

Suntop Solar Farm Environmental Impact Statement

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



Prepared for:

Client representative:

Date:

Photon Energy Australia Pty Ltd

Robert Ibrahim

May 2018
Rev01

Table of Contents

Executive Summary	v
1. Introduction	1
1.1 Project Overview	1
1.2 The Proponent	1
1.3 Location	2
1.4 Purpose and Scope of This Document	11
1.5 Environmental Assessment Process	11
1.6 EIS Structure	12
2. Need and Justification for the Project	14
2.1 Energy Context in Australia and NSW	14
2.2 Strategic Direction of the Region and the State	15
2.3 Benefits of the Proposal	16
2.4 Alternatives Considered	17
3. Proposal Description	20
3.1 Overview	20
3.2 Proposal Site	20
3.3 Suntop Solar Farm	24
4. Statutory Assessment	37
4.1 Planning Pathway	37
4.2 Evaluation of the Development	37
4.3 NSW Legislation	39
4.4 Commonwealth Legislation	44
4.5 Other Relevant Policies and Plans	47
4.6 Summary of Licenses and Approvals	53
5. Stakeholder Consultation	54
5.1 Overview	54
5.2 Identified Stakeholders	54
5.3 Government Agency Consultation	55
5.5 Aboriginal Consultation	60
5.6 Mineral Titleholders Consultation	60
5.7 Community Engagement	62
5.8 Media	69
5.9 Summary of Actions	70
5.10 Changes in Design	72
5.11 Ongoing Community Consultation	72
6. Environmental Impact Assessment	73
6.1 Biodiversity (Flora and Fauna)	73
6.2 Heritage	88
6.3 Visual	97
6.4 Noise	131
6.5 Traffic, Transport and Road Safety	142
6.6 Land Use	156
6.7 Surface Water, Hydrology and Groundwater	158
6.8 Soils, Geology and Contamination	163
6.9 Bushfire Risk	180
6.10 Hazards	185
6.11 Air Quality	190
6.12 Socio-Economic and Property	192
6.13 Waste	203
7. Cumulative Impacts	208
8. Environmental Management	212

8.1	Summary of Environmental Mitigation Measures.....	212
9.	Conclusion	222
9.1	Justification for the Development	222
9.2	Objects of the EP&A Act.....	223
9.3	Ecologically Sustainable Development	224
10.	References.....	227

List of Figures

Figure 1-1:	Location of the Project	3
Figure 1-2:	The Subject Land and Site boundaries	5
Figure 1-3:	Location of the Site relative to the Subject Land	8
Figure 1-4:	Proposal layout in regard to site constraints	9
Figure 3-1:	Existing electrical infrastructure in the area	21
Figure 3-2:	Existing Environment of Wellington.....	23
Figure 3-3:	Existing Environment showing silos and farm buildings in the distance	23
Figure 3-4:	Example of ground mounting arrangements	25
Figure 3-5:	Example of Tracking Solar PV panels.....	25
Figure 3-6:	Solar panel layout.....	26
Figure 3-7:	Example inverter station	27
Figure 3-8:	Example Substation	29
Figure 3-9:	Example security fencing (chain link security fence)	30
Figure 4-1	Existing Site Plan with current Lots	51
Figure 4-2	Proposed new lot layout following subdivision	52
Figure 5-1	Location of Mineral Title boundary intersecting the Site	61
Figure 5-2	Location of sensitive receivers identified through community consultation	66
Figure 6-1	Existing Vegetation.....	77
Figure 6-2	Existing Environment.....	78
Figure 6-3	Mature trees on boundaries of south and western corner of Site	78
Figure 6-4	Vegetation to be cleared	83
Figure 6-5	Vegetation to be cleared at intersection	84
Figure 6-6	Previously recorded Aboriginal Sites.....	92
Figure 6-7	Location of Aboriginal archaeological sites 6.2.1.4 Mitigation / Management Measures	94
Figure 6-8	Typical rural landscape around Wellington – open paddocks, scattered trees, farm structures	100
Figure 6-9	Typical landscape character around Wellington – scattered native trees, crops and pastures	100
Figure 6-10	Royalla solar farm showing colour change that can occur when viewed from the front.	103
Figure 6-11	Viewpoints and Impact Rating	112
Figure 6-12	Photomontage viewpoint locations	113
Figure 6-13	Proposed landscape screening as visual mitigation	114
Figure 6-14	VP1 Existing view.....	116
Figure 6-15	VP1 Likely view post construction.....	117
Figure 6-16	VP1 Likely view with landscape screening 5 years after construction	118
Figure 6-17	VP6 – View A - Existing view.....	119
Figure 6-18	VP6- View A – Likely view of proposal post construction	120
Figure 6-19	VP6 -View A– Likely view with landscape screening 5 years after construction	121
Figure 6-20	VP6 – view B - Existing view	122
Figure 6-21	VP6 – view B - Likely view of proposal post construction	123
Figure 6-22	VP6 – view B - Likely view with landscape screening 5 years after construction	124
Figure 6-23	VP 7 - Existing view	125
Figure 6-24	VP 7 - Likely view of proposal post construction	126
Figure 6-25	VP – Suntop Road - Existing view	127
Figure 6-26	VP – Suntop Road - Likely view of proposal post construction	128

Figure 6-27 VP – Suntop Road - Likely view with landscape screening 5 years after construction	129
Figure 6-28 Sensitive receiver locations (Figure 1 of MAC Noise Assessment, 2018.....	134
Figure 6-29 Light and heavy Vehicle access and route to Proposal site.....	146
Figure 6-30 Concept design for upgrade works at Renshaw McGirr Way and Suntop Road.....	152
Figure 6-31 Concept design for temporary access road.....	153
Figure 6-32 Concept design for permanent access road.....	154
Figure 6-33 Geology of the Suntop area (Extract from Wellington 1:100000 Geological Map)	165
Figure 6-34 Soil test pit locations	171
Figure 6-35 Test Pit Photos.....	175
Figure 6-36 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.....	197

List of Tables

Table 1-1: Annual Rainfall (mm) (source bom.gov.au- D&J Rural No.065034).	10
Table 1-2: EIS Structure	12
Table 2-1: Current Solar Projects (NSW) Source: (DP&E: Resources and Planning, 2016).	14
Table 2-2: Australian electricity generation, by fuel type (Source: Department of Industry, Innovation and Science (2016) Australian Energy Statistics, Table O)	14
Table 3-1: Main Construction Activities by Stage.....	31
Table 3-2: Plant and equipment	33
Table 4-1 Matters of consideration.....	37
Table 4-2 Relevant provisions from the Wellington LEP	49
Table 4-3 Licences and Approvals	53
Table 5-1 Summary of Agency Consultation through the development phase	55
Table 5-2 Key concerns raised by Dubbo Regional Council during consultation	58
Table 5-3 Moderate concerns raised by Dubbo Regional Council through consultation.....	59
Table 5-4 Engagement outcomes of consultation with potentially impacted mineral title holders	62
Table 5-5 Summary of community engagement performed to date	63
Table 5-6 Detailed summary of one on one consultation with sensitive receivers conducted 5th – 6th February	67
Table 5-7 Summary of one on one consultation with sensitive receivers conducted 30th April – 1st May	68
Table 5-8 Summary of actions taken to date to address key concerns raised.....	70
Table 6-1 Mitchell Landscapes in the BDAR Footprint	74
Table 6-2 EPBC Protected Matters Search Tool Results	76
Table 6-3 Pre- European Plant Community Types.....	79
Table 6-4 Frequency of site types from AHIMS database search.....	91
Table 6-5 Historic items within the vicinity of the site.....	96
Table 6-6 Level of Impact	98
Table 6-7 Assessed private viewpoints (all houses) and predicted visual impact levels (Source: Envisage 2018)	106
Table 6-8 Summary of identified potentially affected private viewpoints.....	130
Table 6-9 Construction Equipment Sound Power Levels (Lw) dBA re 10 ⁻¹² W	131
Table 6-10 Operational Equipment Sound Power Levels dBA re 10 ⁻¹² W	132
Table 6-11 Noise Monitoring Location	135
Table 6-12 Unattended Noise Monitoring	135
Table 6-13 Noise management levels at residential receivers.....	136
Table 6-14 Noise Management Levels	137
Table 6-15 Intrusiveness, amenity and project noise trigger levels.....	137
Table 6-16 NSW Road Noise Policy – Traffic Noise Assessment Criteria.....	138
Table 6-17 Predicted Construction Noise Levels	139
Table 6-18 Predicted Operational Noise Levels	140
Table 6-19 Predicted Construction Road Traffic Noise Levels.....	140
Table 6-20 Existing road environment	143

Table 6-21 Vehicle movements expected as a result of the proposal	148
Table 6-22 Intersection sight distances.....	149
Table 6-23 Exploration licences currently in force over the proposed solar farm proposal boundary	156
Table 6-24 Water Licenses and Approvals	161
Table 6-25 Site Geology Descriptions.....	166
Table 6-26 Soil qualities and limitations.....	167
Table 6-27 Registered contaminated sites within Wellington (Dubbo LGA) (Source: NSW EPA)	167
Table 6-28 Soil Sample Descriptions.....	168
Table 6-29 Laboratory analysis schedule.....	169
Table 6-30 Summary of laboratory results.....	169
Table 6-31 Salinity Rating	172
Table 6-32 Site Electrical Conductivities (1:5 solution)	172
Table 6-33 Exchangeable Sodium and Magnesium in the Cation Exchange Complex (%).....	173
Table 6-34 Particle size analysis and K factor.....	174
Table 6-35 Revised Universal Soil Loss Equation.....	176
Table 6-36 Average number of days per year of daily Grassland Fire Danger Rating and GFDI categories at 3 pm at Wellington (D&J Rural).....	181
Table 6-37 Number of days in each month of daily Fire Danger Rating and GFDI categories at Wellington (D&J Rural)	182
Table 6-38 ICNIRP reference levels for 50Hz for occupational and general public exposure to time varying electric and magnetic fields (ICNIRP 2010)	187
Table 6-39 Example magnetic and electrical field levels (TransGrid N.D, and EMF info)	187
Table 6-40 Dangerous goods criteria and SEPP 33 thresholds relevant to the construction and operation of the proposal.....	188
Table 6-41 Comparison of employment data averages from Wellington, NSW and Australia.....	192
Table 6-42 Community services, facilities and Attractions available in Wellington LGA (Dubbo Regional Council)	193
Table 6-43 Expected labour force during different stages of construction	200
Table 6-44 Potential waste generated on-site during construction and operation.....	204
Table 6-45 Material reuse, recycling and disposal facilities which can be used to dispose of waste and recyclables	206
Table 7-1 Developments that are proposed to be carried out within the Dubbo LGA.....	208
Table 8-1 Summary of General Management and Mitigation Measures for Construction and Decommissioning	212
Table 8-2 Summary of Management and Mitigation Measures for Construction and Decommissioning	213
Table 8-3 Summary of Management and Mitigation Measures for Operation	220
Table 9-1 Objectives of the EP&A Act	223

Appendices

Appendix A: SEARs
Appendix B: Table of Summary SEARs
Appendix C: Visual Impact Assessment and Landscape Plan
Appendix D: Biodiversity Assessment Reports
Appendix E: Aboriginal Heritage Impact Assessment
Appendix F: Bushfire Risk Assessment
Appendix G: Community & Stakeholder Consultation
Appendix H: Traffic Impact Assessment
Appendix I: Noise Impact Assessment
Appendix J: Draft Land Management Plan
Appendix K: Soil Log Sheets and Laboratory Results

Prepared by:



David Pritchard

Date: 14 May 2018

Reviewed by:



Jessica Berry

Date: 14 May 2018

Authorised by:



Malinda Facey

Date: 14 May 2018

Revision History

Rev No.	Description	Prepared by	Reviewed by	Authorised by	Date
A	Internal Draft for review	D. Pritchard	J. Berry	J. Berry	12/04/2018
B	Draft for Review	D. Pritchard	J. Berry	M. Facey	1/05/2018
C	Final Draft	D. Pritchard	J. Berry	M. Facey	10/05/2018
00	Final	G. Daneel	J. Berry	M. Facey	14/05/2018
01	Final Rev2	G. Daneel	J. Berry	M. Facey	24/05/2018

© 2018 pitt&sherry

This document is and shall remain the property of **pitt&sherry**. The document may only be used for the purposes for which it was commissioned and in accordance with the Terms of Engagement for the commission. Unauthorised use of this document in any form is prohibited.

Terms and Definitions

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	<i>Biodiversity Conservation Act 2016</i> , replaces the <i>Threatened Species Conservation Act 1995 (TSC Act)</i> 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
BSAL	Biophysical Strategic Agricultural Land
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	Deposited 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	<i>Environmental Planning and Assessment Act 1979 (NSW)</i> . Provides the legislative framework for land use planning and development assessment in NSW
EP&A Regulations	Environmental Planning and Assessment Regulation 2000.
EPBC Act	<i>Environment Protection and Biodiversity Conservation Act 1999 (Commonwealth)</i> . 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
ERSED	Erosion and Sediment
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

Term / Acronym	Description
FM Act	<i>Fisheries Management Act 1994</i>
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
IRR	Initial Risk Rating
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
MGA	Map Grid of Australia
MNES	Matters of national environmental significance under the Commonwealth <i>Environment Protection and Biodiversity Conservation Act 1999</i> .
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	<i>National Parks and Wildlife Act 1974 (NSW)</i>
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
PEA	Preliminary Environmental Assessment
Photon	Photon Energy Australia Pty Ltd (This project will be co-developed by Canadian Solar and Polpo Investment Ltd.)
Photon Energy	Photon Energy NV
PNTL	Project Noise Trigger Levels
POEO Act	<i>Protection of the Environment Operations Act 1997</i>

Term / Acronym	Description
The “Proposal”	Develop and operate a 170-megawatt (MW) (AC) solar photovoltaic (PV) facility including ancillary works and associated infrastructure at 909 Suntop Road, Wellington, 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.
SDD	State significant development
SRD	State and Regional Development
SSDA	State Significant Development Application
The “Subject Land”	Lots 1, 2 and 3 DP 506925, Lot 122 DP 753238 and Lot 90 DP 657805
SWMP	Soil and Water Management Plan
TMP	Traffic Management Plan
VIA	Visual Impact Assessment
WARR Act	Waste Avoidance and Resource Recovery Act
WM Act	<i>Water Management Act 2000</i>
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: Jessica Berry
Senior Environmental Consultant

Qualifications: BSc/BA
Masters Environmental Management

Company: **pitt&sherry Pty Ltd**

Address: Suite 902, Level 9, 1-5 Railway Street
Chatswood NSW 2067

Development Application:

Proponent Name: Suntop Solar Farm Pty Ltd
Proponent Address: 204/55 Grafton Street
Bondi Junction NSW 2022
Australia

Land to be Developed: Lots 1, 2 and 3 DP 506925, Lot 122 DP 753238 and Lot 90 DP 657805
Wellington NSW, 2820
Dubbo Regional Council Local Government Area

Development Description: Suntop 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: 14 MAY 2018

Executive Summary

This Environmental Impact Statement (EIS) has been prepared by pitt&sherry on behalf of Suntop Solar Farm Pty Ltd (SSF) to identify and assess the environmental issues associated with the construction, operation, and decommissioning of an up to 170MW (AC) (200 MW DC) photovoltaic (PV) solar farm located approximately 10km west of the Central West township of Wellington (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 21 September 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 909 Suntop Road, Wellington NSW on, Lots 1,2 and part Lot 3 DP 506925, Lot 122 DP 753238 and Lot 90 DP 657805 (the "Site"). The Site is zoned Primary Production (RU1) under the Wellington LEP 2012.

The solar farm will cover an area of 472 hectares and is estimated to consist of up to 550,000 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 2.5 to 4m below ground. 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 Suntop Road (one permanent and one temporary), installation of electrical infrastructure and other ancillary works including the on-site substation, inverter stations, connection to overhead transmissions lines, fencing and landscaping works. An upgrade to the intersection of Suntop Road and Renshaw McGirr way would also be undertaken to facilitate safe access during construction of the Proposal.

The Site and surrounding land is cleared agricultural land which is currently and has historically been used for grazing of livestock and cropping agriculture. It is located on undulating topography of low rises and long slopes with open gullies. The Mount Arthur Reserve is the largest remaining area of native vegetation in this locality and is located over 5 km to the east of the Site. There are several rural residential receivers located to the immediate north and west of the Site.

