employment opportunities

The proposed development will have a positive employment impact during construction and is likely to create in the order of up to 150 onsite jobs during the peak construction period. Of these workers, it is expected that the majority will be sourced from the local area using facilities and programs operating in the area including any that Council have in place. The Proposal will also supply off-site jobs involved in the supply of materials and off-site jobs involved in the design, management and support of the Proposal. The Proposal will also offer scope to develop regional skills and create more sustainable employment. The project will also employ up to 10 people during the operational phase.

Employment multiplier effect

The construction industry has important linkages with other sectors, so the impacts on the economy go well beyond the direct contribution of construction activities. It is estimated that every $1 spent on construction generates $2.60 in the economy as a whole. Money spent on construction creates more jobs in the construction industry and this leads to increased spending from businesses that manufacture materials such as steel frames and concrete. The increase in the use of products such as this then creates an increase in demand for all types of raw materials used in manufacturing building products. Additionally, spending of wages and salaries from employees in this industry induces a further round of consumption effects in other areas of the economy. Where required, the Proposal would engage with local accommodation providers and Dubbo Regional Council to assist in providing additional short term and temporary accommodation.

Workforce

The Proposal will provide up to ten positions during operation and there will be no displaced jobs from the current site as agricultural activities will continue. The number of people employed during different stages of construction is detailed in Table 6-39.

Local opportunities provided during construction may include:

- Civil engineering and site preparation
- Post, racking, and module installation

- High voltage power system work
- Construction and supervision roles, and
- Administration and construction support roles

Table 6-39: Expected labour force during different stages of construction

Stage of the Proposal	Estimated Number of Employees	Job type	Estimated employment time Timeframe
Construction			
Site establishment and preparation for construction including vegetation clearing	100	Trade Assistant, Subcontractor	1 month
Preliminary civil works (such as drainage works, and foundations for the substation)	100 (Peak)	Civil, Trade Assistant, Sub-contract, Electrician	1 month
Installation of: • Steel post and rail foundation system for the solar panels. • PV panels and DC wiring beneath the panels. • Underground cabling (trenching) and installation of inverter stations.	150 (peak)	Civil, Trade Assistant, Sub-contract, Electrician, Electrician QA	6 Months
Construction of 132kV substation and new transmission line from substation to existing 132 kV transmission line.	100 (Peak)	Civil, Trade Assistant, Sub-contract, Electrician, Electrician QA, Commissioning	2 Months
Offsite electrical works on existing transmission line and existing Wellington Substation	60 (Peak)	Civil, Trade Assistant, Sub-contract, Electrician, Electrician QA, Commissioning	1 Months
Removal of temporary construction facilities and rehabilitation of disturbed areas	100	Trade Assistant, Sub contract Electrician	1 Month
Operation			
Operation and maintenance	6-10		25 years

The labour force may be constrained by:

- Access to accommodation within a reasonable distance from the proposed development and during tourism events, and
- Availability of local labour with the required skill set

The Proposal expects to use both local labour and non-local labour. Local labour is preferred due to the socio-economic benefits however due to the estimated number of skilled labour and the labour requirements of

other local projects (refer Table 6-39) it is anticipated that non-local labour will also be required. It is anticipated that approximately 50% of these jobs will be sourced within 100km of the site, subject to the labour force being available. Due to the size of the Wellington township and proximity of Dubbo and Orange (within 100km) to the Site it is considered there are suitably sized populations proximate to the site to enable this level of local labour supply to be met based on discussions with local council and review of ABS data (ABS 2017a and ABS 2017b).

Currently, the seasonal agricultural production industry is well serviced by labour supply companies who are also supplying labour to solar developments in the region and across the State meaning they have developed a good understanding of the skill based required for their delivery, the timing of the labour requirements and the commitments to meeting local content.

An Australian Industry Participation Plan will be prepared and identify the minimum requirement of 50% of the labour within 100km of the site.

A skills and employment strategy for the Proposal will be developed in consideration of the NSW Infrastructure Legacy Program. Whilst this Program is aimed at multi-billion-dollar projects being delivered in metropolitan Sydney with greater scope to achieve the specified targets, it is considered an excellent guide to determining priorities and approach for the Proposal.

Both the plan and strategy will form part of the engineering, procurement and construction (EPC) contract.

Any non-local specialised contractors are likely to come from across other areas of NSW and would utilise accommodation in Wellington and Dubbo if necessary. Accommodation within Wellington consists of a variety of establishments with a range of facilities and services, these include 5 motels, 5 hotels and three caravan parks which provide cabins, onsite caravans and camping facilities.

Dubbo also has over 40 accommodation options that would be able to accommodate the overflow of people travelling to Wellington during tourism events or competing events and developments. As such it is anticipated that most workers would be accommodated at existing accommodation within the local area.

It is anticipated the workforce needed for the Proposal will travel to site through a combination of shuttle buses from Wellington and potentially from Dubbo. In addition, labour will travel to site via private vehicles. The EPC Contractor will be required to minimise traffic to the site using buses and carpooling wherever possible.

Impact on Available Accommodation and Services

The proposal would provide a positive impact on the accommodation sector of Wellington by increasing occupancy rates, however, during events and other peak periods the Proposal may create a strain on local accommodation. Additionally, should other major infrastructure Proposals commence within proximity to Wellington there may be a significant strain on accommodation. Dubbo, located less than 50 km from Wellington, is a much larger regional centre offering a greater range of accommodation types and may be able to absorb overflow accommodation demands.

The influx of workers has the potential to place increased pressure on local health services. It is considered that the demand for health care could be dispersed throughout surrounding towns based on where workers are staying to minimise the impact.

Impact of Renewable Energy Projects on Land Values

During the consultation stage of the project, the issue of the impact of solar farms on land values was raised. While there have been no relevant definitive investigations of this impact by solar farms, a study was commissioned by the NSW OEH in 2016 into the impact of wind farms on land value. This study concluded that:

- On land used for primary production, where productivity is maintained, there is no loss of value
- International studies have identified that negative impacts are more likely where there is a greater number of traditional residential and lifestyle properties in proximity to wind farms, and
- Appropriately located wind farms within rural areas, removed from higher density residential areas, are unlikely to have a measurable negative impact on surrounding land values

In the case of the Maryvale solar farm, there is not a lot of traditional residential development in the locality with residences being generally associated with surrounding primary production and larger 'lifestyle' lots. The balance of the Site will be used for continued production and the conclusions drawn in relation to wind farms can be reasonably applied to the Proposal.

Amenity

The potential adverse social impacts associated with the Proposal relate to amenity aspects including traffic, visual, noise and air quality during construction and visual amenity during operation. These potential impacts are assessed in detail in Sections 6.2, 6.5, 6.9 and 6.10, but a short summary is provided below.

Amenity impacts from noise would involve construction noise from plant and equipment during the approximately 12-month period of construction during standard construction hours. Dust management during and after construction will minimise the potential for impacts on air quality.

Key traffic and transport impacts for the Proposal relate to haulage of plant equipment and materials as well as employee transport during construction and disruption to existing services including school buses. Increased vehicle numbers have the potential to impact road condition and create indirect impacts such as noise and dust. Dust generation and reduced air quality may occur as a result of earthworks and vehicle movements.

Two types of visual impacts will be generated by the proposal which are:

- Impact to landscape character of the site and the surrounding area; and
- Visual impact to the surrounding viewpoints, both public and private.

Large scale solar farms can create polarised reactions in communities. Some see solar farms as eye sores and a large change to existing land use, lifestyles and land character, others see the benefits of less polluting, renewable sources of energy and the economic benefits of such Proposals.

6.12.5 Mitigation / Management Measures

The following management and mitigation measures will be implemented to address potential impacts

Reference	Mitigation Measures
Construction and Decommissioning Mitigation Measures	
Socio 1	The Community Stakeholder Engagement Program (CSEP) will continue to be implemented, including: • Providing regular updates to the community • Inform relevant stakeholders of potential impacts (for example noise impacts) • Establishment of a complaints handling procedure and a response protocol, and • Responding to any complaints received
Socio 2	Liaise with local industry representatives to maximise the use of local contractors, manufacturing facilities and materials. Create a resourcing plan to ensure jobs will be local.
Socio 3	Local accommodation options for staff will be maximised.
Socio 4	Continued engagement with Dubbo Regional Council to discuss community and business concerns.

6.13 Hazards

A Hazards Assessment was prepared to investigate the potential hazardous impacts of the Proposal. A summary of the key findings of this assessment and associated mitigation measures are outlined below.