The Macquarie River is located approximately 7.7km to the north of the Site. An unnamed first order watercourse runs in an east west direction across the Site and links with Barney's Creek 2.5 km north of the Site. This then flows into the Little River which merges with the Macquarie River in Wellington. There are 8 small constructed agricultural dams within the Site which are currently used for watering livestock along with a series of constructed earth banks which were established many years ago. These reduce the erosion potential on Site and assist with managing surface water flows.

The Site and its surrounds have been significantly disturbed by construction of roads, farming activities (including landform changes), and rural residential dwellings. Vegetation on the Site consists of improved pastures, various crops including wheat under sown with Lucerne, and isolated remnant native trees. Several rows of remnant vegetation are located on the southern and western boundaries in addition to native stands along the edges of Suntop Road. The small amount of remaining native vegetation consists only of trees with no mid-storey or understorey species present.

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 250 construction jobs during peak construction periods and will support six to ten operational jobs during the 30 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
- Aboriginal Heritage
- Visual amenity
- Traffic and Transport
- Erosion and sediment control
- 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
- The Site does not possess suitable habitat for any threatened species.

Implementing buffers including:

- A 15m Asset Protection Zone (APZ) around the perimeter of the Site
- A 10-20m buffer along flowlines
- A 20m buffer around areas of retained vegetation.

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. The project will require minor land clearing to facilitate the installation of the solar PV panels and upgrade of the intersection at Suntop Road and Renshaw McGirr Way. The Site has historically been predominantly cleared for agricultural use and clusters of native vegetation will be retained along the southern and western boundaries as part of the proposal.

No threatened species or EECs will be impacted on the Site however a small loss of EEC (0.04ha) will occur for the upgrade of the intersection at Suntop Road and Renshaw McGirr Way.

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.

Three sites of Aboriginal archaeological potential were identified within the study area but outside the proposed footprint of the development. These consisted of two scatters on the edge of a flowline in the south east of the Site, and a tree of cultural significance located to the north of an existing row of trees. These trees will be retained as part of the vegetation management for the Site.

The Wellington Local Aboriginal Land Council (WLALC) were present and participated in the Site assessment. They have supplied a letter stating that they have no objection to the proposal proceeding but stipulated that the three areas need to be protected from impacts during construction. Accordingly, they have requested that these sites be addressed in the Construction Environmental Management Plan (CEMP). No further Aboriginal cultural heritage assessment is warranted for the Proposal and an unexpected Aboriginal heritage finds procedure will be developed prior to construction.

Visual Amenity

The Proposal would be visible to 29 potentially affected private viewpoints as well as one public viewpoint being Suntop Road. A Visual Impact Assessment (VIA) was prepared and concluded that one viewpoint had a high impact and three viewpoints had a moderate – high impact. The VIA also concluded that these impacts could be reduced through the implementation of mitigation strategies, such as landscape screening.

Traffic

A traffic impact assessment (TIA) 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 vehicle movements which have the potential to impact on the local road network. All vehicles (including heavy vehicles) will access the Site using a designated route which currently caters for a large number of heavy vehicles. No specific road safety issues were identified along the haulage route.

The intersection of Renshaw McGirr Way and Suntop Road will be upgraded to accommodate the increased vehicle movements associated with construction of the Proposal. The works will include installation of a sheltered right turn lane from Renshaw McGirr Way into Suntop Road, removal of trees to improve sight distances and the provision of safety barriers.

Suntop Road and Renshaw McGirr Way are part of a local school bus route. Traffic associated with the proposal will be made aware of this and deliveries by heavy vehicles will be scheduled to avoid school bus pick up and drop off times.

Erosion and Sediment Control

The construction phase has the potential to increase dust levels from the Site. 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. 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, although unlikely during operation. Working with first responders, a plan has been developed to avoid fire fighter electrocution and fume inhalation in the unlikely event of a fire. 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 land use, noise, air quality, waste generation, hazards, and cumulative impacts which have been addressed in Section 6 of the EIS.

Impact avoidance and minimisation measures have been incorporated into the design of the proposal. These measures are considered practical and achievable by the proponent. They are set out for each area of investigation in Sections 6 and summarised in Section 8 of this EIS.

The solar farm is expected to operate for 30 years and at this time SSF would reassess the development and 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 required) to enable continued agricultural use. However, the substation may remain following decommissioning of the solar farm to continue to service the region.

Mitigation measures have been identified that would be effective in reducing the potential impacts to an acceptable level of environmental risk and will enable the project to be constructed, operated and decommissioned without any impairment to existing or future land uses for the Site.

1. Introduction

1.1 Project Overview

Suntop Solar Farm Pty Ltd (SSF) 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 SSF). SSF propose to develop and operate a solar photovoltaic (PV) facility including ancillary works and associated infrastructure with an upper capacity of 170-megawatt (MW) (200MW DC or 170MW AC), at 909 Suntop Road, Wellington, NSW 2820 (Figure 1-1) (“the Proposal”).

The facility would operate for a duration of approximately 30 years following which SSF would reassess the viability and in 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 required) to enable continued agricultural use. However, the substation may remain to continue to service the region subject to review by TransGrid.

SSF will manage the development and operation of the Proposal. Canadian Solar will acquire a 51% shareholding, Photon Energy will retain approximately 25% and Polpo will 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 SSF (ABN 25 619 271 699) which is owned by three companies including Photon Energy, Canadian Solar and Polpo.

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
- 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)

- 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 is a global energy provider and leading manufacturer of solar PV modules and developer of solar energy solutions. Canadian Solar was founded in 2001 in Ontario, Canada and is listed on the NASDAQ. The headquarters of Canadian Solar is located in Ontario and the company has business subsidiaries in 20 countries on six continents.

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
- Oakey 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
- 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 and 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

SSF is proposing to construct and operate a solar farm using PV technology with an upper capacity of 170MW(AC) at 909 Suntop Road, located approximately 10 km west of Wellington township in NSW and within the Dubbo Local Government Area (LGA). The area was previously part of the former Wellington LGA, which has recently been amalgamated with Dubbo to form the Dubbo Regional Council. The Wellington Local Environmental Plan (LEP 2012) is still current and applies to the Site.

The Proposal would be located adjacent to Suntop Road, Wellington, NSW, 2820 and contained within, Lots 1, 2 and part Lot 3 DP 506925, Lot 122 DP 753238 and Lot 90 DP 657805 (the “Subject Land”). The Subject Land totals approximately 517ha. Following subdivision, the Subject Land would total 513ha and the solar farm would occupy approximately 472ha (the “Site”) which is equivalent to approximately 92% of the Subject Land.

Ancillary works would also occur in the road reserve at the intersection of Suntop Road and Renshaw McGirr Way (see Figure 1-1).

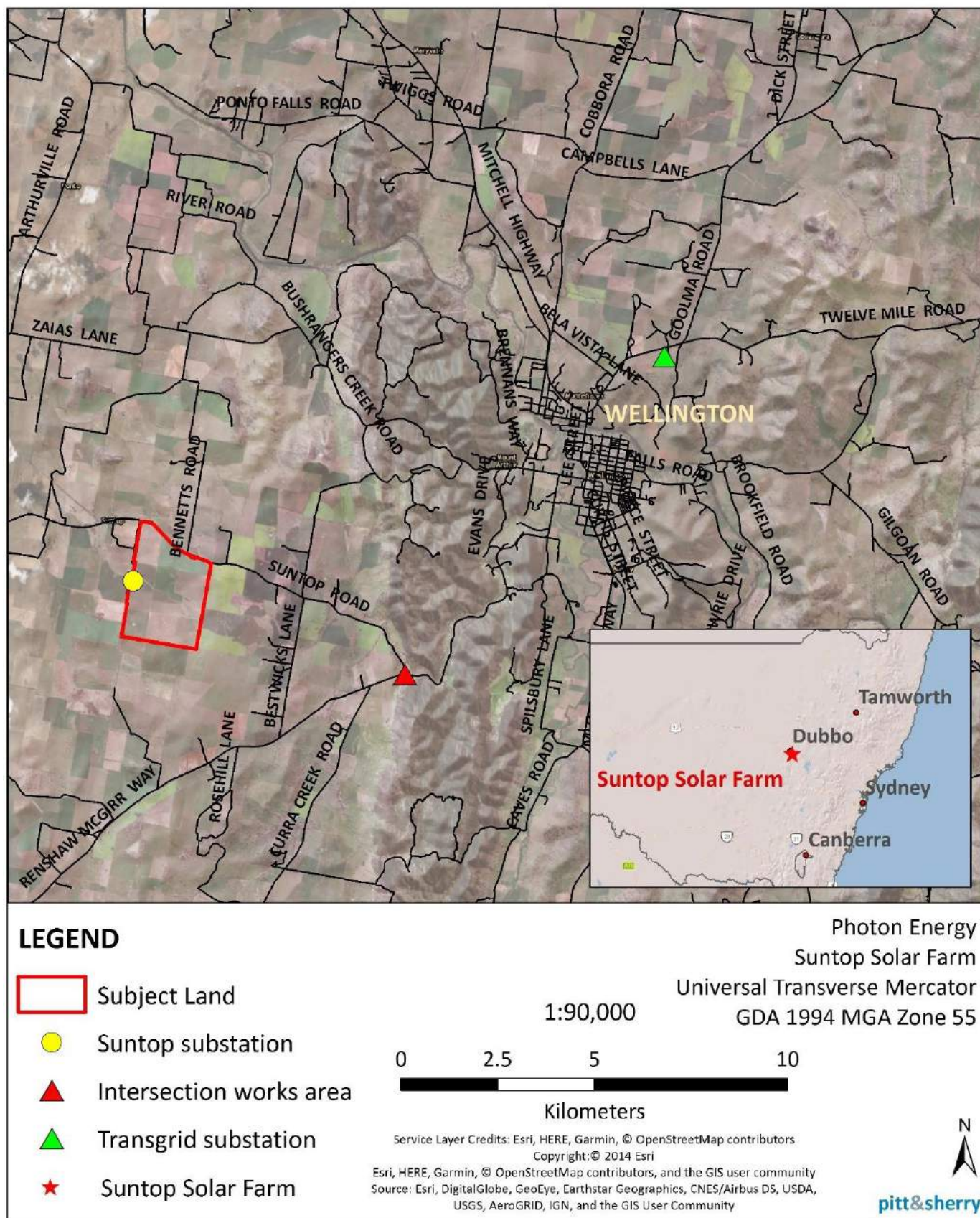


Figure 1-1: Location of the Project

Land ownership

The Proposal would be contained within, Lots 1, 2 and part Lot 3 DP 506925, Lot 122 DP 753238 and Lot 90 DP 657805 (refer Figure 1-2).

The land is privately owned and SSF will be purchasing the Site from the current landowner.

Ancillary works would also occur in the Dubbo Regional Council road reserve at the intersection of Suntop Road and Renshaw McGirr Way subject to issuing of a works permit under Section 138 of the Roads Act 1993.

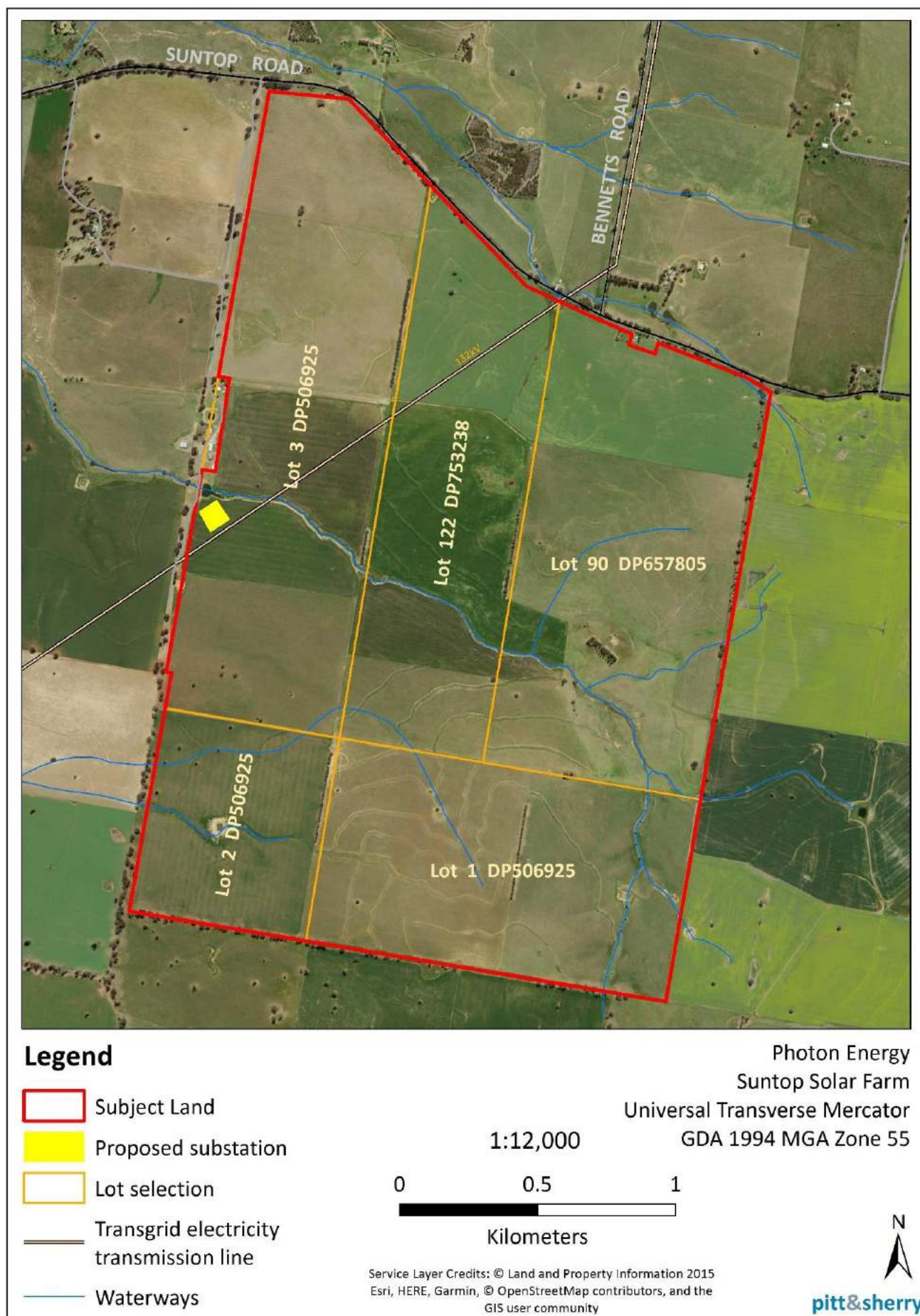


Figure 1-2: The Subject Land and Site boundaries

Catchment Description

The Proposal is located within the Macquarie River Catchment with the closest major water course being the Macquarie River, which is located approximately 7.7km north of the Site.

The Macquarie River is located in the Macquarie – Bogan Catchment and is one of the Murray-Darling Basin's major sub-catchments. The Macquarie-Bogan catchment covers an area of 74,800 square kilometres with the headwaters of the Macquarie River originating in the Great Dividing Range south of Bathurst, where the river flows in a general north-westerly direction until it joins the Barwon River near Brewarrina.

Burrendong Dam to the east of Wellington is located on the Macquarie River and is the largest storage in the catchment with a capacity of 1,190,110 megalitres. The water in this storage is used for a range of uses including irrigation, town water, and stock and domestic supply.

An unnamed creek runs through the Site and flows into Barney's Creek, approximately 2.5km north of the Site (refer to Figure 1-3 and Figure 1-4). This unnamed creek is classified as a first order stream, as it is located at the top of a catchment as a 'headwater' flow. Barney's creek, flows into Little River which is a major tributary of the Macquarie River with the two rivers north of Wellington.

There are 8 agricultural dams within the Site ranging in size from 0.2ha to 0.5ha. The two largest dams are contained in the middle of Lot 2 DP 506925, and the south-west corner of Lot 3 DP 506925. Surface hydrology, landform and soils have been heavily modified by the paddock development and past agricultural use. There are also several man-made agricultural dams in neighbouring plots.

The Site has been classified as groundwater vulnerable under the Wellington LEP, however, the Site has not been identified as flood prone, wetland or riparian land under this LEP. The water course running through the Site is a small first order water course and the topography is undulating which allows surface water to drain from the Site without ponding and causing flooding.

Neighbouring Land Uses

The Site is in an agricultural region and surrounded by cleared agricultural land and rural-residential properties.

The majority of built structures in the region are in the town of Wellington, which is mostly low density residential areas or large lot residences. There is a significant area of dense forest between Wellington and the region of Suntop called Mount Arthur Reserve about 5km east from the Site. Outside the town and surrounding the Site, built structures include sparsely distributed rural-residences which are usually located some distance from roads.

The south, east and west boundaries of the Subject Land are defined by neighbouring agricultural lots with some sections of unnamed, unsealed rural roads and tree-lined fences. Adjoining properties are all rural landholdings of various sizes and are all used for agricultural production including livestock grazing and cultivation for cereal and fodder crops.

There are six rural-residences located with 1km of the Site (refer Figure 5-2):

- Lot 53 DP 753238, located approximately 486m west of the Site (Sensitive Receiver 1)
- Lot 97 DP 753238, located approximately 755m north of the Site (Sensitive Receiver 2)
- Lot 2 DP 983890, located approximately 250m to the north of the Site (Sensitive Receiver 3)
- Lot 92 DP 753238, located approximately 240m north of the Site (Sensitive Receiver 4)
- Lot 51 DP 1082497, located approximately 420m to the east of the Site (Sensitive Receiver 5)
- Lot 90 DP 657805, located immediately north of the Site (Sensitive Receiver 6).

There are also several other properties within 2km of the Site that may be affected due to the flat nature of the landscape and the lack of vegetation screening:

- Lot 17 DP 753246, located approximately 1.9km north-west of the Site
- Lot 1 DP 963275, located approximately 1.8km east of the Site
- Lot 2 DP 842435, Located approximately 1.7km east of the Site
- Lot 50 DP 753238, located approximately 1.1km north of the Site
- Lot 17 DP 753238, located approximately 1.9km north-east of the Site.

The closest residence is located immediately north of the Site on Suntop Road, Sensitive Receiver 6 (refer Section 6.3).

A residence is located on part Lot 3 DP 506925 however this residence is unoccupied and will remain so for the duration of the Proposal.

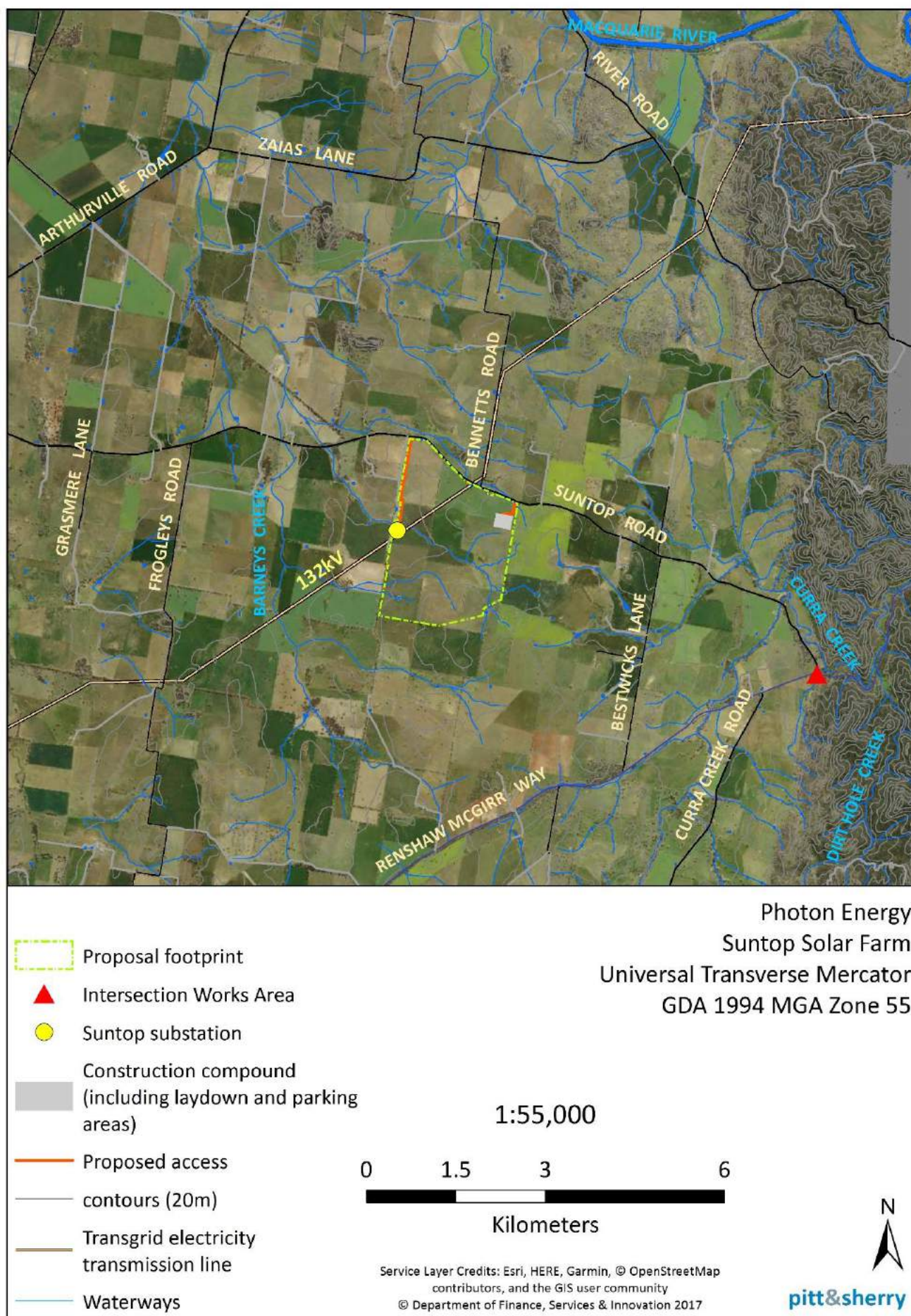


Figure 1-3: Location of the Site relative to the Subject Land

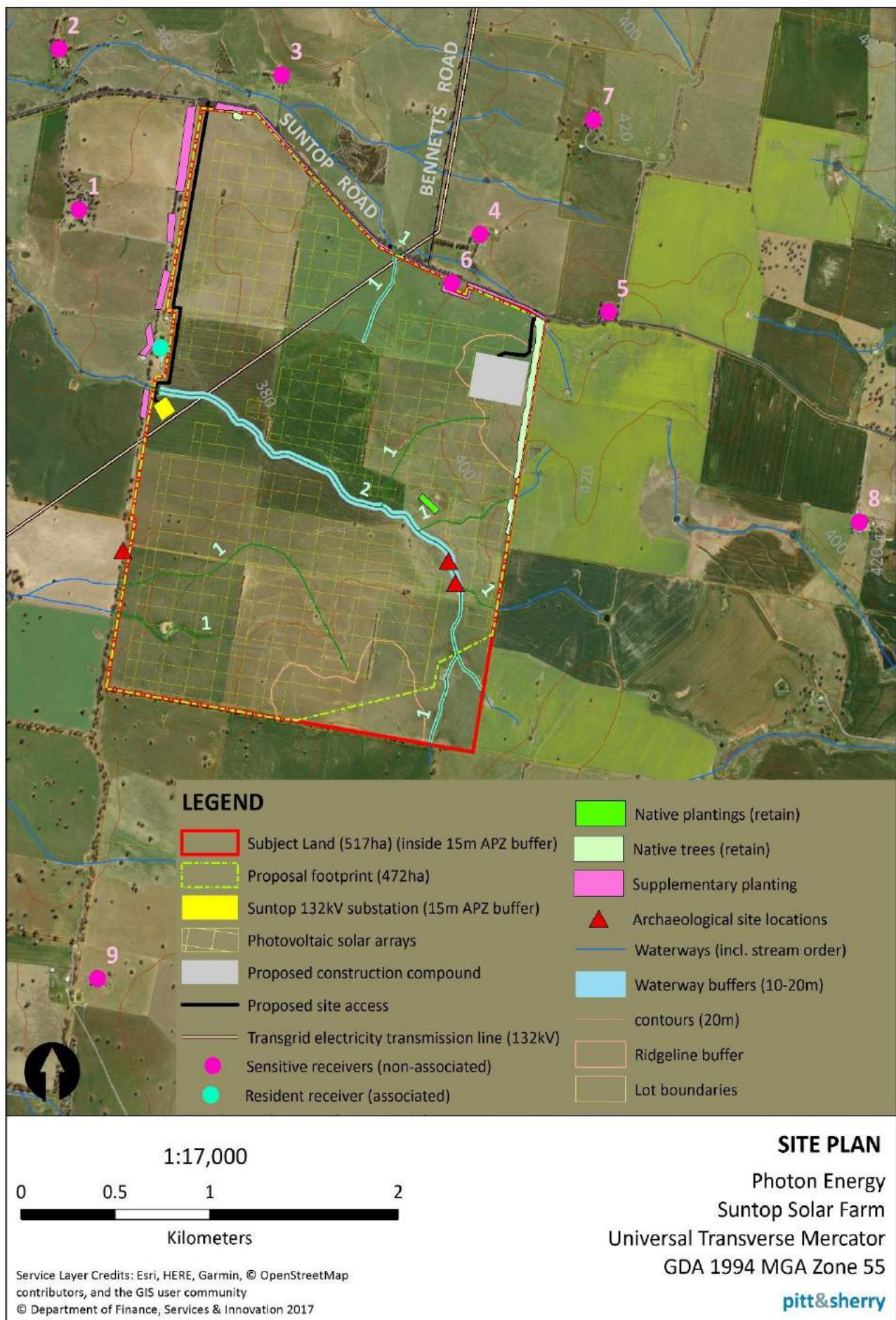


Figure 1-4: Proposal layout in regard to site constraints

Conservation Areas

There are no conservation areas including Endangered Ecological Community (EEC) within the Site.

An EEC was identified at the intersection of Suntop Road and Renshaw McGirr Way and a small part (0.04ha) of this EEC would be impacted by the proposed upgrade. Further assessment is provided in Section 6.1.

The Mount Arthur Reserve, located approximately 5km east of the Site, covers 2,123ha and offers scenic viewpoints as well as picnicking, bushwalking, horse riding and bike riding opportunities. Other places of natural significance include the Wellington Caves Reserve which is approximately 10 kilometres to the south east of Suntop and is on the eastern side of the Bell River, a tributary of the Macquarie River.

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 east of the Proposal. Meteorological data for the Wellington area is outlined in Table 1-1

Table 1-1: Annual Rainfall (mm) (source bom.gov.au- D&J Rural No.065034).

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

1.3.1 Key features of the Proposal

The Proposal would comprise the installation of a solar farm with an upper capacity of 170MW AC that would supply electricity to the National Electricity Market (NEM). The power generated would be transmitted via existing overhead powerlines within an existing TransGrid 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 Suntop Road to the Substation
- Perimeter security fencing
- Upgrade of the intersection of Suntop Road and Renshaw McGirr Way.

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 30 years.

After the initial 30 years, 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 6.6.

1.3.2 Capital Investment Value

The capital investment value (CIV) of the proposed development is estimated at \$262 million (AUD). A copy of the CIV report was provided to Department of Planning and Environment (DP&E).

1.4 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 Suntop Solar Farm in accordance with Schedule 2 of the *Environmental Planning and Assessment Regulation 2000* (EP&A Regulation) and Section 4.15 of the EP&A Act and pursuant to the Secretary's Environmental Assessment Requirements (SEARs) for issued on 21 September 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.

1.5 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
- Determination of the proposal by the Minister for Planning or their delegate.

Section 4 describes the planning and approvals pathway in greater detail.

1.6 EIS Structure

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

Table 1-2: EIS Structure

Chapter		Content
N/A	Executive Summary	Key features of the report
Chapter 1	Introduction	Purpose and scope of this document, proposal overview including the proponent, site location and construction & operation, planning pathway
Chapter 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
Chapter 3	Description of the Proposal	Detailed description of the Proposal site and proposed solar farm, including construction, operation and decommissioning
Chapter 4	Statutory Context	Summary of consultation undertaken with Government agencies, stakeholders and the community.
Chapter 5	Stakeholder Consultation	Consideration of the relevant statutory provisions at the commonwealth and state levels, including the principals of ecologically sustainable development
Chapter 6	Environmental Impact Assessment	Risk assessment, detailed assessment of the potential impacts of the Proposal for a range of key environmental aspects.
Chapter 6.1	Biodiversity (Flora and Fauna)	Detailed assessment of the potential impacts of the proposal for a range of key environmental impacts.
Chapter 6.2	Heritage (Aboriginal and Historic)	
Chapter 6.3	Visual Impact Assessment	
Chapter 6.4	Noise Impact Assessment	
Chapter 6.5	Traffic, Transport and Road Safety	
Chapter 6.6	Land Use	
Chapter 6.7	Surface water, Hydrology and Groundwater	
Chapter 6.8	Soils, Geology and Contamination	
Chapter 6.9	Bushfire	
Chapter 6.10	Hazards and electromagnetic interference	
Chapter 6.11	Air Quality	
Chapter 6.12	Socio- Economic	
Chapter 6.13	Waste	

Chapter		Content
Chapter 7	Cumulative Impacts	
Chapter 8	Environmental Management	Environmental framework, and consolidated summary of recommended management and mitigation measures.
Chapter 9	Conclusion	Conclusion to the EIS including key findings.
Chapter 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	Visual Impact Assessment and Landscape Plan	
Appendix D	Biodiversity Assessment Reports	
Appendix E	Aboriginal Heritage Impact Assessment	
Appendix F	Bushfire Risk Assessment	
Appendix G	Community & Stakeholder Consultation	
Appendix H	Traffic Impact Assessment	
Appendix I	Noise Impact Assessment	
Appendix J	Draft Land Management Plan	
Appendix K	Soil Log Sheets & Laboratory Results	

2. Need and Justification for the Project

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) Australian Energy Statistics, Table O)

	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

	2015 -16		Average Annual Growth	
	GWh	Share (%)	2015-16 (%)	10 years (%)
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
- 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 many miles away. 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
- Provide for increased energy security through diversifying the energy mix and transitioning to low carbon intensive energy sources.

The Proposal would produce an estimated 379 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 The National Energy Guarantee (NEG)

The Australian Government has recently introduced its new energy policy the “National Energy Guarantee” (NEG) to ensure that reliable, affordable power is available. To achieve this power companies would be required to use a percentage of electricity from sources such as coal and gas to ensure a reliable power supply is available, but also buy a percentage from renewables and efficient power supplies to ensure that Australia meets its international obligations made at the Paris climate change conference. The Proposal will contribute to the renewable energy supply.

2.2.3 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
- 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.

2.2.4 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
- 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 our greenhouse gas emissions and reliance on fossil fuels. On an annual basis, the Suntop Solar Farm will produce enough electricity to meet the needs of approximately 65,000 households.

Additionally, the Proposal will reduce greenhouse gas (GHG) emissions by over 357,000 tonnes of CO₂ equivalent per annum. This is roughly equivalent to removing approximately 25,000 cars from the road.

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 Energy security.

The proposal would also generate regional and local benefits including:

- Generating employment:
 - 250 construction jobs (at peak) as well as indirect supply chain jobs
 - Support up to ten operational jobs
- Encouraging regional development:
 - Employee expenditure in the Wellington region (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 (i.e. floodplain, bushfire)
- Surface and ground water resources
- Landscape features
- Access
- Current and previous land use.

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

- Availability of land
- Access, proximity to and capacity of electrical infrastructure
- 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
- 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 Government 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
- 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 retain native vegetation on Site
 - Avoiding riparian zones to avoid potential impacts upon waterways, biodiversity and aboriginal heritage
 - Moving the substation further away from Suntop Road to avoid potential impacts upon sensitive receivers
 - Removing solar panels from two ridges on the Site to reduce the potential visual impacts upon sensitive receivers to the east of the Site
- Implementing buffer distances including:
 - A 200m buffer from the nearest residence
 - A 20m buffer from Suntop Road
 - 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 for areas abutting the areas of remnant trees and the substation

- 20m buffer around the unnamed creek and 10m buffer for two of its tributaries and dams on the 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, SSF will continue to liaise with TransGrid. 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. Proposal Description

3.1 Overview

The construction of the Proposal is estimated to consist of up to 550,000 PV panels which will be installed on a single axis tracker system across the Site.

The single axis tracker system would consist of groups of east-west facing PV modules tilted at +/- 60° angle (each approximately 2m x 1m in area) on mounting structures approximately 2m in height and in rows approximately 11m apart. The mounting structure would be piled steel posts that would extend between 1.6m to 4m below ground depending on geological conditions. The maximum height of panels during tracking movement is up to 4m.