6.13.1 Existing Environment

Hazardous Goods

Current sources of hazardous goods on the Subject Land are:

- Petrol / diesel
- Lubricating and hydraulic oils and greases, and
- Pesticides/ herbicides

Electromagnetic Interference

Current sources of electromagnetic fields (EMF) on the Subject Land are:

- 132kV transmission line through the Site
- House-hold items such as televisions, microwave ovens, computers, Wi-Fi (associated with the existing dwelling in the southern portion of the site)
- Existing electrical wiring in the residence
- Mobile phones and cell towers, and
- Radio and TV station broadcasts

6.13.2 Assessment Methodology

Hazardous Goods

Hazardous goods expected to be used by the proposal will be compared against the Dangerous Goods and SEPP 33 thresholds to determine whether they are exceeded or not. If the screening thresholds are exceeded the proposal would be considered potentially hazardous, and a Preliminary Hazard Assessment (PHA) would be prepared. However, for quantities below the given thresholds, the SEPP indicates that there is unlikely to be a significant off-site risk, in the absence of other risk factors, and no further assessment is warranted.

Electromagnetic Interference

Electric and magnetic fields (EMFs) are a physical field produced by electricity or electrically charged objects. EMFs occur both in the natural environment (e.g. discharges during thunderstorms or the earth's magnetic field) and by man-made objects (*WHO, 2018*).

EMFs can be hazardous to human health, the World Health Organisation (WHO) has concluded that short-term exposure to very high levels of EMFs can be harmful to health however exposure to low EMFs is inconclusive (*WHO, 2018*). In Australia, electrical devices and infrastructure such as transmission lines and substations, operate at a frequency of 50 Hz. This frequency falls within the Extremely Low Frequency (ELF) range of 0-300 Hz.

The International Commission on Non-Ionizing Radiation Protection (ICNIRP) published *Guidelines for limiting exposure to time-varying electric, magnetic and electromagnetic fields (up to 300 GHz)* in 1998 and an updated version in 2010.

The guideline provides a reference document for limiting exposure to EMF that will provide protection against established adverse health effects including direct interactions of fields with the body and indirect

effects from interactions with a conducting object where the electric potential of the object is different from that of the body. Reference levels for occupational and general public exposure are shown in Table 6-40.

The strengths of the fields decrease rapidly with increasing distance from operating electrical equipment and can also be reduced by shielding. Trees, tall fences, buildings and most other large structures provide shielding from electric fields. As such electromagnetic fields, would vary in different locations at the Site.

Table 6-40: ICNIRP Reference Levels for 50Hz for Occupational and General Public Exposure to Time Varying Electric and Magnetic Fields (ICNIRP 2010)

Exposure characteristics	Electric Field	Magnetic Field
Occupational exposure	10kV/m	10,000mG
Public exposure	5kV/m	2,000mG

An impact assessment of potential hazards and risks associated with EMFs was completed. This included a comparison of magnetic and electrical field levels with the ICNIRP Guidelines. Typical EMF levels and the ICNIRP exposure criteria for these types of infrastructure are shown in Table 6-41.

Table 6-41: Example Magnetic and Electrical Field Levels (TransGrid N.D, and EMF Info)

Object	Electric Field Levels (kV/m)	Magnetic Field Levels (mG)
ICNIRP Public exposure criteria	5kv/m	2,000mG
Distribution Line		
Directly beneath the line	0.3 – 2.6	2 – 20
40m from the line	0.01 – 0.1	1 - 10
High Voltage Transmission Line (132 kV)		
Directly beneath the line	0.3 – 3.6	10 – 200
Edge of the line easement	0.01 – 0.1	2 – 50
Substations		
Substations at the fence-line (excluding where overhead supply lines enter or leave the station)	≤ 0.1	1 – 8
Underground cables		
Directly above underground cables (1m depth)	Underground cabling would not produce external electric fields due to shielding from soil	5 – 200
Example: House hold appliance (Kettle)		
300mm away from the appliance	0.01 – 0.05	2 – 10

6.13.3 Impact Assessment

Hazardous Goods

Construction and operation

Potential hazards and risks during construction and operation would be associated with the on-site storage, use and transport of dangerous goods and hazardous substances. Dangerous goods that would require transportation and storage during construction or operation of the Proposal are identified in Table 6-42.

These substances do not exceed SEPP 33 thresholds therefore further assessment, in the form of a PHA, is not required.

Some components of solar infrastructure can contain hazardous substances such as cadmium however the components to be used for the Proposal do not contain hazardous substances.

Table 6-42: Dangerous Goods Criteria and SEPP 33 Thresholds Relevant to the Construction and Operation of the Proposal

Hazardous Material	Storage threshold	Transport Thresholds		Storage Method	Anticipated quantities	Exceedance of SEPP 33 thresholds
		Movements	Quantities			
	Class 2 – Gases					
Fire Extinguisher (CO_2 type)	Not subject to regulations	Not subject to regulations	Not subject to regulations	Compressed in a steel bottle and housed in substation building	2	No
	Class 3 – Flammable liquids					
Fuel (Petrol; diesel for generator)	5 tonnes (stored with other class 3 flammable liquids)	>750 cumulative >45/week	3-10 tonnes	Stored in drums in a bunded area. Class 3 goods will only be stored with other class 3 goods.	< 3 tonnes	No
Lubricating and hydraulic oils and greases	Not subject to regulations	Not subject to regulations	Not subject to regulations	Stored in drums or original containers in a bunded area. Class 3 goods will only be stored with other class 3 goods.	< 1 tonne	No
	Class 6 – Toxic and infectious substances					
Pesticides (herbicides)	2.5 tonnes	All	1 to 3 tonnes	Stored in a secure area within the Proposal boundary	<1 tonne	No

Electromagnetic Interference

EMF may be generated during construction and operation of the solar farm including from the following components when operational:

- Transmission Lines
- Substation
- Cabling (underground)/ collection circuits

- Central inverters, and
- Solar PV panels

Transmission Lines
High voltage transmission lines are already present in the area. The expected transmission line EMF levels, as specified in Table 6-41, are below the ICNIRP Guidelines for limiting exposure to time-varying electric, magnetic and electromagnetic fields (up to 300 GHz)'.

Substation
The substation boundary fence will create a suitable buffer to reduce EMF to negligible levels.

Cabling (underground)
The solar farm would require installation of cabling between panels and the inverters. This cabling would be under ground. The levels specified in Table 6-41 are below the public and occupational exposure levels recommended by the ICNIRP Guidelines.

Central Inverters
Up to 80 inverters are expected to be installed across the site. The AC power frequency range of the inverters will fall into the Extremely Low Frequency (ELF) range of 0-300Hz, with the inverters expected to have a frequency of between 47 and 63Hz.

PV Panels
The layout of the Proposal has been designed to provide a buffer between the facility, sensitive receivers, road users and the general public. The site is surrounded by agricultural land and rural residences with the closest receiver being approximately 1km from the solar farm boundary. The majority of the infrastructure that would generate EMF would be located within the secured solar farm Site with no public access.

Given the levels associated with the infrastructure components and the distance to publicly accessible land and the nearest receiver, EMFs from the proposed development are likely to be indistinguishable from background levels at the boundary fence.

Construction

Up to 150 staff may access the site during the 12-month construction period. No other access to the Site is anticipated and the Proposal will be fenced with a 1.8 to 2.5m chain link security fence with three barbed wires on top to restrict any public access**.** There are four residents within 1km of the proposed Site, and six residences located within 1 to 2km of the Site. The closest of these is 700 m from the edge of the solar panel area. As a result of the low EMF, short term construction period and distance between components producing EMF and receivers, there will be low to negligible potential for EMF impacts upon human health.

Operation

During operation of the solar farm limited staff (up to ten) will attend the site for regular inspections, maintenance work and stock management activities. In consideration of the security fencing and distance from sensitive receivers with the potential to be impacted by EMF during operation the risk of impacts from EMF generated during operation of the Proposal will be limited.

No dangerous goods or hazard impacts in addition to those mentioned for construction are anticipated during the decommissioning phase.

6.13.4 Mitigation / Management Measures

Reference	Mitigation Measures
Construction and Decommissioning Mitigation Measures	
Hazardous Goods	
Haz 1	Dangerous or hazardous materials would be transported, stored and handled in accordance with AS1940-2004: The storage and handling of flammable and combustible liquids and the ADG Code where relevant.
Electromagnetic Interference	
Haz 2	All electrical equipment would be designed in accordance with relevant codes and industry best practice standards in Australia.
Haz 3	The layout of the Proposal has been designed considering buffer distances between the solar farm and sensitive receivers, road users and the general public.

6.14 Waste

A Waste Assessment was prepared to investigate the potential waste impacts of the Proposal. A summary of the key findings of this assessment and associated mitigation measures are outlined below.