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

- Construction of two access roads (one permanent and one temporary) for all access and egress for the Site and substation
- Installation of Electrical infrastructure including:
 - A 132kV Substation
 - Inverters to collect and convert DC to AC
 - Cabling and other electrical infrastructure (e.g. security systems)
- A maintenance compound and buildings
- Fencing, landscaping and environmental works on Site
- Upgrade works at the intersection of Suntop Road and Renshaw McGirr Way.

Power generated by the facility will be transmitted via existing 132kV transmission lines, in an easement owned by TransGrid that traverses the Site and extends through to the Wellington substation approximately 15 kilometres to the north.

A tee off connection will be used to connect directly into the existing grid located on Site. A tee off connection is a type of electrical connector that allows connection to existing transmission or distribution networks.

The operational life of the solar farm is expected to be approximately 30 years at which point the panels are either replaced and operations continue or removed and the site is decommissioned and rehabilitated as required.

3.2 Proposal Site

The Subject Land, as described in Section 1.3, totals approximately 517 hectares in area and is currently used for agriculture including cropping (e.g. wheat and lucerne) and grazing by sheep. Following subdivision, the solar farm would occupy 472 hectares out of 517 hectares (equivalent to approximately 92%) with grazing land to continue to occur across all of the Subject Land. Ancillary works would also occur in the road reserve at the intersection of Suntop Road and Renshaw McGirr Way.

There is an existing TransGrid easement that runs across the Site from the eastern boundary of Lot 122 DP 753238, through the northern boundary of the Site, and exits through the western boundary of Lot 3 DP 506925 refer to Figure 3-1. This easement contains existing TransGrid 132kV powerlines on wooden pole structures connecting to the Wellington substation approximately 15km to the north-east of the Site.



Figure 3-1: Existing electrical infrastructure in the area

Suntop Road is a local road managed by Dubbo Regional Council which runs along the northern boundary of the Site. The south, east and west boundaries of the Subject Land are defined by neighbouring agricultural lots.

All vehicles would access the Site from Suntop Road, a sealed, two-way local road. Suntop Road joins Renshaw McGirr Way about 6.5km east of the Site. The Mitchell Highway (A32) joins McGirr Way about 9 km further east of the Site. All vehicle access will be via this route.

Two new access roads (one permanent and one temporary) would be constructed leading south into the Site from Suntop Road. A permanent access road would be constructed along the western boundary and a temporary construction access road in the south east corner of the Subject Land. Additionally, the intersection of Suntop Road and Renshaw McGirr Way would be upgraded. Further details regarding intersection upgrades and traffic management are outlined in Section 6.5.

The Site comprises a series of barb wire fenced paddocks which have been largely cleared for agricultural purposes including cropping (e.g. wheat and lucerne) and sheep grazing. On the western side of the property are several built structures including a residence (unoccupied), agricultural sheds and storage silos. The land associated with these structures will be subdivided as part of the Proposal so that they can continue to be used by the current landowner and as such will not form part of the Site.

Mature native trees occur along the western boundary of the Subject Land. A few remnant trees are scattered within the paddocks over exotic ground covers. Several linear tree plantings occur along parcel boundaries within the Site and provide marginal fauna habitat, but limited flora conservation value due to the presence of exotic groundcovers. A detailed Biodiversity Assessment has been prepared as part of this EIS (refer section 6.1) which provides further details on existing vegetation and biodiversity.

Surface hydrology, landform and soils have been heavily modified by agricultural use. Numerous contour banks direct surface runoff into farm dams. There are 8 dams within the Site ranging in size from 0.2ha to

0.5ha. There is one 2nd order waterway (unnamed) that flows east to west through the centre of the Site, and two 1st order waterways (unnamed) lacking banks or channel structure in the southern half of the Site. The Site drains into the Little River, a major tributary of the Macquarie River.

The Site has been classified as groundwater vulnerable under the Wellington LEP.

3.2.1 Surrounding Locality

The Proposal is located within an agricultural region approximately 10 km west of the town of Wellington in the central west slopes and plains region of New South Wales.

Wellington is the closest town to the Proposal and covers an area of 4,113 km². The population of Wellington was 4,077 in the 2016 Census (*ABS 2016*). The main industries are aged care residential services (6.1%), correctional and detention services (5.5%), takeaway food services (5.3%), supermarket and grocery stores (4.7%) and local government administration (4.5%) (*ABS 2016*).

Settlement of the area dates from 1823, with the land used as an agricultural station, other land uses included growing wheat and grazing sheep. During the 1850's Wellington felt the benefits of gold mining. Prior to European settlement the Wiradjuri people occupied the area. No Heritage items have been listed within 1km of the Site (Wellington LEP 2012).

The majority of built structures in the region are in the town of Wellington which is mostly low density residential areas or large lot residences. Outside the township, built structures include sparsely distributed rural-residences which are usually located some distance from roads.

Residences in proximity to the Site generally occur on large rural properties used for agriculture predominantly grazing and some limited cropping activities. There are 6 residences located within 1km of the Proposal and are depicted in Section 6.3.

The Site has sealed road access along Suntop Road from the Mitchell Highway which is approximately 9 kilometres east of the Site. Wellington has a small airfield that does not support commercial flights and is utilised by private light aircraft. This is located approximately 10 km to the north west of Wellington. Commercial flights are available from Dubbo Airport which is approximately 65 km north of the Site.

Mount Arthur Reserve, a significant area of dense forest and hills between Wellington and the Site sits about 5km north-east of the Proposal. A region within the neighbouring eastern lots, of approximately 350ha has been identified as Karst landscape. A Karst landscape is characterised by the presence of underground cavern networks created from the dissolution of bedrock by surface water or groundwater. Further detail on the soils and geology for the Site are contained in Section 6.8.

The closest major water course is the Macquarie River, located approximately 7.7km north of the Site, which flows north-west into the Murray-Darling Basin. Other waterways and man-made agricultural dams lie in neighbouring and nearby farm lands.

The environment around the Site is dominated by cleared agricultural land which is the dominant industry in the region. Figure 3-2 and Figure 3-3 show the rural nature of the Site and the surrounding land.



Figure 3-2: Existing Environment of Wellington



Figure 3-3: Existing Environment showing silos and farm buildings in the distance

3.3 Suntop Solar Farm

3.3.1 Key infrastructure components

The proposal would consist of the following elements:

- Solar Components including:
 - Up to 550,000 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
- An access road
- Upgrade of intersection of Suntop Road and Renshaw McGirr Way
- Ancillary facilities and construction compounds
- Perimeter security fencing
- 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
- Parking area.

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

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 2m high with steel posts as foundations. Piles would be driven or screwed in to the ground using pile drivers to a maximum depth of 1.6m to 4m depending on geological conditions.

The Proposal will comprise of up to 550,000 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 3-4 and Figure 3-5 provide an indication of what the proposed solar modules would look like. An indicative layout of the PV panels is shown in Figure 3-6.



Figure 3-4: Example of ground mounting arrangements



Figure 3-5: Example of Tracking Solar PV panels

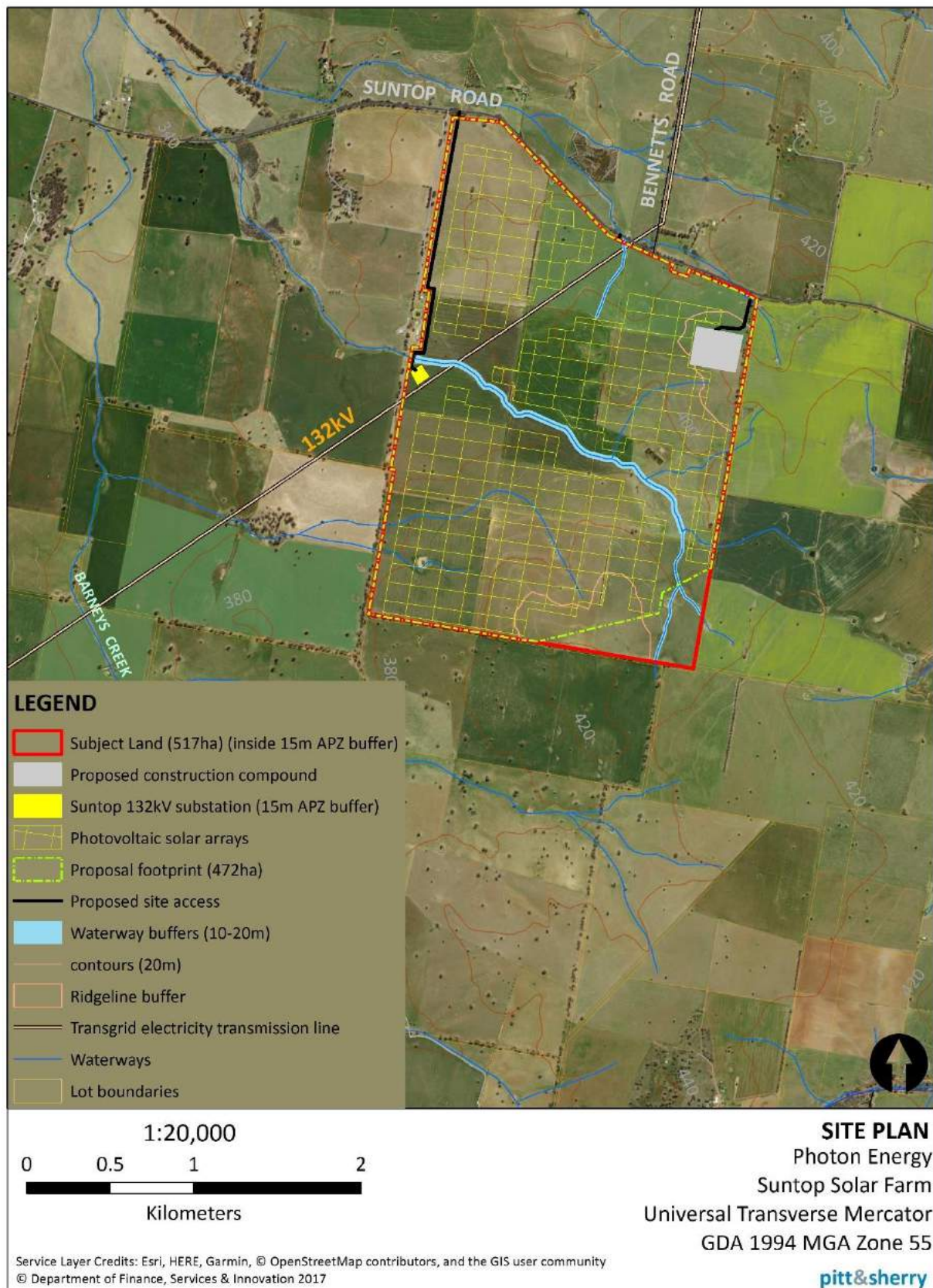


Figure 3-6: Solar panel layout

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 approximately up to 60 inverter stations across the Site.

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

- Approximately 40 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 59 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 3-7) and fitted with:

- 118 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
- Cooling fans.



Figure 3-7: 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 3 DP 506925.

The substation footprint is approximately 60m x 80m in size and set back 1.6km from Suntop 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. An example of a similar substation can be seen in Figure 3-8.

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
- 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 TransGrid design and safety standards.

The substation would be constructed on a concrete pad, approximately 60m x 80m, and the concrete pad will be raised off the ground to mitigate risks of flood waters affecting safe and reliable operation of the substation. Consistent with existing TransGrid 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.

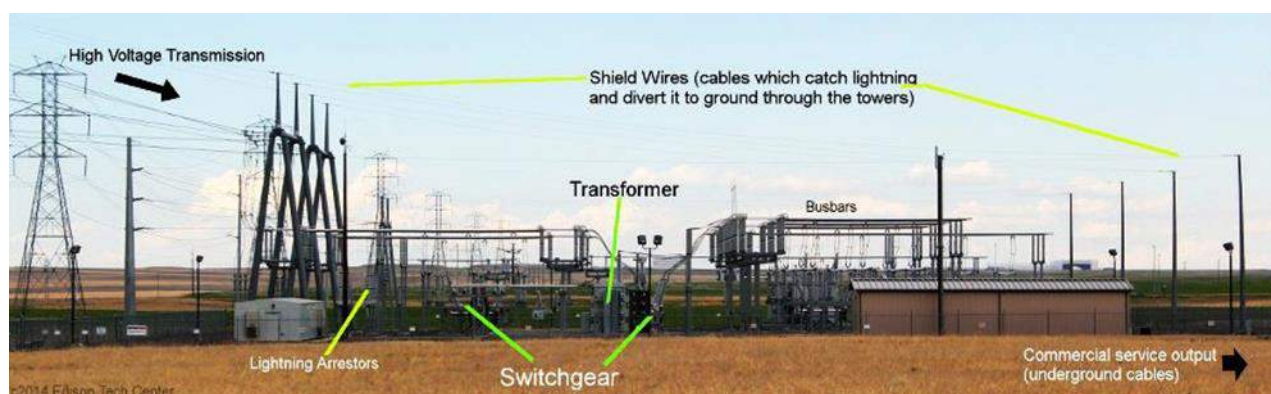


Figure 3-8: Example Substation

TransGrid Infrastructure Works

The Proposal would require connection to electrical infrastructure within an existing TransGrid easement at the south-western side of Lot 3 DP 506925 within the Site.

The connection will be made to the existing overhead transmission line. This connection is subject to TransGrid 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).

Access Roads

A new access road to the Site will be constructed from Suntop Road along the western boundary of the Site (Lot 3 DP 506925) and will provide access to the substation. This will connect with an existing farm access road (running parallel to the top of an existing dam wall). A concept design for the access road is provided in **Appendix I**.

During detailed design and site investigation the existing sections of this access road will be reviewed to determine suitability for heavy vehicle access. If the existing formation is not considered suitable further works may be required such as strengthening and widening of the crest of the dam wall to allow widening of the road and reducing the approach and departure angles.

A temporary access would also be created from Suntop Road in the vicinity of the north-eastern corner of the Site (Lot 90 DP657805). This would provide access to the Site carpark and construction compound during construction.

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. The temporary access road on Lot 90 DP 657805 would be remediated to previous conditions at the end of the construction period.

Intersection Upgrade

The intersection of Suntop Road and Renshaw McGirr Way would be upgraded to meet AUSTROAD Guidelines, Dubbo Regional Council Engineering Standards and a safe intersection stopping distance (SISD) for 100km/h including:

- Removal of 19 trees to improve sight distances and facilitate upgrade works
- Installation of crash barriers on either side of Suntop Road at the intersection with Renshaw McGirr Way
- Rural Basic Right turn treatment to widen the should of Renshaw McGirr Way to allow through vehicles to pass to the left of the turning vehicles.

A concept design for the intersection upgrade is provided in **Appendix I**.

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 north-eastern portion of the Site on Lot 90 DP 657805 (Figure 3-6).

Temporary ancillary facilities associated with the compound site would include:

- Construction offices (one 12m x 3m site office, four 12 x 3m break rooms)
- Parking area
- Staff amenities
- 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 3-9.



Figure 3-9: 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 utility 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.

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 • 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 tree and vegetation protection measures as required • Establishment of additional sedimentation and erosion controls as required.
Preliminary civil works	• Setting up foundations for the substation and inverter stations • Drainage works (as required) • Intersection upgrade works.
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.
Intersection Works	Widening and trees • Set up traffic control for safe working and traffic management and crew facilities • Mark out and remove trees and clear away

Stage	Main activities
	- Excavate road edge area to be constructed for widening - Prepare formation and lay drainage where required - Construct road formation in layers and compact - Install permanent signage. - Remove traffic control, make good and open new road area. Culvert protection - Set up traffic control for safe working area, and set up crew facilities - Set out support post positions - Prepare foundations for posts and set in place - Fit W or similar type barrier on posts - Erect permanent road signage as required - Remove traffic control and make good.
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 C).

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 shoulder widening at the intersection of Suntop Road and Renshaw McGirr Way.

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 geological 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
- Vegetation clearance - groundcover and scattered paddock trees on Site and at the intersection of Suntop Road and Renshaw McGirr Way
- Shoulder widening at the intersection of Suntop Road and Renshaw McGirr Way.

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 Proposal will be in accordance with the Interim Construction Noise Guidelines (ICNG) recommended standard hours as detailed below:

- Monday to Friday – 7am to 6pm
- Saturdays – 8am to 1pm
- 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 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 on site from existing dams or 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.

Labour

It is estimated that up to 250 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

Equipment	Quantity	Model Type
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 6.5 provides an indication of the total overall one-way 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 will include:

- Galvanized steel and Aluminium solar support structures
- Up to 550,000 Crystalline silicon solar PV panels with Aluminium frame
- 118 Inverters
- Substation components
- 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
- 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
- Topsoil.