6.14.1 Impact Assessment

Activities proposed during the construction and operation of the solar farm have the potential to generate waste. Potential waste streams generated during the construction, operation and decommissioning stage include:

- Green waste (from vegetation removal and some from ongoing maintenance activities)
- Wood/plastic pallets and cable drums
- Plastic wrapping and straps
- Liquid waste
- Paper and cardboard
- Soil from trenching and backfill works for cable laying and road upgrades that cannot be reused on site
- Electrical components (from repair, replacement or removal of PV infrastructure)
- Metals
- General construction waste (offcuts)
- Sewage, and
- General domestic waste

The classification and description of each of the general waste types to be potentially generated by the proposal is summarized in Table 6-43.

Table 6-43: Potential Waste Generated on-Site During Construction and Operation

Waste material and description	Waste classification	Management Details
Green Waste Shrubs, clearing of groundcover	General Solid Waste (non-putrescible)	Management options for green waste include beneficial offsite reuse or disposal to a green waste facility or landfill. If suitably weed free the green waste could also we used as mulch for other vegetated areas.
Wood Pallets and cable drums	General Solid Waste (non-putrescible)	Pallets and cable drums will be separated for reuse or recycling. Pallets can be recycled by processing the wood into products like particleboard, wood chips, mulch, animal bedding, biofilters (for storm water) or used as biomass - a source of renewable energy. MSF will investigate whether a “take-back” arrangement for the pallets can be organized so the pallets can be re-used.
Plastic Plastic wrapping and straps associated with packaging of solar infrastructure.	General Solid Waste (non-putrescible)	Plastic wrapping and straps will be disposed to landfill.

Waste material and description	Waste classification	Management Details
Liquid waste Oil, fuels, etc. Contaminated water from equipment washing	Liquid waste	Onsite testing may be carried out on the waste water generated onsite to see if it is within discharge limits. If the waste water is not within discharge limits the wastewater collected in the tanks would be pumped out and taken to an offsite licensed facility on a regular basis.
Paper and cardboard From packaging of solar infrastructure	General Solid Waste (non-putrescible)	Recyclables will be collected by a suitably qualified waste management contractor and sent to a recycling facility.
Soil From trenching and backfill works for cable laying/ road upgrade	General Solid Waste (non-putrescible)	The soil would be reused to backfill trenched areas. If there is excess soil after back filling then this soil will be reused elsewhere on site. Soil from excavation associated with the road upgrades would be reused at the intersection to facilitate the proposed works. Potential Acid Sulphate Soils (PASS) have not been identified on site however in the event of an unexpected find Acid Sulphate Soils (ASS) would be treated using lime and then reused. If following treatment (or for other reasons) these soils are still not considered suitable then soil should be transported to the nearest licensed waste disposal facility.
Electrical components Repair, replacement or removal of infrastructure components	General Solid Waste (non-putrescible)	During decommissioning or in the event of repair works all above ground infrastructure and materials would be removed from the site and recycled or otherwise disposed of at approved facilities.
Metals Repair, replacement or removal of infrastructure components	General Solid Waste (non-putrescible)	Metals will be separated for recycling.
Construction waste Metal, steel, timber, fittings,	General Solid Waste (non-putrescible)	The construction of infrastructure will involve prefabricated components which are manufactured off site and transported to the site for installation/ assembly. As such, the construction of the Proposal is not expected to generate a significant amount of construction waste. All attempts would be made to separate and reuse or recycle building materials.
Sewage	Liquid Waste and General Solid Waste (putrescible)	Biological waste will be collected as part of a service agreement with the temporary amenity hire contractor and disposed of appropriately.

Waste material and description	Waste classification	Management Details
General domestic waste Paper, cardboard, aluminum cans, steel, plastics, glass, food waste, plastic wrap, etc. generated by onsite staff	General Solid Waste (non-putrescible and putrescible)	General waste will be collected by a waste management contractor and disposed of to a suitably licensed facility (putrescible landfill).

Potential impacts from the generation, handling, storage and disposal of waste from the Proposal includes:

- Pollution of land and waterways
- Air pollution
- Overuse of scarce resources
- Human and animal health impacts, and
- Decreased amenity

It is proposed that all waste generated during the construction of the proposal will be segregated in accordance with the construction waste management plan (WMP). The waste management plan will include management options for stockpiles.

Table 6-44 below provides details for potential recycling facilities and disposal points that will be used to remove waste and recyclables. Discussions with Dubbo Regional Council has identified that a notice period must be given to the Wellington Waste Management Depot for any large quantities of waste.

Table 6-44: Material Reuse, Recycling and Disposal Facilities Which can be used to Dispose of Waste and Recyclables

Name of the facility	Address	Opening Hours	Materials and Services	Distance from the Site
Wellington Waste Transfer Station 02 6845 2244	83 Nanima Village Road, Wellington 2820	8:00am to 5:00pm Monday, Thursday, Friday Saturday 10am - 3pm Sunday 11am – 5pm Tuesday – Wednesday 8am – 12 noon – Green waste only	• General domestic waste • Metals • Lighting • Paints • Green waste • Wood • Batteries • Pallets • E-waste	17km
Wellington Waste Transfer Station is licensed to accept: general solid waste (putrescible); general solid waste (non-putrescible); asbestos waste; waste tyres; any waste received on site that is below licensing thresholds in Schedule 1 of the POEO Act.				

General contingency procedures and remedial actions for the management of potentially contaminated material discovered will be illustrated in an Unexpected Finds Protocol (Waste). The protocol will be developed by the contractor within a site-specific WMP prior to the commencement of construction works and implemented in the case of unanticipated discovery of contaminated material during construction of the proposal

During decommissioning, all infrastructure (excluding the substation) and materials would be removed from the site and recycled or otherwise disposed of at approved facilities.

6.14.2 Mitigation / Management Measures

The following mitigation and management measures are recommended to minimise potential waste impacts.

Reference	Mitigation measures
Construction and Decommissioning Mitigation Measures	
W1	A WMP will be prepared and implemented as part of the CEMP to manage any construction waste. The WMP will include but not be limited to: • Measures to avoid and minimise waste associated with the Proposal • The procedure for assessing, classifying and storing waste in accordance with the EPA's Waste Classification Guidelines (EPA, 2014) and management options • Procedures for storage, transport and disposal of waste • Procedures for notification to Wellington Waste Management Depot prior to any large disposals, and • Monitoring, record keeping and reporting, e.g. waste tracking data demonstrating the lawful disposal of contaminated products, waste or residues generated at the facility
W2	An Unexpected Finds (Waste) Protocol would be established and implemented in case potentially contaminated, hazardous or unsuitable material are encountered during the site works.
W3	Waste management strategies and mitigation measures will be communicated to all employees and contractors during site induction, prior to commencing works at the site.
W4	A schedule will be created with the temporary amenity hire contractor to remove sewage.
W5	The proposed facility will comply with the relevant Protection of Environment Operations Act waste-tracking requirements for any wastes assessed or classified as hazardous waste, industrial waste or 'Group A' waste (such as solvents, paints or oils).
W6	Waste generated from the Proposal will be managed in accordance with the principles of the waste hierarchy. A decommissioning environmental management plan will be prepared for the proposed facility with a WMP.
W7	Wellington Waste Management Depot given appropriate notification before any large quantities of waste are deposited at the Wellington Waste Management Depot. Consultation will be undertaken with Dubbo Regional Council to determine what these notification periods will be and what waste can be taken by the facility.
Operational Mitigation Measures	
W8	A WMP will be prepared and implemented as part of the OEMP to manage any waste operational waste.

7. Cumulative Impact

The cumulative impact assessment has considered the previous local government area of Wellington which is now part of the larger Dubbo Regional Council.

7.1 Background

A search of the Major Projects Register on the DP&E website and the former Wellington LGA (now Dubbo Regional Council LGA) website was undertaken on the 9th March 2018 to identify any other major projects within the vicinity of the development site which would likely contribute to cumulative impacts. This search identified the following projects in the council area that may add to cumulative impacts:

- Wellington Solar
- Wellington North Solar Plant
- Suntop Solar
- Dubbo Solar Hub
- Brocklehurst Solar Farm
- Nevertire Solar Farm
- Bodangora Wind Farm (under construction), and
- Uulungula Wind Farm

7.2 Potential Impacts

Developments that have been approved or are proposed to be carried out in the vicinity of the Proposal are outlined in Table 7-1..

Table 7-1: Developments that are Proposed to be Carried Out Within the Dubbo LGA

Project	Cumulative construction Impacts	Cumulative operational Impacts
Wellington Solar This includes the construction, operation and decommissioning of a photovoltaic (PV) solar farm that would produce up to 174 MW of electricity. The project site is approximately 2km to the north of Wellington on the Goolma Road and is approximately 7 km by road (via the Mitchell Highway) and 4.3 km in a straight line from the Maryvale Site.	The current timing of this proposal for construction is unknown. The EIS was approved in December 2017. The timing may overlap with this Proposal. Cumulative construction impacts may include: • Additional construction traffic causing congestion along haulage routes, increased collision risk, damage to road infrastructure and associated noise from additional traffic. • Local labour may not be available to accommodate both projects increasing the demand for local accommodation and health services. • Generation of additional waste. Local waste disposal centres may not be able to accommodate waste	There are not expected to be any cumulative impacts resulting from the operation of the Wellington Solar proposal.

Project	Cumulative construction Impacts	Cumulative operational Impacts
	disposal from both projects during construction. These impacts would be temporary and are manageable with the implementation of safeguards (refer to mitigation measures below).	
Wellington North Solar Plant This includes the construction, operation and decommissioning of a photovoltaic (PV) solar farm that would produce up to 300 MW of electricity. The proposal footprint is approximately 840 ha (including transmission lines) with the site approximately 5 km to the north of Wellington on the Goolma Road and approximately 3 km by road and 3 km in a straight line from the Site.	The EIS has been submitted to DPE for assessment. If the development proceeds the timing may overlap with this Proposal. Cumulative construction impacts may include: • Additional construction traffic causing congestion along haulage routes, increased collision risk, damage to road infrastructure and associated noise from additional traffic. This project also proposes to use Cobbora Road as an access point. • Local labour may not be available to accommodate both projects increasing the demand for local accommodation and health services. • Generation of additional waste. Local waste disposal centres may not be able to accommodate waste disposal from both projects during construction. These impacts would be temporary and are manageable with the implementation of safeguards (refer to mitigation measures below).	There are not expected to be any cumulative impacts resulting from the operation of the Wellington North Solar Plant.
Suntop Solar Farm This includes the construction, operation and decommissioning of a photovoltaic (PV) solar farm that would produce up to 170 MW of electricity. The proposal footprint is approximately 513 ha with the site approximately 15 km to the south west of the Maryvale Site, in a straight line, and 27 km by road.	Suntop Solar Farm is currently being assessed by DPE and would be due to commence construction in the first quarter of 2019.	There may be overlap with the construction of the Maryvale Solar Farm.
Dubbo Solar Hub	Due to the distance between this and the proposed development there are	There are not expected to be any

Project	Cumulative construction Impacts	Cumulative operational Impacts
This is an approved farm currently under construction. Approximately 90 ha of ground-mounted solar panels are spread in two close locations on Eumungerie Rd with the capacity to generate 26 MW. The site is over 25 km NW of Dubbo.	not expected to be cumulative construction impacts.	cumulative impacts resulting from the operation of the Dubbo Solar Hub.
Brocklehurst Solar Farm This is an approved farm with the capacity to generate 29 MW of electricity. Brocklehurst is located over 40 km from the Maryvale site.	Due to the distance between this and the proposed development there are not expected to be cumulative construction impacts.	There are not expected to be any cumulative impacts resulting from the operation of the Brocklehurst Solar Farm.
Nevertire Solar Farm This is an approved facility with the capacity to generate 105 MW located approximately 120 km from the Maryvale site.	Due to the distance between this and the proposed development there are not expected to be cumulative construction impacts.	There are not expected to be any cumulative impacts resulting from the operation of the Nevertire Solar Farm.
Bodangora Wind Farm This approved development includes the construction and operation of up to 33 wind turbines, generating up to 120 MW of electricity. The proposal footprint is approximately 8,500 ha with the site located approximately 10 km to the east north east of the Maryvale site on Gillinghill Road.	Due to the timeframe of this application there are not expected to be cumulative construction impacts.	There are not expected to be any cumulative impacts resulting from the operation of the Bodangora Wind Farm.
Uungula Wind Farm This proposed development includes construction and operation of up to 127 wind turbines with the capacity to generate 400 MW of electricity. The proposal footprint is located approximately 15 km east of the Maryvale site	The current timing for construction of this wind farm is predicted for 2020 however assessments have not been publicly exhibited and no approvals obtained. Due to the timeframe of this application there are not expected to be cumulative construction impacts	There are not expected to be any cumulative impacts resulting from the operation of the Uungula Wind Farm.

The cumulative impacts from projects in the Wellington district of the Dubbo Regional LGA can be grouped into five broad categories:

- Traffic generation and associated risks (increased risk of collision, damage to infrastructure)
- Pressure on local accommodation and services

- Waste disposal
- Access to local labour, and
- Visual impacts

7.2.1 Traffic generation

The major road networks affected by the additional projects include the Mitchell Highway. The Wellington Solar Farm and the Wellington North Solar Plant are both located on the northern side of Wellington. The proposed Maryvale site will be accessed via the Mitchell Highway and a series of local roads to provide access to the Site. The Golden Highway also forms part of the transport route for solar farms developing in the region.

Both highways have suitable capacity to cater for construction and operational traffic, are key freight routes in NSW and designated as '*oversize, over mass load carrying vehicles network approved roads*' by Roads and Maritime Services. Both highways are State roads which carry high traffic volumes and any additional construction or operational vehicle traffic on these major roads would be within the range of daily variation in traffic on these routes.

The Traffic Impact Assessment prepared as part of this EIS details that these roads will be able to accommodate the increase in traffic during the construction period (**Appendix F**).

The proposals could lead to an increase in congestion along haulage routes and additional construction traffic may also increase collision risk, have the potential to cause damage to road infrastructure and increase noise levels along haulage routes. Traffic impacts would largely be temporary and are considered manageable with the implementation of safeguards (refer to Section 6.2).

7.2.2 Pressure on local accommodation and services

Should several projects occur at the same time local labour may not be available to all projects. Non-local labour would therefore be required for construction increasing the demand for local accommodation and local health services. Strain on local accommodation and health services is expected to be spread over the region with employees staying primarily in Wellington or accommodated in Dubbo or Orange if necessary.

However, there is also potential for positive cumulative economic effects from the construction of multiple developments in the area (refer Section 6.12). The increased creation of jobs and economic input into local businesses would provide a benefit to local communities.

7.2.3 Waste Disposal

Construction of the projects listed above is expected to generate additional construction related waste. Local waste disposal centres may not be able to accommodate waste disposal from multiple projects during construction. Should projects occur concurrently the WMP within the CEMP would need to be updated to incorporate and address potential cumulative impacts from surrounding development activities as they become known.

7.2.4 Access to Local Labour

The construction of the projects listed in Table 7-1 are expected to use local labour, however, there is a limited amount of labour available in Wellington and the surrounding areas. This will most likely result in the use of non-local labour to assist with labour requirements.

7.2.5 Visual Impacts

The visual impact assessment determined that overall, the Maryvale Solar Farm will result in a moderate and acceptable level of change to the landscape character of the Site and surrounding areas.

The proposed solar farms in the locality are separated by direction and driving distances of over 20km from the urban centre of Wellington and by the major landform of the Mount Arthur Reserve. When driving past each solar farm, the panels would only be in view momentarily.

Considering this physical separation and visual characteristics of the PV solar farm and surrounding environs, the combined effects from the proposed solar farms is unlikely to change the dominant agricultural setting of the physical landscape.

7.2.6 Mitigation / Management Measures

Cumulative impacts are best addressed through careful management of individual components, as set out in Section 8. However, the following mitigation and management measures are recommended to minimise potential cumulative impacts.

Ref	Mitigation Measure
Construction and Decommissioning Mitigation Measures	
CU1	The CEMP would be updated as required to incorporate potential cumulative impacts from surrounding development activities as they become known. This would include a process to review and update mitigation measures as new work begins or if complaints are received. Key areas within the CEMP include the Waste Management Plan and the Traffic Management Plan.

8. Management and Mitigation Measures

8.1 Summary of Environmental Mitigation Measures

Throughout this EIS, a number of management and mitigation measures have been identified in order to minimise adverse environmental, social and economic impacts that could potentially arise from the Proposal. These management and mitigation measures would be implemented during the construction, decommissioning and operation of the Proposal. The identified management and mitigation measures will be incorporated into contractual arrangements with any future contractors for construction and operation of the Proposal.

These management and mitigation measures would minimise any potential adverse impacts arising from the Proposal on the surrounding environment. The general management and mitigation measures for construction and decommissioning of the proposal are summarised in Table 8-1. The specific management and mitigation measures for construction and operation of the proposal are summarised in Table 8-2 and Table 8-3 respectively.