3.3.3 Operation

The construction phase of the proposal is anticipated to commence in the first quarter of 2019 and subsequently operational phase is anticipated to commence in the first quarter 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)
- 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 24 hour response should a security event occur.

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.

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 Mazda BT-50 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. The water demands of the solar farm operation are small and likely to be less than the commensurate with the current demands from agriculture on the Site.

Emergency firefighting water would be stored in a tank (approx. 50,000L) located adjacent to the maintenance storage containers.

3.3.4 Decommissioning

The solar farm has an operational timeline of approximately 30 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. Much 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
- 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 TransGrid.

4. Statutory Assessment

4.1 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 value, and is therefore declared SSD.

The proposal to construct and operate the Suntop 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 23 August 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 EP&A Regulations. In formulating the environmental assessment requirements, requests were sent to relevant public authorities and agencies to inform the key issues raised in Section 6. The SEARs were issued to SSF on the 21 September 2017 refer **Appendix A** and are summarised in **Appendix B** 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 Regulations.

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.

4.2 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 4-1 and assessed in terms of their relevance to the proposal.

Table 4-1 Matters of consideration

Provision	Relevance to the Proposal
Any environmental planning instrument	Relevant environmental planning instruments (EPIs) are discussed in Section 4.5. They include: <i>State Environmental Planning Policy (State and Regional Development) 2011</i> <i>State Environmental Planning Policy (Infrastructure) 2007</i> <i>State Environmental Planning Policy (Rural Lands) 2008</i> <i>State Environmental Planning Policy No. 55 – Remediation of Land</i> <i>Wellington Local Environmental Plan 2012</i>
Any proposed instrument that is or has been the subject of public consultation under the EP&A Act	There are no draft instruments relevant to the proposal

Provision	Relevance to the Proposal
and that has been notified to the consent authority	
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 • 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-mentioned developments are proposed in the Suntop Solar Farm. • The provision of development under <i>the Dark Sky Planning Guideline</i>. 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 <i>Coastal Protection Act 1979</i>. 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 Section 6 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 8.1.
The suitability of the site for the development	The suitability of the Site for the proposal is discussed in Section 2.4.
Any submissions made in accordance with this Act or the regulations	The proponent is committed to address any submission made in relation to the Suntop Solar Farm. Consultation with stakeholders that has been undertaken during the planning stages are summarised in Section 5
The public interest	The proposal is in the interest of the public for the following reasons:

Provision	Relevance to the Proposal
	• 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 • 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 5. This plan aims to inform the community and stakeholders about the proposal and their role in providing input into the assessment and development process.

4.3 NSW Legislation

4.3.1 Environmental Planning and Assessment Act 1979

The Environmental Planning and Assessment Act 1979 (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 4.1, 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
- 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*
- 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
- A licence under the Pipelines Act 1967.

4.3.2 Environmental Planning and Assessment Regulations 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 (refer Section 4.3.2).

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 B**. Clause 6 and 7 of Schedule 2 specifies the form and content requirements of the EIS.

4.3.3 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. Suntop 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 6.13.

4.3.4 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 1993 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 Services (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 have been undertaken as outlined in Section 5. Further consultation will be undertaken during detailed design.

Proposed works associated with access to the Site is summarised in Section 6.5.

4.3.5 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 600 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.

4.3.6 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, as such a flora and fauna assessment has been prepared as part of the EIS.

Three days of comprehensive field survey were undertaken on the 29th November 2017, 15th January 2018 and 8th May 2018 by FloraSearch of Orange. One threatened ecological community (TEC) listed under the BC Act and the EPBC Act is considered to once have occupied the Site, but this has been reduced by clearing to a few scattered paddock trees. The site is predominantly vegetated with common pasture species or cultivated annual crops such as wheat. A roadside remnant of the Box Gum Woodland EEC was identified adjacent Renshaw McGirr Way within the proposed intersection upgrade footprint.

A Biodiversity Development Assessment Report (BDAR) has been prepared (refer Section 6.1 and **Appendix D**).

4.3.7 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 Section 6.1.

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 6.2.1 and **Appendix E** 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.

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.

4.3.8 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 is a Crown Road (paper Road) located on the western boundary of Lot 3 DP506925. This road forms part of land to be subdivided as part of the Proposal as described in Section 4.5.6 and as such would be retained by the existing landowner. It will not be located on the Site for this Proposal. There is no other Crown Land associated with the Site.

4.3.9 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 impact to Heritage is provided in Section 6.2.

4.3.10 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 1997* 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 12th April 2018 which concluded that the Site is not mapped as fire prone land (RFS 2017). An assessment of bush fire impacts is provided in Section 6.9 and **Appendix F**.

4.3.11 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 sources 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 and Cudgegong Regulated Rivers Water Source 2016*, 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 that between the banks of all rivers, from the upstream limit of Windamere Dam water storage downstream to the junctions of the Macquarie River and its effluent rivers with the Barwon River. This plan does not apply to water contained within aquifer water sources underlying the area or to water on land adjacent to this water source.

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 region surrounding the Site is not mapped within the Department of Primary Industries 'high priority Groundwater Dependent Ecosystem' (GDE) map.

4.3.12 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 claims 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.

An unnamed creek runs through the Site and flows into Barney's Creek, approximately 2.5km north of the Site. This unnamed creek is classified as a first order stream, as it is located at the top of a catchment as a 'headwater' flow. Flows in this waterway are intermittent and would be unlikely to be able to support viable populations of fish.

4.3.13 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 New South Wales, Australia.

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.

Upon inspection of the strategic weed management plan for the Wellington, no listed priority weed species have been identified to exist on the Site.

4.4 Commonwealth Legislation

4.4.1 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 (DoE) 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*" (MNES) 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
- 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 Wetlands of International Importance and is not in close proximity to any such area. On this basis, the Proposal will not impact upon any Wetlands of International Importance (declared RAMSAR Wetlands) 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 listed under the EPBC Act have been recorded within a 20km radius of the Proposal. These are;

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

As detailed, the Site has been cleared of the majority of native vegetation. The Proposal involves the removal of a very small number of isolated paddock trees and some disturbance to groundcover during construction. The removal of this vegetation is unlikely to impact any threatened ecological communities.

Works associated with the intersection upgrade at Suntop Road and Renshaw McGirr Way will include removal of 0.04ha of Box-Gum Woodland EEC.

Nationally Listed Threatened Species

A total of 27 threatened species listed under the EPBC Act have been recorded or have suitable habitat within a 10km radius of the Proposal.

Of the listed threatened flora species, none are likely to occur on the Site. All the species are wide ranging and would be unlikely to be exclusively reliant on-site habitats for their life cycle requirements.

Of the 19 threatened fauna species, five have the potential to occur (Regent Honeyeater, Swift Parrot, Painted Honeyeater, Corben's Long-eared Bat and the Grey-headed Flying Fox). The main type of impact on fauna that would occur as a result of the Proposal would be the removal of native trees. The small number of trees to be removed are in poor condition, isolated and do not possess habitat features such as hollows. 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 (see **Appendix D**).

Nationally Listed Migratory Species

A total of 12 migratory species listed under the EPBC Act have been recorded or have potential suitable habitat within a 10km radius of the Proposal.

No migratory species listed under the EPBC Act was 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 important habitat that would be used by migratory species.

Nationally Listed Marine Species

A total of 16 marine species listed under the EPBC Act have been recorded or have potential suitable habitat within a 10km radius to the Proposal. However as there is no suitable habitat onsite for these marine species no potential impact has been identified.

4.4.2 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 March 2018 identified no current applications or determinations within Dubbo Regional Council LGA (Wellington area) that are relevant to the Site.

Section 6.2.1 outlines management and mitigation measures that will be implemented as part of the Proposal to ensure protection of any un-expected Indigenous heritage finds.

4.4.3 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.

- 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 in Section 9.3.

4.5 Other Relevant Policies and Plans

4.5.1 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.

4.5.2 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 SEPP 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 boundary of 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 and Schedule 3 does not include electricity generating works.

4.5.3 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 sheep grazing and has considered land use conflicts by completing a land use risk assessment (Section 6.6)

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.

4.5.4 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
- any mining licences.

A very small section of the south-western corner of the Site is subject to Exploration Licence 8463 (EL8463). Consultation with the Licence holder has taken place as required under the SEARS and is detailed in Section 5 of the EIS.

4.5.5 State Environmental Planning Policy No. 44 – Koala Habitat Protection

This Policy aims to encourage the proper conservation and management of areas of natural vegetation that provide habitat for koalas to ensure a permanent free-living population over their present range and reverse the current trend of koala population decline. This policy achieves this aim by:

- Requiring the preparation of plans of management before development consent can be granted in relation to areas of core koala habitat
- Encouraging the identification of areas of core koala habitat
- Encouraging the inclusion of areas of core koala habitat in environment protection zones.

Three of the remnant eucalypt species on and around the Subject Land are recognised as secondary Koala food trees (OEH, 2018e), these being, Inland Grey Box, Fuzzy Box and White Box. The last of these is listed as a Koala feed tree in Schedule 2 of SEPP 44. However, the Site does not have an extant Koala population (Biosphere Environmental Consultants, 2018) and is not classified as 'core' Koala habitat, therefore a SEPP 44 plan of management is not required.

4.5.6 Wellington Local Environment Plan (2012)

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

SSF has a purchase agreement with the landholders for Lots 1, 2 and part Lot 3 DP 506925, Lot 122 DP 753238 and Lot 90 DP 657805 including a vacant residence.

A subdivision of Lot 3 DP 506925 is proposed as part of the purchase agreement, such that the current Landowner can continue to operate separately from the proposed solar farm (Lot 1). The existing Lot layout is provided in Figure 4-1 and the subdivision proposed by SSF is shown in Figure 4-2.

The subdivision comprises:

- Lot 1 - formerly a 4ha portion of Lot 3 DP 506925 comprising an access road and farm buildings; and
- Lot 2 – the remaining 513ha of Lot 3 DP506925 plus Lots 1 and 2 DP 506925, Lot 122 DP 753238 and Lot 90 DP 657805 including agricultural paddocks and a vacant residential building.

No new dwelling entitlement will be attached to either of the newly created lots, and the current dwelling will be attached to the larger of the two lots to comply with the Wellington LEP.

The Wellington LEP designates the Site as 'AF' on the Lot Size Map Sheet LSZ_004, 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 shown on the Lot Size Map.

The smaller of the two 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.

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 to the development are listed in Table 4-2.

Table 4-2 Relevant provisions from the Wellington LEP

Relevant objectives	Relevance to the Proposal
Land use zones	The LEP designates the site of the proposed works is zoned as Primary Production (RU1). 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 • 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:

Relevant objectives	Relevance to the Proposal
	- 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 - Is highly reversible and will not impact the future productivity of the land. Electricity generation is not listed among developments which are permitted consent for this zone however, under clause 34(7) of the ISEPP the Proposal is permissible with consent.
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. - Conserve Aboriginal objects and Aboriginal places of heritage significance. The Site contains three items of Aboriginal cultural significance which are located outside the proposed footprint for development. The Wellington Local Aboriginal Land Council (WLALC) have supplied a report outlining their agreement to the proposal with the recommendation of protecting these items through their inclusion and listing in a Construction Environmental Management Plan (CEMP). Refer to Section 6.2 and Appendix E.
Bush fire hazard reduction	The land of the proposed site is not mapped as bush fire vulnerable. Potential impacts are addressed in Section 6.9.
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 - Suitable road access. The development will not require a water supply or sewage disposal and management. These services will be transported onto and off the site temporarily during construction. A permanent 50,000L water tank will be located near the substation for fire-fighting purposes. The development will supply electricity and will not impact existing storm water drainage. Road access is addressed in Section 6.5.