Table 8-1: Summary of General Management and Mitigation Measures for Construction and Decommissioning

Mitigation Measure Reference	Description
G1	A project specific Construction Environmental Management Plan (CEMP) and all relevant sub-plans will be prepared by the Contractor prior to commencing Stage 1 construction. The sub-plans will include: • Land Management Plan (LMP) including a weed management plan • Soil and Water Management Plan (SWMP) including erosion and sediment (ERSED) control • Unexpected Finds protocol • Waste Management Plan (WMP) • Traffic Management Plan (TMP) • Emergency Contingency Plan
G2	All employees, contractors and subcontractors are to receive a project induction. The environmental component may be covered in toolbox talks and should include: • Environmental mitigation measures • Vegetation clearing operations and controls to prevent unauthorised clearing • The Unexpected Finds Protocols (historic heritage, Aboriginal heritage and waste) • Aboriginal heritage (Types of aboriginal heritage objects, details of the NMH heritage object, legislative requirements and penalties associated with the harm or desecration of Aboriginal heritage objects) • Waste management strategies and mitigation measures
G3	Implement community consultation measures to inform the community of construction activity and potential impacts.
G4	A complaint handling procedure and register will be implemented to assist in recording and managing potential conflict with the local community during construction.
G5	Mud and other debris shall be removed from the wheels and bodies of construction vehicles and equipment prior to leaving the project site and before entering the sealed public road network. Soil, earth, mud and other similar materials must be removed from the roadway preferably by dry methods (sweeping, shovelling).

Table 8-2: Summary of Management and Mitigation Measures for Construction and Decommissioning

Reference	Mitigation Measure
Biodiversity	
B1	A 10-m buffer shall be established between the perimeter of the remnant Yellow Box Woodland and the works footprint. No works (e.g. plant, material stockpiling) should encroach this area.
B2	Erect barriers to protect roadside vegetation including old growth eucalypts during road upgrade works.
B3	A clearing protocol will be developed to ensure any potential impacts to native fauna are minimised during vegetation removal. This will include supervised removal of trees with hollows by a trained wildlife carer and tree removal to be undertaken in the non-breeding season.
B4	The Land Management Plan (Appendix L) will be incorporated into an overall construction environmental management plan (CEMP). This will include weed management, animal pest management and monitoring as well as an induction for all employees and contractors detailing the trees that are protected on Site.
B5	Trenches should be backfilled as soon as possible to minimise the chance of fauna becoming trapped. Any trench sections left open for greater than a day would be inspected daily, early in the morning and any trapped fauna removed. The use of ramps or ladders to facilitate trapped fauna escape is recommended.
B6	Speed limits should be set to 20km per hour on internal roads and tracks.
B7	A Vegetation Management Plan will be developed and incorporated into an overall CEMP including protection measures to conserve the remnant Yellow Box Woodland and other significant vegetation.
B8	All staff and contractors will be inducted into the CEMP and informed of the biodiversity management measures and no-go zones.
B9	A rehabilitation plan will be prepared and implemented prior to decommissioning.
Aboriginal Heritage	
AB1	An Unexpected Finds Protocol which addresses unexpected aboriginal heritage finds will be included in the Construction Environmental Management Plan to be completed by the construction contractor.
AB2	The Unexpected Finds Protocol will form part of the site induction and must be viewed by all relevant employees and contractors before working on site.
AB3	Aboriginal archaeological sites Maryvale Road AFT 1, Maryvale Road AFT 2, Maryvale Road IF 1, Maryvale Road TRE 1, Seatonville Road AFT 1, Seatonville Road AFT 2 and Seatonville Road IF 1, and the Culturally significant tree (all outside the footprint), should be addressed in the CEMP to ensure protection.
AB4	If suspected Aboriginal objects, such as stone artefacts are identified during works, works must cease within 10m of the affected area and an archaeologist called in to assess the finds. If the finds are found to be Aboriginal objects, the OEH must be notified under section 89A of the NPW Act. Appropriate management or avoidance should be sought if Aboriginal objects are to be moved or harmed.
AB5	In the extremely unlikely event that human remains are found, works should immediately cease and the NSW Police are to be contacted. If the remains are suspected to be Aboriginal, the OEH may also be contacted at this time to assist in determining appropriate management.
Heritage	
H1	An Unexpected Finds Protocol which addresses unexpected non-indigenous heritage finds will be included in the Construction Environmental Management Plant to be completed by the construction contractor.

Reference	Mitigation Measure
H2	The Unexpected Finds Protocol will form part of the site induction and must be viewed by all relevant employees and contractors before working on site.
H3	If an item (or suspected item) of heritage is discovered during construction, all work in the area of the find will cease immediately and the Unexpected Finds Protocol implemented including notifying an officer from the Heritage branch of OEH immediately (in accordance with section 146 of the *Heritage Act 1977*) and seeking advice for management of the object.
Visual	
V1	Minimise impact through use of siting and design features. Group ancillary facility structures where possible to minimise sprawl. Stabilise new access tracks formed within the Site required for operations, but do not seal with bitumen or other dark coating.
V2	Minimise and repair ground disturbance. Minimise grading across the Site and undertake the minimum levelling necessary to install panel supports. Rehabilitate exposed ground surfaces as soon as possible and implement erosion and sediment controls to avoid issues associated with dust generation and water pollution.
V3	Minimise vegetation removal. Retain existing trees near the substation and along creek line on the western boundary. Maintain a buffer of 40m between infrastructure and waterway 2. Install temporary fencing around vegetation to be retained and demarcate as a no-go zone.
V4	Develop a Detailed Landscape Plan as part of the CEMP to implement the Concept Landscape Plan, which includes visual screening, as indicated in Figure 6-11.
V5	Retain as much existing grass cover beneath solar panels as possible.
V6	Progressively stabilise disturbed area with pasture grasses. Develop a remediation plan to include the following actions: • recontour, cultivate, seed, and stabilise the majority of disturbed surfaces with pasture grass species following the removal of infrastructure, and • re-establish any previously removed native vegetation with appropriate, similar species
V7	Use colour to reduce contrast. Treat the support structures of PV panels and ancillary structures such as inverters, with a non-reflective finish. Paint or colour-treat facility components to better match the surroundings and decrease their visibility and contrast. Choose a colour two to three shades darker than the background colour.
Noise	
N1	Prepare a construction noise management protocol for site to manage noise emissions.
N2	Implement a formal complaint handling procedure to manage any potential concerns from the community. This will include: • Details of a readily accessible contact person. • A well-documented process that includes an escalation procedure so that (if required) there is a path to follow should the complainant not be satisfied. • Details regarding setting up a complaint register. Each complaint would need to be investigated and appropriate noise amelioration measures put in place to mitigate future occurrences, where the noise in question is in excess of allowable limits

Reference	Mitigation Measure
N3	Works are to be carried out during standard work hours (i.e., 7am to 6pm Monday to Friday; 8am to 1pm Saturdays). Any construction outside of these normal working hours would only be undertaken in the event of an emergency or with prior approval from relevant authorities. For non-emergency works outside standard hours, residents and other sensitive land use occupants should be informed of the works between 5 and 14 days before commencement.
N4	Toolbox and induction of personnel prior to start of shift to discuss noise control measures that may be implemented to reduce noise emissions to the community, construction hours and nearest sensitive receivers.
N5	All plant should be shut down when not in use. Plant to be parked/started at farthest point from relevant assessment locations
N6	Avoid the operation of noisy equipment near noise sensitive areas and where possible, loading and unloading would be conducted away from sensitive areas.
N7	Noise levels will be considered when procuring equipment.
N8	All plant is to utilise a broadband reverse alarm in lieu of the traditional hi frequency type reverse alarm.
N9	Ongoing community consultation for residences within close proximity of the works. The information would include details of: • The proposed works and when these will occur • The duration and nature of the works • Details of what to do should they have a noise complaint • Updates on the progress of works
N10	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)
N11	Signage is to be placed at the front entrance advising truck drivers of their requirement to minimise noise both on and off-site
Traffic, Transport and Road Safety	
T1	Undertake consultation with the relevant Road Authority for the proposed road improvements, as stated in 6.2.4, and any ancillary road works and obtain a Section 138 approval prior to the construction of the proposal.
T2	A Traffic Management Plan (TMP) for construction shall be developed in accordance with Roads and Maritime Guidelines and the Australian Standard AS1742.3. The plan would include: • The designated routes of construction traffic to the site • A map of the primary access routes highlighting critical locations • Drivers Code of Conduct • Carpooling/shuttle bus arrangements to minimise vehicle numbers during construction • Scheduling of deliveries • Community consultation requirements • Any restrictions on traffic movements (such as residential areas, school pick-up and drop-off times) • Traffic controls (speed limits, signage, etc.) • A complaint handling procedure / register • An induction process for vehicle operators • The origin, number, size, frequency, including peak and daily traffic volumes and destination of vehicles accessing/exiting the site

Reference	Mitigation Measure
	• Loads, weights and lengths of haulage and construction related vehicles and the number of movements of such vehicles • Existing background traffic, peak hour volumes and types and their interaction with projected development related traffic • Cumulative impacts of existing background traffic and traffic generated by the construction of the solar farm • The management and coordination of construction and staff vehicle movements to the site and measures to limit disruption to other motorists • Specifically, the TMP will detail how the projected maximum of seventy (70) light vehicles accessing the site per day will be achieved and enforced • Shuttle bus collection and drop off locations and details of parking at these locations • Measures to be employed to ensure a high level of safety for all road users during the construction and operation phases of the development • Scheduling of haulage vehicle movements to minimise convoy length or platoons • Details of intersection improvement works in accordance with Austroads Guide to Road Design • Local climate and environment conditions that may affect road safety for vehicles used during construction, operation and decommissioning of the project (e.g. fog, wet weather and wildlife strikes)
T3	All Proposal personnel will be provided training on the requirements of the TMP through site inductions, toolbox talks or specific training
T4	The heavy vehicle route will be included within the Driver's Code of Conduct and will form part of the project inception meeting for the project for all staff and drivers. This will include informing all drivers of school bus pick up, and drop off times along the route.
T5	Traffic control will be provided in accordance with the approved construction TMP to manage traffic movements (vehicular, cycle and pedestrian) during construction and maintain the flow of traffic within the site and on surrounding public roads
T6	Traffic management controls will be communicated to appropriate stakeholders which will include the local community in the site vicinity via a letter box drop
T7	Directional signage will be installed to direct construction traffic, and warn other motorists of construction traffic. This signage is positioned in accordance with the approved Traffic Control Plans.
T8	All employees, subcontractors and suppliers will comply with the speed limits within the worksite, which are as follows: • 40 km/h on formed roads • 20 km/h during foggy/dusty conditions with headlights on • 10 km/h when passing pedestrians
T9	A dilapidation survey will be completed along Maryvale Road prior to upgrades on this road and after the works are complete. A dilapidation survey protocol is provided in Appendix H.
T10	Temporary traffic controls will be installed at the intersection of Maryvale Road and Cobbora Road to reduce the posted vehicle speeds to 80km/h and signage to advise drivers of turning trucks.
T11	A Traffic management plan (TMP) for decommissioning will be developed as part of the decommissioning management plan. This will include a decommissioning haulage route. The indicative decommissioning route provided in this EIS will be reviewed prior to the start of decommissioning.
T12	Establish a maintenance schedule with Dubbo Regional Council for Coborra Road, Maryvale Road and Seatonville Road for the duration of construction.

Reference	Mitigation Measure
Land Use	
L1	Managed grazing will be used to maintain the height of ground cover during operation of the solar farm.
L2	If operations cease and the Site is to be decommissioned, a remediation plan will be compiled and implemented including identification of pasture species in consultation with local agronomic experts.
L3	All the infrastructure will be removed upon decommissioning with the possible exception of the substation, transmission lines to the substation and access road to the substation.
L4	Implement the Detailed Landscape Plan
L5	All pesticides will be used in accordance with the *Pesticides Act 1999*, such that only registered pesticides are used based on label instructions that are designed to minimise impacts on surrounding land
Surface Water, Hydrology and Groundwater	
SW1	A Soil and Water Management Plan (SWMP) will be prepared and implemented by the Contractor as part of the CEMP, this will include use of onsite water for dust mitigation measures.
SW2	Minimise the footprint of disturbance at any one time by implementing progressive construction and remediation works
SW3	Design solar panel arrays to allow sufficient space between panels to establish and maintain ground cover beneath the panels and assist in reducing potential sediment impacts on water quality
SW4	Ensure all refuelling activities are undertaken in a bunded area at least 40m from any waterways.
SW5	Additional mitigation measures will be considered during detailed design.
Soils, Geology and Contamination	
S1	A Soil and Water Management Plan (SWMP) will be prepared and implemented as part of the CEMP, in accordance with Managing Urban Stormwater: Soils and Construction (Landcom, 2004). This will include an erosion and sediment control plan for the Site and intersection for implementation during construction.
S2	Minimise the footprint of disturbance during construction and employ progressive rehabilitation strategies to reduce the erosion hazard.
S3	During trenching activities and backfilling, as far as practicable separate topsoil and subsoil and when backfilling return the soil layers in their original order where practicable to do so.
S4	Employ dust management measures on unsealed roads, stockpiles and other areas of loose or disturbed soil prone to dust generation. Controls may include covering of stockpiles, watering roads and synthetic soil stabilisers. Dust management techniques shall be outlined in the SWMP.
S5	Maintain erosion and sediment controls until construction works are complete.
S6	Install stabilised site entrances that all construction vehicles will use to access the site. The stabilised entrance and traffic management protocols in the CEMP shall be designed to minimise tracking of sediment onto adjoining roads from departing vehicles.
S7	Undertake site inspections at least weekly and following significant rainfall events to observe the condition and operation of erosion and sediment controls and water management systems, and schedule any required maintenance.

Reference	Mitigation Measure
S8	Undertake soil amelioration and vegetation improvement works in line with the requirements of a Land Management Plan. This should include undertaking required land or vegetation improvement works at an appropriate stage during solar farm development. For example, soil amelioration and fertilising might be most practically undertaken prior to solar panel installation. For similar reasons the desired pasture should be sown before solar panel installation.
S9	Design arrays to allow sufficient space between panels for essential maintenance activities and to facilitate maintenance of an effective ground cover beneath the panels to reduce erosion and help suppress weeds.
S10	Develop and implement a protocol for management of an unexpected finds of soil contamination.
S11	Stabilise batters required for ancillary infrastructure.
Bushfire	
BF1	All electrical components would be designed and managed to minimise potential for ignition
BF2	The design would consider that the permanent access road must be trafficable by Category 1 fire appliances.
BF3	Design should consider shielding of solar farm components including burial of cables underground and shielding of above ground cables and circuitry (e.g. metal conduit)
BF4	Research undertaken into the ignition, flammability and toxicity risks of the solar farm components once the design is finalised.
BF5	Maximise use of construction components using materials such as glass, silicon, steel and aluminium rather than plastic.
BF6	Develop an Emergency Response Plan (ERP) in consultation with the NSW RFS District Fire Control Centre prior to construction. The ERP should include: • Foreseeable on-site and off-site fire events • Clearly states work health safety risks and procedures to be followed by fire-fighters, including – Personal protective clothing – Minimum level of respiratory protection – Minimum evacuation zone distances – A safe method of shutting down and isolating the PV system – Any other risk control measures required to be followed by fire fighters • Any other risk control measures required to be followed by fire-fighters • Evacuation triggers and protocols • Suppression response strategies and tactics, including aerial suppression options/management
BF7	Two copies of the ERP should be permanently stored in a prominent 'Emergency Information Cabinet' to be located at the main entrance point to the solar farm, external to any security fence or locked gate, and a copy provided to local emergency responders.
BF8	An Asset Protection Zone (APZ) will be constructed around the solar farm with the following requirements: • The APZ will be 15 m wide around the entire perimeter of the solar farm footprint, and 20 m wide for areas abutting the remnant vegetation and landscaping areas • The external edge of the APZ setback at least 25 m from the external edge of PV panels or other components • The APZ must be either a mineral earth fire break (i.e. dirt or gravel) • No trees or shrubs to be planted on the internal side of the fire break including that associated with the landscape plan

Reference	Mitigation Measure
	• APZ preferably located external to any security fence • Access track located on the internal edge of the APZ that is trafficable by Category 1 fire appliances • The substation should have a 20m APZ with no internal vegetation (gravel surface)
BF9	The APZ or a fire break is to be constructed as part of the first stage of the development.
BF10	Construction between 1 December and 31 March would be undertaken in accordance with the following: • All plant, vehicles and earth moving machinery will be cleaned of any accumulated flammable material (e.g. soil and vegetation) • A suitable fire appliance (e.g. fire extinguisher) is present on site with at least two personnel trained in bushfire fighting • On days when Very High fire danger or worse is forecast for Wellington, the "fires near me" app is to be checked hourly for the occurrence of any fires likely to threaten the site • All operations involving machinery will cease while the GFDI is or forecast to be 35 or greater
BF11	Installation of electrical equipment such as, junction boxes, inverters, transformer and electrical cabling, is to be in accordance with AS 3000:2007 Electrical installations and undertaken by qualified professionals.
BF12	Install a water supply tank with a capacity of 20,000L outside the APZ near the substation.
BF13	Ensure any trees or shrubs planted are outside the APZ and meet the following criteria: • Use species suitable for the environment that have low fire spotting characteristics (e.g. smooth bark) • Maintain a 20m APZ width adjacent any vegetation
BF14	At the end of construction and prior to operation contact the Local Emergency Management Committee to establish emergency management procedures with relevant authorities for the safety hazards presented by the site.
BF15	At the end of construction and prior to operation brief the local volunteer fire brigades and neighbouring farmers.
Hazards	
Hazardous Goods	
Haz 1	Dangerous or hazardous materials would be transported, stored and handled in accordance with AS1940-2004: The storage and handling of flammable and combustible liquids and the ADG Code where relevant.
Electromagnetic Interference	
Haz 2	All electrical equipment would be designed in accordance with relevant codes and industry best practice standards in Australia.
Haz 3	The layout of the Proposal has been designed considering buffer distances between the solar farm and sensitive receivers, road users and the general public.
Air Quality	
A1	Activities shall be assessed during adverse weather conditions and modified as required to reduce dust generation (e.g. cease activity where reasonable levels of dust cannot be maintained).
A2	Engines to be switched off when not in use for any prolonged period.
A3	Water suppression of dust on exposed areas, roads and stockpiles when required.
A4	Temporarily excavated soil and other materials that exhibit significant dust lift off would be wet down, stabilised or covered to manage dust.