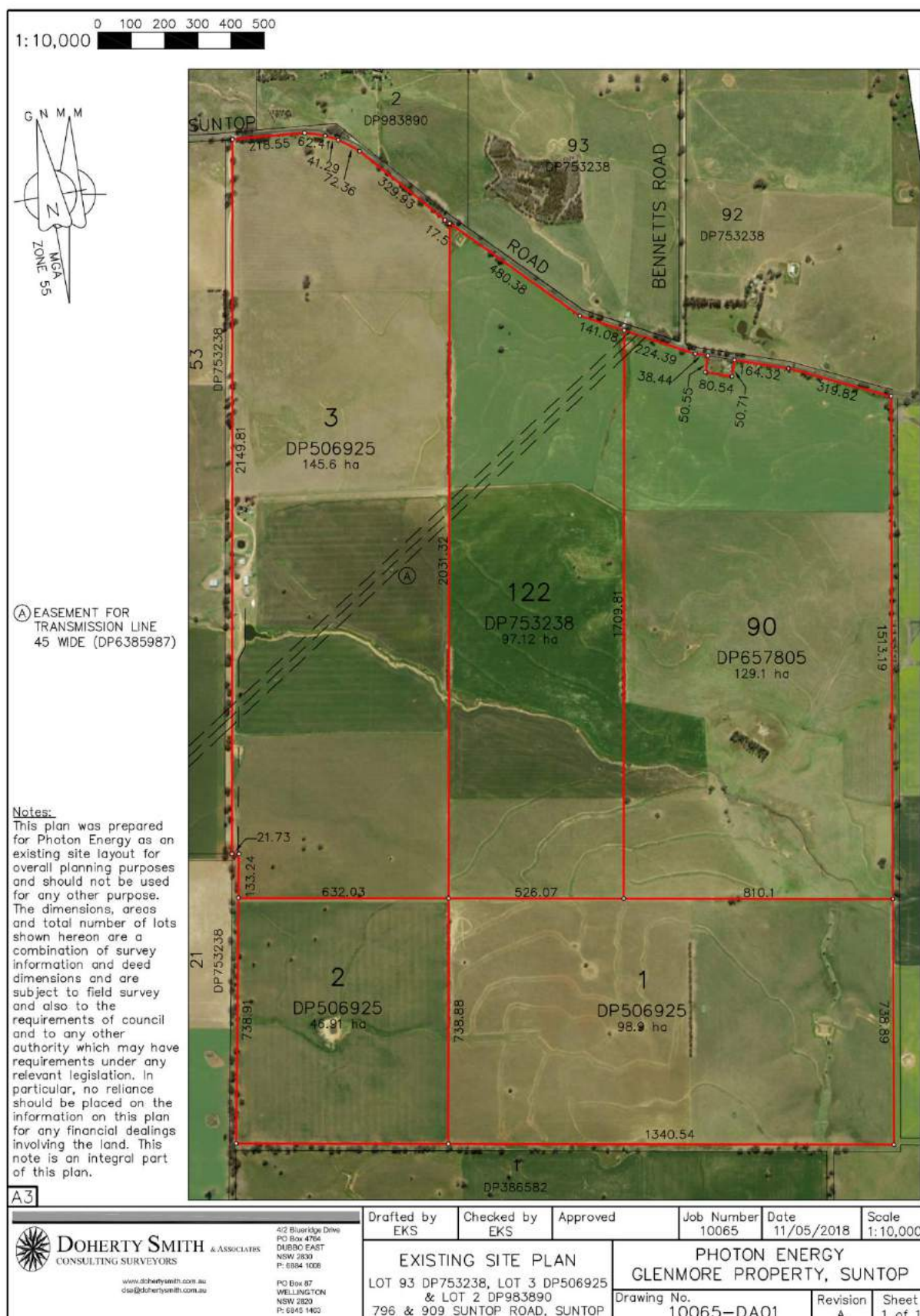


Figure 4-1 Existing Site Plan with current Lots

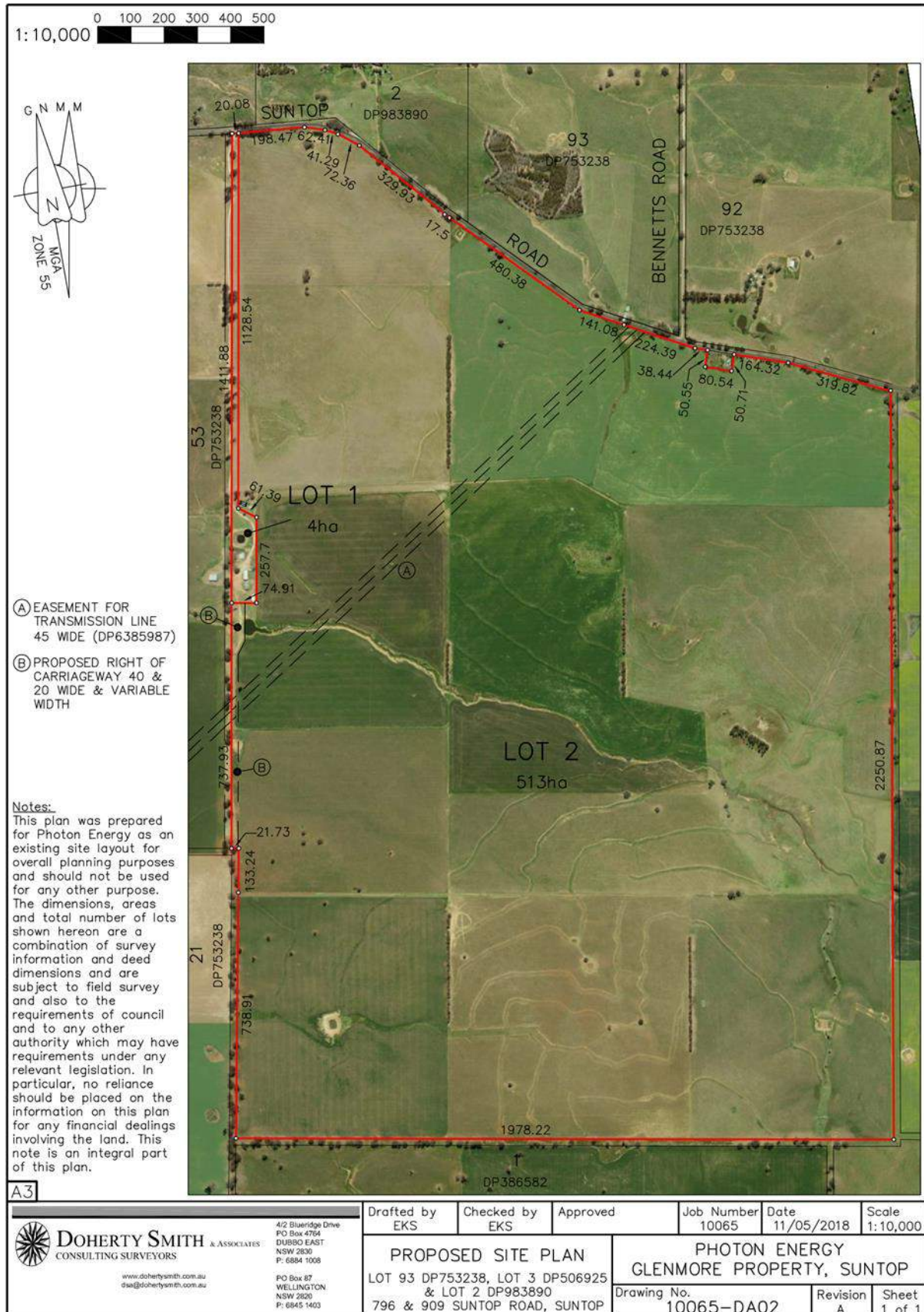


Figure 4-2 Proposed new lot layout following subdivision

4.6 Summary of Licenses and Approvals

Table 4-3 provides a summary of the licenses and approvals required for the proposed Suntop Solar farm.

Table 4-3 Licences and Approvals

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

5. Stakeholder Consultation

5.1 Overview

A Community and Stakeholder Engagement Plan (CSEP) was prepared in November 2017 in accordance with *The Community and Stakeholder Engagement Draft Environmental Assessment Guidance Series June 2017* (Draft Guidelines) prepared by 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 G**).

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 stakeholders with the opportunity to inform design, where required
- Seeking feedback and comments on the proposed development
- Identifying engagement requirements through the EIS, Submission, Determination and post approvals stage 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 and incorporated into the final design (refer to Section 5.10).

5.2 Identified Stakeholders

The following stakeholders were identified:

- Adjacent landholders (referred to as Sensitive Receivers see Figure 5-2)
- Suntop community (via a community meeting)
- Dubbo Regional Council
- Government Agencies including:
 - Department of Planning and Environment (DP&E)
 - Office of Environment and Heritage (OEH)
 - Department of Primary Industries (Water & Lands)
 - Department of Resources and Geosciences
 - Roads and Maritime Service
 - Rural Fire Service
- Neighbouring Industry
 - Civil Aviation Safety Authority (CASA)
 - TransGrid
- Mineral Titleholders
- Wellington Local Aboriginal Land Council (LALC).

5.3 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.

Table 5-1 Summary of Agency Consultation through the development phase

Stakeholder	Date	Details of Engagement	Key Aspects	Outcomes
DP&E	19/12/2017	Meeting A review of the seven Photon Solar projects were presented to DP&E, including Suntop.	- Substation location - Traffic – potential traffic through Wellington and the potential for a mustering point in Wellington. - Cumulative Impacts.	It was discussed with DP&E that SSF would address council's advice to locate the substation away from Suntop Road, to minimise visual impact. pitt&sherry updated DP&E on the ongoing discussions with council and the traffic impact specialist around the potential for road upgrades. After consideration of potential mustering points, it was decided to exclude B doubles so there is no need for a mustering point. DP&E also raised that they require each specialist report to address cumulative impacts, specifically relating to multiple solar projects being constructed in the region.
	14/02/2018	Meeting Update of progress on each property. Including Suntop.	General project update.	Information regarding key issues i.e. traffic and road upgrades
Roads and Maritime Services	October 2017	Phone calls & Emails Ongoing RMS Manager of Land Use Assessment	- Impact of construction through truck movements on the road network - Access to the property - Intersection performance, specifically upgrades required for Renshaw McGirr Way and Suntop Road - Potential reflection of the solar panels causing driver nuisance	The potential transport route was assessed in Traffic Impact Assessment (TIA). It is considered the potential traffic impact on the Mitchell Highway and Renshaw McGirr Way will be minimal. Refer to Appendix H for the TIA. Access to the property via local roads was discussed with Dubbo Regional Council on multiple occasions (Appendix G). The intersection between Renshaw McGirr Way and Suntop Road has been discussed with Roads and Maritime and Dubbo Regional Council, proposed upgrades are outlined in Appendix H.

Stakeholder	Date	Details of Engagement	Key Aspects	Outcomes
			- Driver code of conduct, and protocol for drivers travelling long distances to and from site (driver fatigue) - Impact on road safety, including to pedestrians, cyclists and any bus routes impacted. - Details on road upgrades or Road Safety Audit if required.	Due to the distance from Suntop Road, reflection causing a nuisance to drivers is not considered to be an issue. A traffic management plan will be developed as part of the CEMP. The driver code of conduct is provided in the TIA (refer Appendix H). It specifically addresses driver fatigue management and hours of vehicle movements. Following consultation with Dubbo Regional Council & the community, SSF are assessing the feasibility of vehicle movement exclusion times during school start/ends times. A Road Safety Audit has not been identified as being required for this proposed development.
SES Macquarie Headquarters	03/05/2018	Letter Requesting a response to proposed development (see Appendix G).	Review the potential development impacts on community emergency management arrangements for flooding.	No response from SES has been received as of 7/5/18.
OEH	Ongoing	Phone calls Heritage specialist liaised with OEH to inform Aboriginal consultation process and outcomes. Phone calls Pitt&sherry discussed with the North West Regional operations Division of OEH to request the removal of All conditions under the	- Aboriginal cultural heritage items have the potential to occur on site - Water (potential impact on hydrology and water quality) and soils (potential for acid-sulphate soils) - Flooding – impact of the proposed development on existing flood behaviour	The Aboriginal Heritage specialist has addressed concerns raised by OEH. Aboriginal Heritage Impact Assessment, located in Appendix E of the EIS. Section 6.7 and Section 6.8 of the EIS addresses the proposed developments' potential impacts and mitigation methods for hydrology and soils. pitt&sherry confirmed with OEH Senior Conservation Planning Officer that Sections 10 – 14 (Attachment A Standard Environmental Assessment Requirements) would not be required for the Suntop Solar EIS. Correspondence is provided in Appendix G.

Stakeholder	Date	Details of Engagement	Key Aspects	Outcomes
		'Flooding and Coastal Erosion' section of Attachment "A" Standard Environmental Assessment Requirements (27/02/2018)		
DPI Wellington	Ongoing	Phone DPI Wellington: Asked for comment on salinity issues in district.	Impact on change of land use to salinity.	pitt&sherry contacted the Principal Salinity Officer at DPI – Wellington. Commented that if the site is sown to improved pastures and actively grazed, this would have a positive impact on salinity levels in this area.
Water NSW (Dubbo Office)	Ongoing	Phone Advice surrounding existing Bores on site	Bore location on site, and potential for new Bores to be drilled in adjacent property.	Discussions with the Water Regulation Officer confirmed that the three bores identified by pitt&sherry were the only registered bores near the proposed site location.
RFS	22/11/2018	Bushfire impact specialist consulted with the RFS, to be advised on fire history, resources, mitigation measures and fire suppression.	- Grass/cropping fire impacts - Potential hazards to firefighters - Vehicle access and defensible space - Impacts on community emergency management arrangements	The Bushfire specialist has addressed concerns raised by RFS during consultation within the Bushfire report, Appendix F . The contact with RFS was via phone and face to face at their Office.
TransGrid	09/10/2017	Meeting Pitt&sherry met with TransGrid to discuss substation design	- Location of the substation - Capacity of the current infrastructure to receive proposed volts - Cumulative impacts	Continual engagement with TransGrid, has allowed for them to provide input throughout the design process. This has mitigated the potential for the final solar farm design to not align with the expectations of TransGrid.
	17/10/2017	Letter Request for Information		
	24/10/2017	Letter TransGrid response to RFI		
		Multiple Emails		

Stake holder	Date	Details of Engagement	Key Aspects	Outcomes
		Were exchanged as further information as required		
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 unofficial email response on 22/01/2018, saying there are no concerns with the proposed development. Refer to Appendix G .

5.4 Dubbo Regional Council

SSF and pitt&sherry have held four 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
- Attended by representatives from Photon Energy only.

23 November 2017

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

6 February 2018

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

30 April 2018

- Musarrat Khan – Senior Development Engineer.

Table 5-2 includes the key concerns raised by Dubbo Regional Council from their response to the SEARs and subsequent consultation.

Table 5-2 Key concerns raised by Dubbo Regional Council during consultation

Key concern	Outcome of Engagement
Identification of all safety concerns for all proposed routes.	Assessment of all proposed routes have been provided in the Traffic Impact Assessment (TIA), Appendix H . There have been multiple iterations of the TIA to incorporate council and Roads and Maritime feedback. A key outcome of this

Key concern	Outcome of Engagement
	discussion has been the proposed upgrade of the intersection of Renshaw McGirr Way and Suntop Road. The concept design is located in Appendix H .
Degradation of the condition of Suntop Road due to increased traffic.	A dilapidation survey of Suntop Road will be carried out before construction.
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 Wellington and be transported to site each day. The Council Economic Development Officer discussed opportunities for involved local industries through industry breakfasts. SSF will participate in these to source local contractors and labour.
Sourcing skilled workers. Potential opportunities for sponsorship in workforce training programs.	SSF is coordinating with the Economic Development Officer at Dubbo Regional Council to understand how to best engage with the local community on future employment opportunities. Photon has engaged Skillset and coordinated with the Infrastructure Capability Network on other projects in the State, and intends to follow this process if the proposal is approved.
Noise and dust during construction	Dust mitigation has been addressed within the Traffic Impact assessment, Section 6.5. Noise impacts and mitigation measures have been assessed in the Noise Impact Assessment in Section 6.4, Appendix I. 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.
Substation and panel locations	Dubbo Regional Council expressed their favour in the substation location positioned on the western boundary away from Suntop Road, to minimise visual impacts. The council also suggested that panels are not installed on the ridges of hills located within the Site. In response to this, the substation was moved to the south west side of the property. A new access road will be constructed for trucks transporting materials and maintenance crews. Some parts of the ridge line will be excluded from panels although a construction and parking area will be temporarily used that is on a ridge line.
Vegetation screening located on road verge	Notification and request for comment on verge planting was raised on 27/04/2018 to Musarrat Kahn, who suggested contacting the Manager of Horticultural Services. Request for comment was sent to the Manager Horticultural Services at Dubbo Regional Council on proposed planting of sections of the Suntop Road verge (07/05/2018). Follow up phone call was made 12/05/2018, and over the phone advice received. Awaiting a written response as of 24/05/2018.

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 in Table 5-3 below.

Table 5-3 Moderate concerns raised by Dubbo Regional Council through consultation

Concern	Outcome
Location of shipping containers visible from Suntop Road	Shipping container location will be located at the construction laydown area (Figure 3-9). This area is located approximately 150 – 200m away from Suntop Road and is located behind a slight ridge line. This is a temporary construction area and will be removed after the Proposal is built.
Construction traffic impact on the local School bus run.	Council had been contacted by community members voicing their concerns regarding heavy vehicles driving the same route as the local school bus during construction. SSF has agreed to minimise truck movements through these periods.
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 Impact Assessment Report, Appendix F .

5.5 Aboriginal Consultation

The Wellington Local Aboriginal Land Council (WLALC) completed a site inspection on 26th February 2018, and again on 14th May 2018 with Matthew Kelleher from Kelleher Nightingale. The WLALC identified a mature tree within the study area that has cultural significance to local Aboriginal people. The survey also identified two archaeological sites situated within the central eastern part of the proposed site along the creek line. These items are not located within the proposed works footprint. The WLALC had no objections to the proposed solar farm development provided that impacts are avoided to the identified archaeological sites and the culturally significant tree. The Heritage Impact Assessment is discussed in Section 6.2.

5.6 Mineral Titleholders Consultation

As requested by DP&E in the SEARS, Table 5-4 outlines the engagement outcomes of consultation with potentially impacted exploration licence holders, quarry operators and mineral title holders. Lachlan Resources Pty Ltd was identified as a potentially impacted exploration licence holder, as their licence EL8463 intersects a section of the Proposal, see Figure 5-1-1.

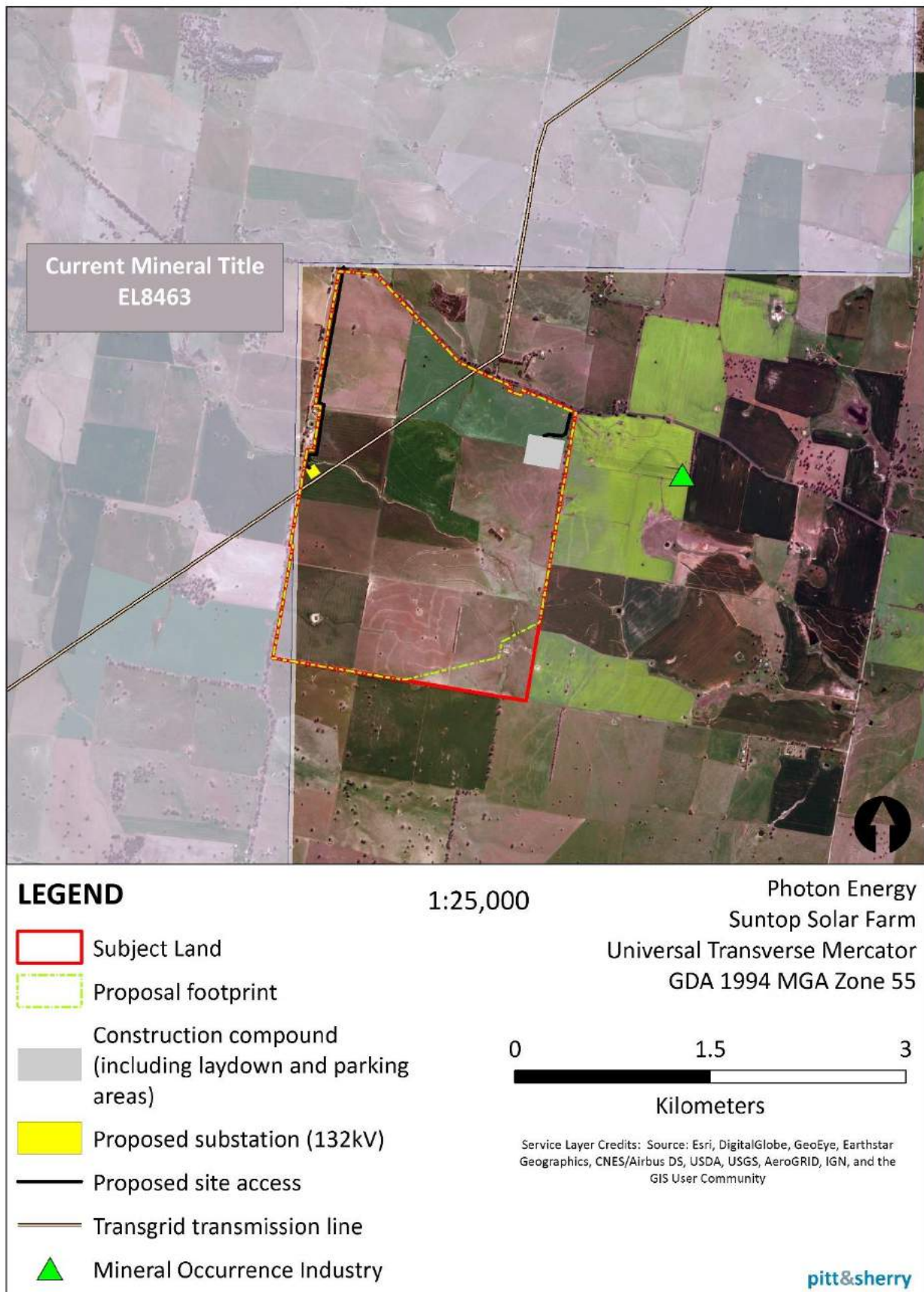


Figure 5-1 Location of Mineral Title boundary intersecting the Site

Table 5-4 Engagement outcomes of consultation with potentially impacted mineral title holders

Title Holder	Outcome of Engagement
Lachlan Resources Pty Ltd	Attempts to contact Lachlan Resources revealed that the company had been acquired by KPMG. pitt&sherry contacted KPMG (15/11/2017), who explained that Lachlan Resources is going through a DOCA (Deed of Company Arrangement). This will be finalised in January 2018, upon finalisation the assets of the company will be owned by 'Ascent capital'. pitt&sherry sent an email to Ascent Capital (29/11/2017) asking for comment on the proposal, see Appendix G. pitt&sherry contacted Ascent Capital on 16/05/2018 to reveal that a different company Emmerson Resources Ltd now held the licence. Emmerson Resources were contacted on 17/05/2018, and have provided a letter response outlining that they see no impact on any of their current or future proposed activities (Appendix G).