Reference	Mitigation Measure
A5	Development of a complaint procedure to promptly identify and respond to complaints.
A6	Vehicles and plant would be fitted with suitable pollution reduction devices wherever possible and maintained according to manufacturer's specifications.
Socio-economic	
Socio 1	The Community Stakeholder Engagement Program (CSEP) will continue to be implemented, including: Providing regular updates to the community Inform relevant stakeholders of potential impacts (for example noise impacts) Establishment of a complaints handling procedure and a response protocol Responding to any complaints received.
Socio 2	Liaise with local industry representatives to maximise the use of local contractors, manufacturing facilities and materials. Create a resourcing plan to ensure jobs will be local.
Socio 3	Local accommodation options for staff will be maximised.
Socio 4	Continued engagement with Dubbo Regional Council to discuss community and business concerns.
Waste	
W1	A WMP will be prepared and implemented as part of the CEMP to manage any construction waste. The WMP will include but not be limited to: Measures to avoid and minimise waste associated with the Proposal The procedure for assessing, classifying and storing waste in accordance with the EPA's Waste Classification Guidelines (EPA, 2014) and management options Procedures for storage, transport and disposal of waste Procedures for notification to Wellington Waste Management Depot prior to any large disposals Monitoring, record keeping and reporting, e.g. waste tracking data demonstrating the lawful disposal of contaminated products, waste or residues generated at the facility.
W2	An Unexpected Finds (Waste) Protocol would be established and implemented in case potentially contaminated, hazardous or unsuitable material are encountered during the site works.
W3	Waste management strategies and mitigation measures will be communicated to all employees and contractors during site induction, prior to commencing works at the site.
W4	A schedule will be created with the temporary amenity hire contractor to remove sewage.
W5	The proposed facility will comply with the relevant Protection of Environment Operations Act waste-tracking requirements for any wastes assessed or classified as hazardous waste, industrial waste or 'Group A' waste (such as solvents, paints or oils).
W6	Waste generated from the Proposal will be managed in accordance with the principles of the waste hierarchy. A decommissioning environmental management plan will be prepared for the proposed facility with a Waste Management Plan.
W7	Wellington Waste Management Depot given appropriate notification before any large quantities of waste are deposited at the Wellington Waste Management Depot.

Reference	Mitigation Measure
	Consultation will be undertaken with Dubbo Regional Council to determine what these notification periods will be and what waste can be taken by the facility.
Cumulative Impacts	
CU1	The CEMP would be updated as required to incorporate potential cumulative impacts from surrounding development activities as they become known. This would include a process to review and update mitigation measures as new work begins or if complaints are received. Key areas within the CEMP include the Waste Management Plan and the Traffic Management Plan.

Table 8-3: Summary of Management and Mitigation Measures for Operation

Reference	Mitigation Measure
Biodiversity	
B10	Development of an OEMP which will include: • The land management plan – which will have a procedure or plan for monitoring vegetation cover and composition and allow for adaptive management • A weed management plan – including monitoring and control • A pest animal management plan – including monitoring and control and site cleanliness • Vehicle speed limits, to reduce risk of collision with fauna, and • Prohibition of domestic pets on site
Visual	
V8	Minimise impact through use of siting and design features. Signage required at the Site should be of sufficient size to be readable at driver height within short range (0-20m) and contain only information sufficient for basic facility and company identification, for safety, navigation, and delivery purposes. Large scale signage will not be installed.
V9	Avoid Night Sky Impacts. Permanent evening lighting will be limited to compulsory lighting required for the substation. Substation lighting will be turned on if an intrusion is detected or if staff are on site undertaking works outside of daylight hours. Amber colour lights will be used rather than bluish-white lighting.
V10	An OEMP will be prepared for the Proposal and will incorporate a complaints management process.
V11	Monitor performance of screen planting areas six-monthly for first three years then annually. Replant as necessary if plants die, and supplement planting with alternative species if plants are not adapting to the Site.
V12	Keep non-reflective finishes and colour-treated coatings in good repair. Reapply if surface is subject to fading or flaking
Noise	
N12	Complete a one-off noise validation monitoring assessment to quantify emissions from site and to confirm emissions meet relevant criteria.
N13	Prepare an operational noise protocol that can be implemented to address any community concerns regarding noise emissions for future operations of the Proposal.

Reference	Mitigation Measure
Land Use	
L6	An OEMP will be prepared for the Proposal and will incorporate: • a land management plan including weed management; and • ongoing landscaping commitments.
Surface water, Hydrology and Groundwater	
SW6	Implement the Land Management Plan to ensure at least 80% groundcover is restored and maintained (Refer **Appendix L**)
Soils, Geology and Contamination	
S12	Implement a Land Management Plan that addresses the ongoing land management and maintenance activities (Refer Appendix J). This would address: • Ongoing agronomic management of the land including stock, water, vegetation and soils management • Measures required to maintain healthy soil and plant systems and maintain the agricultural capability of the land • Stock management programs and infrastructure (e.g. fencing, watering points) • Soil amelioration, pasture management and weed control, and • Monitoring programs for soil fertility and groundcover
Bushfire	
BF16	Fit PV arrays with an earthing and lightning protection system connected to the main earth link.
BF17	Vegetation fuel levels internal to the APZ and throughout the solar farm will be maintained by grazing, slashing or mowing.
BF18	Remove any vegetation that occurs within the substation compound.
BF19	The solar farm will be monitored via off-site control centres to ensure systems are working correctly, investigate any alarms and monitor panel performance.
BF20	Suspend site maintenance operations when GFDI is or forecast to be 35 or greater.
BF21	Brief the local volunteer fire brigades and neighbouring farmers at regular intervals e.g. annual pre-season fire meetings.
Air Quality	
A7	Establish and maintain ground cover in accordance with the Land Management Plan for the site.
Waste	
W8	A WMP will be prepared and implemented as part of the OEMP to manage any waste operational waste.

9. Conclusion

9.1 Summary

This chapter provides the justification for the Maryvale Solar Farm taking into account its' biophysical, social and economic impacts, the suitability of the Site and whether or not the Proposal is in the public interest. The Proposal is also considered in the context of the objectives of the EP&A Act 1979, including the principals of ecologically sustainable development (ESD) as defined in Schedule 2 of the *EP&A Regulation 2000*.

9.2 Justification for the Development

The project, identified as a State Significant Development (SSD) has been subject to an environmental impact assessment under Part 4, Section 5.1 of the EP&A Act. As noted in Section 5.1, the Project is classified as SSD in accordance with the State and Regional Development (SRD) SEPP.

This EIS has examined and taken into account all matters affecting or likely to affect the environment by reason of the proposed activity.

The environmental impact assessment that was undertaken concludes that the project could potentially have limited impacts on:

- Biodiversity
- Traffic and Transport
- Aboriginal Heritage
- Visual amenity
- Soils, and
- Bush Fire

A summary of the impacts for these is provided below. Appropriate mitigation and management measures outlined in Section 8 will be carried out during the construction, operation and decommissioning phases.

9.2.1 Biodiversity

A biodiversity assessment was undertaken by flora and fauna specialists to assess the impacts of the development on biodiversity. Surveys of the site concluded that no threatened ecological communities, populations, flora or fauna species meet the criteria for Serious and Irreversible Impacts as a result of the Project. The Site has largely been cleared previously however the project will require the clearing of isolated paddock trees, none of these are representative of any threatened ecological community. None of the remnant Yellow Box Woodland community on site will be impacted by the Proposal, however, a buffer around this community is recommended. A number of threatened bird species are considered to have a moderate likelihood of foraging on site however none are considered likely to breed on site. Habitat features on site are limited and some hollow bearing trees will be removed to allow construction. To minimise unnecessary loss of hollows and the potential habitats they offer, roadside vegetation containing old growth eucalypts will be protected during construction. Vegetation clearance and construction protocols will be implemented to minimise impacts on native fauna.