5.7 Community Engagement

The CSEP documents the methodology for community engagement in Table 6, see **Appendix G**. During the progression of the Proposal, the engagement methodology was adapted to maximise outcomes. Table 5-5 provides a summary of the engagement conducted to date across multiple communication platforms, highlighting concerns. Figure 5-2 provides indication of the sensitive receivers consulted with during this process.

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 30th of August 2017
 - Attendance register allowed for the collection of contact details for interested community members, for future direct updates
 - 21 attendees at the community meeting provided their contact details
 - From this list, contact details for six out of the nine sensitive receivers identified as moderately visually impacted or above were obtained. This allowed for one on one meetings with these receivers to be organised. Other receivers identified were contacted via letter drop.
 - The list of community members who attended the original meeting on 30th of August, were overlaid with the sensitive receivers from the visual assessment. This then gave a more accurate reflection of the residents potentially impacted by the proposed development and those interested in the proposed development
- Updates provided by the Suntop Solar website (<http://www.photonenergy.com.au/current-projects/suntop-solar-farm/>), and the option for contact through the website as well as a dedicated hotline (1300 881 045), also allowed for interested community members to voice their queries and/or concerns
- pitt&sherry contact details were provided during one on one meetings with impacted receivers (listed in Table 5-6). These contact details have since been shared with community members through word of mouth, offering the community another mechanism to provide input
- Development of a project update. Copies of this were given to residents, as well as emailed to community members who have provided their contact details to receive updates (**Appendix G**).

Table 5-6 provides a detailed summary of the concerns raised for each of the sensitive receivers visited during one on one consultation (5th – 6th February 2018). Table 5-7 provides a detailed summary of the second round of one on one consultation conducted 30th April – 1st May 2018. During this round of consultation

photomontages, a draft landscape plan and an updated site footprint were provided for discussion with the sensitive receivers.

Over the course of the consultation period to date, 21 community members were present during the community consultation, 24 residents within the locality of the site were contacted either through letters, emails or phone calls, and 6 neighbouring residents (4 land owners) have participated in a group or one on one meeting. A summary is provided in Table 5-5.

Table 5-5 Summary of community engagement performed to date

Stakeholder	Communication method	Date	Community Responses
General Community	Newspaper Advertisement	30/08/2017	One advertisement has been posted by Photon Energy in the Wellington Times. The post invited members of the community to participate in the community meeting to be held the evening of the 30 th August.
General Community	Community Meeting Arthurville Rural Fire Station	30/08/2017	21 local residents attended the initial meeting. A presentation was given by SSF on the proposed development. Feedback from the residents included questions around use of B-Double trucks during school bus pick up and drop off hours. Meeting Minutes are provided in Appendix G .
Adjacent Landholders	Email	24/01/2018	Request for meeting was sent to sensitive receivers 1, 3 and 6, who had provided their contact details at the community meeting (Figure 5-2). A response was received by receiver 6 to organise a meeting time.
		25/01/2018	Response received from receiver 1 to confirm meeting time.
		1/02/2018	Request for meeting sent to receiver 4.
		5/02/2018	Rescheduling of meeting for receiver 1, due to clash with council proposed meeting time.
		6/03/2018 – 8/03/2018	Notification sent to receivers 1, 2, 4, 6 of Geotechnical survey occurring on site during the week of the 13 th March 2018.
		12/03/2018 – 13/03/2018	Receiver 1 request for clarification on updates made to the proposal. Raised concern that the wider community needed further information. Request for meeting sent to receivers 1, 2, 4, 6 for proposed site visit during 22 – 23 rd March. Response received by receivers 1 and 6 to confirm times.
		20/03/2018	Apologies sent to receivers 1, 2, 4, 6 for no longer being able to attend meeting, with aim to re-organise after Easter Break.
		23/03/2018	Project update emails sent to receivers 1, 2, 3, 4, 6 as well as all community members who registered their emails during the community meeting. This included an attached update, provided in Appendix G .

Stakeholder	Communication method	Date	Community Responses
		16/04/2018	Receiver 1 enquired about site progress. pitt&sherry responded with new proposed dates for rescheduled meetings.
		19/04/2018 – 24/04/2018	Request for meetings sent to receivers 1, 2, 4, 6. Meeting times organised with receivers 1 and 6.
		3/05/2018	Summary of one on one meeting notes sent to receivers 1, 4 and 6.
Adjacent Landholders	One on One	06/02/2018	Photon and pitt&sherry met with sensitive receiver 6, 2, 4, and the landowners for receiver 1. Table 5-6 provides a detailed summary of the concerns raised by these receivers.
		01/05/2018	Photon and pitt&sherry met with sensitive receivers 1, 4, and 6. Table 5-7 provides a detailed summary of the concerns raised by these receivers.
Adjacent Landholders	Letter	20/12/2017	A letter was sent to all registered attendees (21) of the community meeting detailing a project update. This letter included a summary of work achieved to date, as well as an anticipated timeline for the next steps in accordance to the approval pathway. Letter provided in Appendix G .
		24/01/2018	Letters sent to receivers 2, 5 and 7 requesting meeting for week of the 5 th of February.
		01/05/2018	Letter sent to receiver 5 and 7 notifying them that their property has been included in the noise assessment and that we would like to discuss the outcomes of the assessment. No response was received by either receiver.
Adjacent Landholders	Phone Call	22/11/2017	Photon contacted receivers 8 and 9 to introduce Photon Energy and the proposed Suntop Solar Farm. Explained that visual consultants had identified their property and homestead as a potential sensitive receiver being impacted visually. Both receivers did not express any concerns regarding the Proposal.
			Photon received contact details for receiver 7 through the landowner of the Site. Photon attempted to contact receiver 7 leaving a voicemail and follow up text message describing the proposal and requesting if further information is required. No response was received from receiver 7.
		31/01/2018 – 01/02/2018	pitt&sherry contacted receiver 2, 3 and 4 to follow up from email request for meeting. Receiver 3 expressed that they had no concerns with the development and were content to not have further discussions. Receiver

Stakeholder	Communication method	Date	Community Responses
			2 expressed no concerns with the development. Receiver 4 organised a meeting time to discuss further.
		06/02/2018	pitt&sherry received a call from receiver 2, expressing that they would like a meeting and scheduled a time for a discussion.
		13/03/2018	pitt&sherry contacted receiver 1 to follow up email exchange regarding wider community consultation.
		15/03/2018	pitt&sherry contacted receiver 4 to confirm a meeting time.
		20/03/2018	Receiver 2 contacted pitt&sherry to receive update on the meeting that was then rescheduled.
		19/04/2018 – 24/04/2018	pitt&sherry contacted receiver 2 to confirm the rescheduled dates, left voicemail.
		26/04/2018	pitt&sherry contacted receiver 3 to provide an update on the proposal, and inform receiver 3 that their property is likely to experience a slight increase in noise (from 45dB to 51dB) during the construction period. Receiver 3 thanked pitt&sherry for the call but did not express any concern with the new information.
		30/04/2018	Receiver 2 contacted pitt&sherry to confirm that they did not require a second meeting, but would like to remain updated on the project.
		23/05/2018	Pitt&sherry contacted receiver 9 to ask for an email address, such that the receiver could be notified on when the public exhibition period begins. Receiver 9 made note that they do not believe they were contacted before this point, and provided email address to ensure they receive updates.

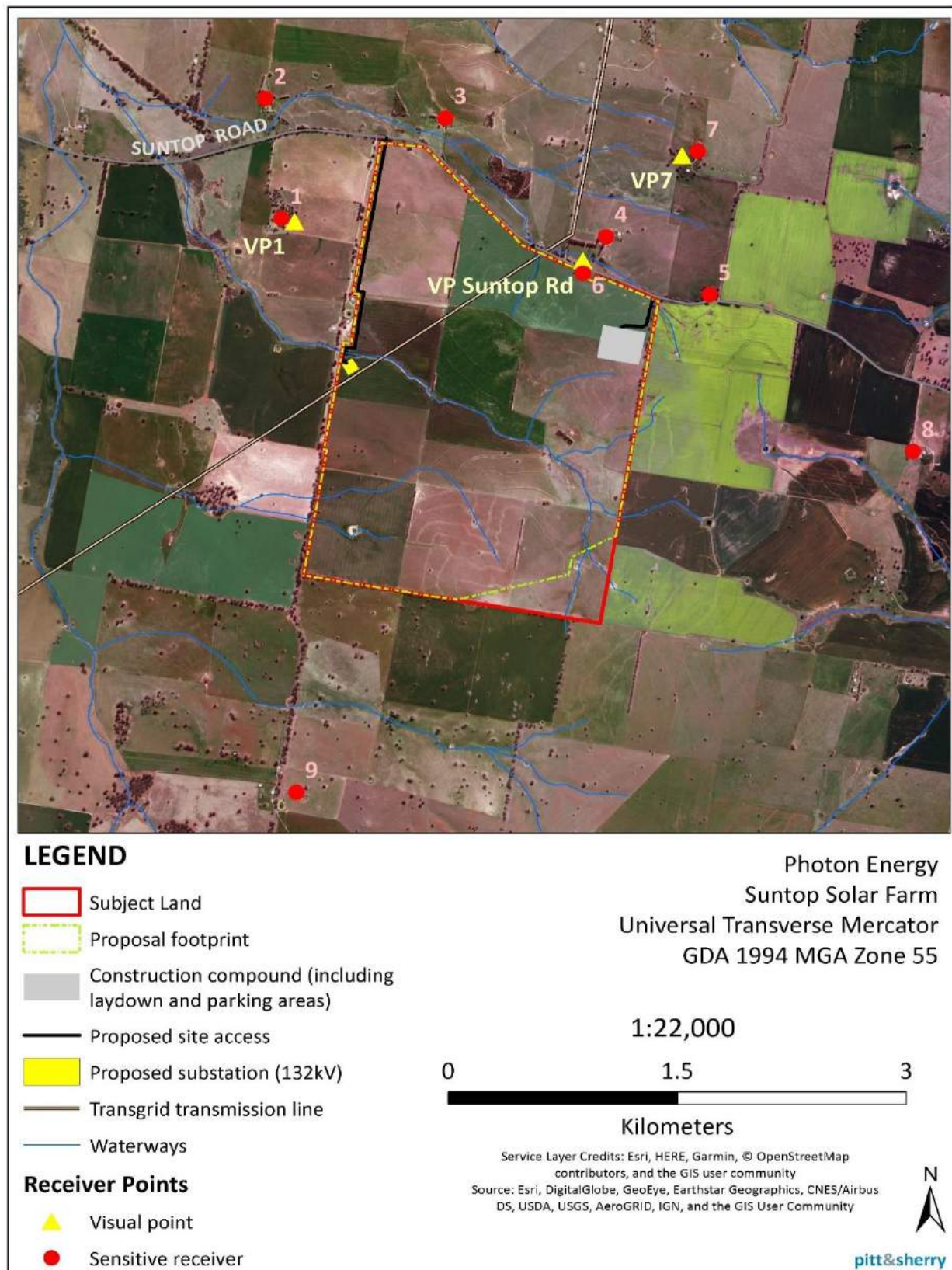


Figure 5-2 Location of sensitive receivers identified through community consultation

Table 5-6 Detailed summary of one on one consultation with sensitive receivers conducted 5th – 6th February

Sensitive Receiver	Concerns Raised
6.	Visual: Resident expressed concern around visual impacts. Vegetation screening as a form of visual mitigation and dust control was discussed, and resident expressed that they would be interested in screening. Noise & Traffic: Resident expressed moderate concern for the noise of the proposed development as well as the increase in heavy vehicle traffic. It was discussed that a noise impact assessment and traffic impact assessment are being undertaken and that pitt&sherry will update the resident with the outcomes during the second round of consultation.
1.	Property owners of receiver 1 currently have tenants in the residence but live locally. Water supply: Residents expressed concern that access to the shared easement for the water supply located on the proposed site would be restricted during construction and the pipes may be broken through construction impacting on their water supply. Access road: Residents and the current landowner for the Site have an agreement in place to share the existing access road running along the western edge of the Site. Expected increase in traffic to the access road may impede on their agricultural practices, including moving stock. They also expressed concern regarding degradation of the access road condition. Visual: Residents are very concerned about the visual impact of the development on their outlook. Vegetation screening as mitigation was discussed. Power supply: Residents receives their power from infrastructure located on the Site. Concern was raised that construction may interfere with access to this power. Traffic during construction: Residents expressed concern regarding the frequency of heavy vehicles on Suntop Road, and how that will impact dust, road quality and the school bus run. Substation location: Residents expressed their preference for the substation to be located towards Suntop Road. They were not in favour of the proposed substation location located on the western border of the Site. Glint / glare from the panels: Residents expressed concern regarding the glare on from the panels during different parts of the day. Overall residents expressed that they were not supportive of the proposal.
4.	Substation location: Resident expressed their preference for the substation to be located away from Suntop Road. Local employment: Resident was interested in understanding employment opportunities. Overall resident expressed that they were not concerned with the proposal.
2.	Visual: Resident expressed concern around visual impacts from the road, rather than the property. Vegetation screening as a form of visual mitigation and dust control was discussed, and resident expressed that they would be interested in screening. Substation location: Resident expressed their preference for the substation to be located away from Suntop Road.

Sensitive Receiver	Concerns Raised
	Resident expressed that they would like to be kept informed about when the public exhibition period opens.

Table 5-7 Summary of one on one consultation with sensitive receivers conducted 30th April – 1st May

Sensitive Receiver	Concerns Raised & Discussed
6.	Visual: Resident was shown the photomontages taken from two angles at the front of their property. Resident was pleasantly surprised by the distance the panels now were from their house (150-200m) rather than at the border of their fence. The resident expressed after discussing the landscape plan, they were happy to have the vegetation screening within Sensitive Receiver 6 boundary. Ongoing engagement is required through the detailed design period to discuss species selection and program for planting (subject to approval). Site access: The resident was shown the updated Site footprint including the access road located to the east of their property, where the proposed construction laydown area would be. The resident expressed that they were not overly concerned with the proposed access route due to the dense vegetation they had on the eastern border of their property. Noise & Traffic: Outcomes from the noise impact assessment were shared with the resident. It was explained that there would be a slight audible increase in noise during the construction period (12 months) but would not be heard over ambient noise during operation. Overall the resident was pleased to hear that the substation location was away from their property, and that the vegetation screening proposed would mitigate most of their view of the Site.
1.	Insurances: Residents raised concern regarding insurance implications in case they start a fire due to normal agricultural operations. Photon agreed to discuss with their insurance company. The Residents would like some certainty around legal obligations. A Bushfire Assessment was completed as part of the EIS. This includes Asset Protection Zones (APZ's) to minimise risk. Refer to Appendix F. Water supply: Residents expressed concern that access to the shared easement for the water supply located on the proposed site would be restricted during construction and there was a risk that the pipes may be broken, limiting their water supply. Photon responded by offering to take reasonable measures to locate an adequate water supply on the residents' property, such that they did not have to rely on the existing bore. Residents were also concerned about salinity issues being transferred from the proposed site to their agricultural land. Access road: Following on from the meeting in February, Photon has assessed the access to the property and have completed a concept design for a new access road to run in parallel to the east of the existing access road. The new access road would cross into the existing access road at the back of the farm sheds and cross the dam. This is designed to allow access to the substation for construction and maintenance purposes.