9.2.2 Traffic

A traffic impact assessment was completed to assess traffic impacts and this recognised that during the construction phase of the project there will be an increase in the number of heavy vehicle movements along local roads and major transport networks. Maryvale Road and Seatonville Road are minor local roads with low levels of traffic. Cobbora Road provides a link between the Mitchell and Golden Highways and carries approximately 1,000 vehicles per day. The Mitchell Highway in turn carries a higher volume of traffic with a

significant portion of this being heavy vehicles. The current road network was found to be operating very well with minimal delays or congestion with the only delays along the proposed routes being associated with heavy vehicles in the township of Wellington.

It is expected that the total traffic flows on the regional road network will remain well within acceptable limits and will continue to operate to a good level of service for all road users. It is considered the additional traffic movements will have a minimal and acceptable impact upon the operation of the local roads and the heavy vehicle route can safely accommodate the additional traffic movements.

9.2.3 Aboriginal Heritage

An Aboriginal Cultural Heritage Assessment was undertaken to assess the impacts on aboriginal heritage and to determine the archaeological potential of the Site. Consultation with Aboriginal stakeholders was undertaken in accordance with the Proposal SEARs.

Thirteen sites of Aboriginal archaeological significance have been previously identified within the study area but outside the proposed footprint of the development. Field survey within the study area identified seven sites, surface artefacts and artefact scatters and a culturally modified tree, however, these were all located outside the development area. The remainder of the study area was assessed as exhibiting low archaeological potential due to combinations of archaeologically unfavourable topography, agricultural activity, previous road construction activities and contemporary disturbance of the land.

No further Aboriginal cultural heritage assessment is warranted for the Proposal and an unexpected Aboriginal heritage finds procedure will be developed prior to construction.

9.2.4 Visual Amenity

The Proposal would be visible to 47 potentially affected private viewpoints as well as five public viewpoints located on the Mitchell Highway, Combo Road, Cobbora Road, Tarwong Lane and Phillipsons/Twiggs Roads. A Visual Impact Assessment was prepared and concluded that one private viewpoint had a moderate-high impact and 20 private viewpoints had a moderate impact. Impacts from public viewpoints were moderate-low and low. The VIA concluded that these impacts could be reduced through the implementation of mitigation strategies, such as landscape screening so that four private viewpoints were moderately impacted and 30 rated moderate-low.

9.2.5 Soils

The construction phase has the potential to increase dust levels from the Site and potentially impact on surface water quality. The use of appropriate land management techniques during construction and the implementation of the mitigation measures specified in Section 8 will reduce potential dust impacts. Buffers required between watercourses and construction activity, to reduce visual impacts, will have the additional benefit of ensuring an appropriate vegetated buffer to assist with natural filtration of surface flows. A Soil and Water Management Plan (SWMP) will be developed as part of the CEMP.

9.2.6 Bushfire

A Bushfire risk assessment was completed and concluded that potential ignition sources from construction and decommissioning of the proposal were generally consistent with the existing environment apart from any electrical faults. Similarly, ignitions from electrical equipment is theoretically possible during operation. Solar farms also present unusual risks to fire fighters such as electrocution and inhalation of fumes. The land is not mapped as fire prone land and it has been concluded that these risks can be managed by the mitigation measures specified in Section 8.

Lower risk issues including noise, air quality, waste generation, hazards, and cumulative impacts have been addressed in Section 6.

9.3 Objects of the EP&A Act

Table 9-1: Objectives of the EP&A Act

Object	Comment
1.3 (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.	The Proposal does result in the loss of productive agricultural land for a period of approximately 25 years however in the meantime it can be used for grazing agriculture (sheep) and could be returned to cropping agricultural use upon decommissioning. The Proposal will not result in the sterilisation of natural resources including mineral resources
1.3 (b) To facilitate ecologically sustainable development by integrating relevant economic, environmental and social considerations in decision-making about environmental planning and assessment	Ecologically sustainable development is considered in Section 9.4.
1.3 (c) To promote the orderly economic use and development of land.	The Proposal would diversify sources of income for the agricultural sector, allowing financial resilience whilst retaining its agricultural use within the Site.
1.3 (d) To promote the delivery and maintenance of affordable housing.	Not relevant to the project.
1.3 (e) To protect the environment, including the conservation of threatened and other species of native animals and plants, ecological communities and their habitats.	The Proposal will not impact on any threatened species or communities. Vegetation removal will be limited and all remnant areas of vegetation will be retained, with suitable buffers provided along watercourses and around the Yellow Box Woodland.
1.3 (f) To promote the sustainable management of built and cultural heritage (including Aboriginal cultural heritage).	The proposal will not impact upon any areas of built and cultural heritage. An Unexpected (heritage) Finds protocol will be developed prior to construction.
1.3 (g) To promote good design and amenity of the built environment.	Not relevant to the project.
1.3 (h) To promote the proper construction and maintenance of buildings, including the protection of the health and safety of their occupants.	Not relevant to the project.
1.3 (i) To promote the sharing of the responsibility for environmental planning and assessment between the different levels of government in the State.	Not relevant to the project.
1.3 (j) To provide increased opportunity for community participation in environmental planning and assessment.	Consultation activities are outlined in Section 4. Maryvale Solar Farm will continue to consult the community and stakeholders during the Proposal's development.

9.4 Ecologically Sustainable Development

Ecologically Sustainable Development (ESD) involves the effective integration of social, economic and environmental considerations in decision-making processes. In 1992, the Commonwealth and all State and Territory governments endorsed the *National Strategy for Ecologically Sustainable Development*.

Clause 7(1)(f) of the *Environmental Planning and Assessment Regulation 2000* requires an EIS to provide justification for a development with specific reference to the principles of ecologically sustainable development (ESD) as set out in the Regulation. This is provided below.

9.4.1 The Precautionary Principle

The precautionary principle states that where '*there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation*'. Implementing the precautionary principle includes:

- Careful evaluation to avoid serious or irreversible damage to the environment wherever practicable, and
- An assessment of the risk-weighted consequences of various options

This EIS assesses environmental aspects and impacts associated with the proposed Maryvale Solar Farm with the purpose of eliminating (where practicable) and reducing the risk of serious and permanent impacts on the environment. Specialist studies were undertaken to provide accurate information to assist with the evaluation and development of the Proposal. Mitigation measures are provided in Section 8.

9.4.2 Intergenerational Equity

The intergenerational equity principle recognises that '*the present generation should ensure that the health, diversity and productivity of the environment is maintained or enhanced for the benefit of future generations'.*

The Proposal would result in amenity impacts, however would not result in any impacts that are likely to adversely impact on the health, diversity or productivity of the environment for future generations. The Proposal would benefit future generations by reducing the reliance on energy sources derived from non-renewable resources, which produce Green House Gas emissions.

Should the Proposal not proceed, the principle of intergenerational equity may be compromised, as the impacts of climate change continue to be realised, due to a continued dependence on GHG emitting energy resources.

The solar farm would be decommissioned at the end of its operational life, removing all above ground infrastructure (with the exception of the substation). Decommissioning would therefore result in returning the site to its existing land capability for future generations. The Proposal is therefore consistent with the principles of intergenerational equity.

9.4.3 Conservation of Biological Diversity and Ecological Integrity

Ecologically Sustainable Development mandates that the conservation of biological diversity and ecological integrity should be a fundamental consideration in environmental planning and decision-making processes. Biodiversity refers to the variety of all life.

An assessment of the existing local flora and fauna has been undertaken in order to recognise and manage any potential impacts of the Proposal on local biodiversity. This assessment is provided in Appendix D and summarised in Section 6.1.

This principle requires that environmental factors should be included in the valuation of assets and services in terms of the overall costs to the Proposal.

The environmental consequences of the Proposal have been assessed in this EIS and mitigation measures identified for factors with potential for adverse impact. Implementing the mitigation measures would impose an economic cost on the proponent, increasing both the capital and operating costs of the Proposal. This signifies that environmental resources have been given appropriate valuation.

The Proposal has been designed with an objective of minimising potential impacts on the surrounding environment. This indicates that the concept design for the Proposal has been developed with an environmental objective in mind.

The aims, structure and content of this EIS have incorporated these ESD principles. The mitigation measures in Section 8 provide an auditable environmental management commitment to these parameters. This proposed development would be considered ecologically sustainable, due to the social, economic and environmental benefits provided in Section 2.3 and the mitigation measures put in place to protect from adverse impacts on the environment.

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Appendix A

SEARs

Appendix B

Table of Summary SEARs

Appendix C

Community and Stakeholder Consultation

Appendix D

Biodiversity Development Assessment Report

Appendix E

Traffic Impact Assessment

Appendix F

Aboriginal Heritage Assessment

Appendix G

Land Use Conflict Risk Assessment

Appendix H

Visual Impact Assessment and Landscape Plan

Appendix I

Soil Log Sheets & Laboratory Results

Appendix J

Bushfire Assessment

Appendix K

Noise Impact Assessment

Appendix L

Draft Land Management Plan

Appendix M

Draft Rehabilitation and Decommissioning Plan

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