Sensitive Receiver	Concerns Raised & Discussed
	The residents expressed that they were unhappy with this proposal as it will still interfere with moving stock. The design of the new access track will be completed through detailed design. This will include further discussions with the landholders on the frequency and duration of stock movements to minimise conflict. Visual: Residents are very concerned about the visual impact of the development on their outlook. Photomontages were shown to the residents, they expressed their concern regarding the availability of water to maintain vegetation screening. Traffic during construction: Residents expressed concern regarding the frequency of heavy vehicles on Suntop Road, and how that will impact dust, road quality and the school bus run. It was discussed that the results of the traffic impact assessment are being review by Roads and Maritime and Dubbo Regional Council. As documented in the Traffic Impact Assessment, SSF will attempt to minimise truck movements in key school drop off and pick up times (Appendix H). Substation location: Residents expressed their extreme disappointment and dissatisfaction with the location of the substation due to the visual impact. Overall the residents do not approve of this proposal.
4.	Visual: Resident was shown the photomontages taken from a viewpoint on Suntop Road, in front of their property. It was explained that discussions with the council would be undertaken to seek approval for planting on the public road verge to mitigate view of the solar panels from the road. Site access: The resident was shown the updated Site footprint including the access road located to the east of their property, where the proposed construction laydown area would be. The resident expressed that they were not concerned with the proposed access route. Noise & Traffic: Outcomes from the noise impact assessment were shared with the resident. It was explained that there would be a slight audible increase in noise during the construction period (12 months) but would not be heard over ambient noise during operation. Local employment: Resident was interested in understanding employment opportunities. It was explained that if the proposal is approved, SSF would work with local contractors and agencies to hire locally wherever possible. Overall, resident did not express an objection to the proposal.

5.8 Media

Two articles featuring the Suntop Solar Farm were published by the Wellington Times during preparation of the EIS, dated 30/10/2017 and 30/12/2017.

Community members also expressed their opinions on the proposed development through social media platforms, such as Facebook and the Suntop Solar Farm website (<http://www.photonenergy.com.au/current-projects/suntop-solar-farm/>)

5.9 Summary of Actions

Table 5-8 below outlines the actions taken to date as a response to the concerns raised by Suntop community members during consultation. As consultation is an ongoing process, actions will continue to be performed during the remainder of the submission process.

Table 5-8 Summary of actions taken to date to address key concerns raised

Concern	Actions	Response to key issues
Visual Impact	Following the February one on one consultation, Photon commissioned four photomontages to be completed. Photomontage locations were chosen in consultation with the sensitive receivers to ensure accurate representation of impact. During the April/May one on one consultation photomontages and proposed vegetation screening landscape plans were shown to receivers. The proposed solar footprint was revised to reduce the number of panels located on high points across the site. Solar footprint was shifted 150-200m away from the property boundary parallel to Suntop Road, reducing visual impacts. Location of the substation was changed reducing the visual impact of multiple residents on Suntop Road, as well as the wider community who uses the road.	Refer to the Visual Impact Assessment in Appendix C. Visual mitigation is being proposed by landscape screening. This is documented in the landscape plan, as a part of the Visual Impact Assessment. Consultation will be sought from neighbouring residents during the detailed design if the proposal is approved.
Road condition & upgrades	A copy of the Traffic Impact Assessment (TIA) was sent to Dubbo Regional Council for review. Council sent the TIA to Roads and Maritime for comment. Roads and Maritime commented that they did not support a temporary reduction in speed limits and an intersection upgrade was likely required.	An intersection upgrade for Renshaw McGirr Drive and Suntop Road is now proposed. The concept design can be found in Section 6.5.
Construction Noise	Consultation with sensitive receivers prompted a review of the Noise Impact Assessment, to ensure concerns raised have been addressed. Receivers 1, 3 -6 were identified as having an audible noise increase during the construction period. It should be noted that pile driving for geotechnical reasons was undertaken in	The Noise Impact Assessment has addressed concerns through implementation of construction restrictions such as strict operating hours. See Appendix I. The potential noise impact was discussed with Receivers 1-6.

Concern	Actions	Response to key issues
	mid-March 18. The residents were sent an email to inform them of the works. There was no commentary about noise or other impacts associated with the pile driving when completing the one on ones.	
Air Quality: Construction Dust	Consultation with sensitive receivers prompted a review of the Traffic Impact Assessment, to ensure concerns raised have been addressed.	The Traffic Impact Assessment has addressed concerns through ensuring a water truck to be on site to wet down construction area, if required. See Appendix H
Traffic during construction: Trucks along the local roads during school bus pick up and drop off times.	Consultation with sensitive receivers prompted a review of the Traffic Impact Assessment, to ensure concerns raised have been addressed. SSF is considering putting in restrictions to vehicle operation hours between school pick up and drop off times.	The Traffic Impact Assessment has addressed concerns through ensuring vehicles are required to access the Site within standard construction hours. See Appendix H SSF will make all reasonable attempts to minimise truck movements during school pick up and drop off times.
Bushfire risk: Equipment in use during construction, and/or operational electrical infrastructure causing a fire	Consultation with sensitive receivers prompted a review of the Bushfire Impact Assessment, to ensure concerns raised have been addressed. Bushfire impact specialists have consulted with the RFS to be advised on fire history, resources, mitigation measures and fire suppression.	The Bushfire Impact Assessment has addressed concerns through implementation of an asset protection zone of 15m. A buffer around the solar footprint boundary will also be required, as well as equipment on site for fire protection. See Appendix F .
Local Employment	Discussions with the Dubbo Regional Council and the community prompted a review of the Socio-economic and Property Chapter in the EIS (Section 6.12). SSF will endeavour to employ local contractors and labour, utilising the Local Contract Network and Skillset.	The Socio-economic and property chapter has addressed local employment opportunities through ensuring the Proponent commits to liaising with local industry representatives to maximise the use of local contractors, manufacturing facilities and materials
Site Access	Photon worked with the property owner of the Site, as well as receiver 1 to address concerns regarding the use of the current access road on the eastern boundary of the Site. It was determined that a new access road on the Site would be developed from Suntop road to the substation location.	Concept designs for a new access road to be developed can be found in Appendix H .

Concern	Actions	Response to key issues
Water Supply	Photon worked with the property owner of the Site, as well as receiver 1 to address concerns regarding access to a freshwater bore on the Site. It was determined that SSF would take reasonable measures to locate and commission an adequate water source on receiver 1's property to remove reliance on the current bore.	SSF will undertake reasonable efforts to locate an adequate water supply.

5.10 Changes in Design

Through the development of the Proposal several changes were made to optimise preliminary design and minimise impact on the local community.

These changes included:

- Relocating the substation away from Suntop Road to reduce visual impacts
- Upgrades at the intersection of Suntop Road and Renshaw McGirr Way. A concept plan can be found in **Appendix H**. The upgrades will facilitate safe access during construction and provide a long-term community benefit
- Creating a 150-200m buffer from Suntop Road to reduce visual impacts
- Reducing the number of panels located at the highest points of the Site to reduce visual impacts

5.11 Ongoing Community Consultation

SSF 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) and Suntop Solar Farm website. An email notifying the dates of public exhibition will be distributed to all community members who registered at the community meeting, as well as to the residents identified through the community consultation process.

6. Environmental Impact Assessment

This chapter introduces and describes the key environmental risks and provides a comprehensive assessment of these risks related to the Proposal.

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; as well as consultation with relevant government agencies and neighbouring landowners.

The 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 Section 6 below. 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:

- Biodiversity
- Aboriginal Heritage
- Visual amenity
- Noise
- Traffic
- Erosion and sediment control
- Bush Fire.

6.1 Biodiversity (Flora and Fauna)

A Biodiversity Assessment Report (BDAR) was completed in accordance with the Biodiversity Assessment Method (BAM) (OEH, 2017a) established under the *Biodiversity Conservation Act 2016* (BC Act). The BDAR investigated the potential impacts of the proposal on flora and fauna on the Site (refer **Appendix D**). This included information collected from field assessments of the existing flora and fauna and the potential for the site to provide potential habitat for threatened species.

The BDR was prepared by Dr Colin Bower (FloraSearch), who is an accredited assessor under section 6.10 of the BC Act (assessor accreditation number BAAS18048).

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 (Section 3); 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 scattered remnant paddock trees and several linear plantings of native trees. The total area of the plantings is 1.13ha, 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 plantings
- the paddock tree module for
 - 25 paddock trees proposed to be removed from the Site
 - Up to 10 additional roadside trees on Renshaw McGirr Way.

Database Searches

A desktop review of relevant spatial ecological datasets was conducted to identify vegetation communities mapped for the Subject Land as well as locations of threatened 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
- Commonwealth Department of the Environment (DotE) 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 Nangar Ranges Mitchell Landscape (OEH, 2018a)

Table 6-1 Mitchell Landscapes in the BDAR Footprint

Landscape Name	Percentage Estimate	Cleared	Area (ha)	Percent (%) of BDAR Footprint Covered by Landscape
Nangar Ranges	84		408.3	94.3
Macquarie Alluvial Plains	78		24.7	5.7

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 (DotE) 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 (OEI, 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 D**
- Commonwealth Department of the Environment and Energy (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 16 ecosystem credit species all being fauna species, and 14 species credit species, four flora and 10 fauna species (refer **Appendix D**). Four fauna species are dual ecosystem and credit species.

The BioNet database search returned records of one flora species, the Sandhill Spider Orchid (*Caladenia arenaria*) and one fauna species, the Glossy Black Cockatoo (*Calyptorhynchus lathamii*), close to the Site that were not identified by the BAMC.

The PMST search returned 8 potentially occurring flora species, and 21 fauna species. Assessment of these species is required to determine whether there is any obligation to refer the Proposal to the Commonwealth Department of the Environment and Energy (DoEE) under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

The total numbers of potentially occurring threatened species identified by the searches are 12 flora and 34 fauna species (refer **Appendix D**).

Commonwealth Matters of National Environmental Significance (MNES)

An EPBC protected matters report was undertaken by pitt&sherry in September 2017 (20km buffer of the development site) to identify Matters of National Environmental Significance (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 Matters of National Environmental Significance (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 Tool Results

MNES	Number of MNES identified within a 20km buffer from the subject site
World Heritage Properties	None
National Heritage Places	None
Wetlands of International Importance	None
Great Barrier Reef Marine Park	None
Commonwealth Marine Area	None
Listed Threatened Ecological Communities	2
Listed Threatened species	27 Threatened species 6 flora species 21 fauna species (6 mammals, 9 birds, 4 fish, 2 reptiles)
Listed Migratory Species	12

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 in the vicinity of the subject site.

Review of 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.

Access is via Suntop Road which runs across the northern boundary of the Site and this like many rural roads in the Wellington district is vegetated with a mix of scattered mature native trees, introduced and native grass species and common agricultural weed species. The native trees remaining along the main access corridor just outside the western boundary of the Site and along Suntop Road are mainly Inland Grey Box (*Eucalyptus microcarpa*) with some White Box and Fuzzy Box.

The native vegetation beside watercourses and on lower slopes at the intersection of Suntop Road and Renshaw – McGirr Way is dominated by *Eucalyptus melliodora* with occasional *Eucalyptus blakelyi*.

The paddocks on site have been cleared for agricultural purposes with the remaining native vegetation being limited to narrow linear plantings along several fence lines within the site, isolated scattered mature trees and narrow clumps of very scattered mature trees along the southern and western boundaries. The existing vegetation is shown in Figure 6-1. The Site and its immediate surrounds do not possess any native vegetation corridors that link to other sites and are isolated in terms of connectivity. Figure 6-2 and Figure 6-3 show the extent of previous clearing and examples of the remaining vegetation on Site.

There is an unnamed watercourse that bisects the Site in an east -west direction and this only carries water after rain events. Given the slope of the topography to the west, the creek does not have any standing ponds with inflows draining into a small farm dam near the western boundary. The watercourse is fed by several small drainage depressions and constructed grassed waterways which are connected to earth rollover banks that have been constructed to control surface water flows and reduce the erosion potential on site. None of the flowlines have any riparian vegetation growing along them while the dam has several scattered clumps of water tolerant species such as sedges and reeds growing on sections of its margin.

The above observations suggest that three Plant Community Types (PCTs) are likely to have occurred on the Site prior to its clearance (Table 2) (BioNet, 2018a). The three PCTs include:

- PCT 201-Fuzzy Box Woodland on alluvial brown loam soils mainly in the NSW South Western Slopes Bioregion
- PCT 267 - White Box - White Cypress Pine - Western Grey Box shrub/grass/forb woodland in the NSW South Western Slopes Bioregion
- PCT 266 -White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion.

All of these PCTs represent Threatened Ecological Communities, however, no structurally or floristically representative remnants of these PCTs remain on the Site.

A roadside remanent of the Box-Gum Woodland EEC dominated by Yellow Box (*Eucalyptus melliodora*) was identified at the intersection of Renshaw McGirr Way and Suntop Road.



Figure 6-1 Existing Vegetation



Figure 6-2 Existing Environment



Figure 6-3 Mature trees on boundaries of south and western corner of Site

Survey Results

The flora survey was conducted over three days on the 29th November 2017, 15th January 2018 and 8th May 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 22nd November 2017.

Areas of potential habitat value were identified and then traversed by foot. As most of the site consisted of cleared 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 small stands of native vegetation recorded on the Site are likely to represent a mosaic of these 'best fit' Plant Community Types (PCTs). In addition to this, the native vegetation being assessed is comprised of very small scattered plantings of native eucalypts, some of which are endemic to the location. The PCT which best fits the Site is listed as PCT 267 and it is considered likely to have been the dominant PCT on the Site pre-European settlement. PCT267 is listed as the flowing community:

- White Box - White Cypress Pine - Western Grey Box shrub/grass/forb woodland in the NSW South Western Slopes Bioregion.

Table 6-3 details the predicted pre- European Plant Community Types on the site.

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	201	Fuzzy Box Woodland on alluvial brown loam soils mainly in the NSW South Western Slopes Bioregion.	<i>Eucalyptus conica</i> , <i>E. microcarpa</i> <i>E. melliodora</i>	The north-western tip of the Site is mapped as part of the Macquarie Alluvial Plains Mitchell Landscape (OEHL, 2018a), which is habitat for PCT201.	<i>Fuzzy Box Woodland on alluvial Soils of the South-Western Slopes, Darling Riverine Plains and Brigalow Belt South Bioregions</i> <i>Endangered Ecological Community (BC Act)</i>
		267	White Box - White Cypress Pine - Western Grey Box shrub/grass/forb woodland in the	<i>E. albens</i> <i>E. microcarpa</i> <i>Callitris glaucophylla</i>	The three-dominant species of PCT 267 are the dominant trees remaining on	<i>White Box Yellow Box Blakely's Red Gum Woodland</i> <i>Endangered Ecological</i>

Vegetation Formation	Vegetation Class	PCT		Dominant tree species	Justification	Threatened Ecological Communities
		No.	Name			
			NSW South Western Slopes Bioregion.		and close to the Site, making PCT 267 a good fit for the lower parts of the site, excluding the north west corner.	<i>Community (BC Act)</i> and <i>White Box – Yellow Box – Blakely’s Red Gum Grassy Woodland and Derived Native Grassland Critically Endangered Ecological Community</i> (Environment Protection and Biodiversity Conservation Act 1999 [EPBC Act]).
		266	White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion.	<i>E. albens</i> <i>Brachychiton populneus</i> <i>E. blakelyi</i>	The higher parts of the Site appear to have been dominated originally by White Box with some Kurrajong.	
		277	Blakely’s Red Gum – Yellow Gum grassy tall woodland in the NSW South Western Slopes Bioregion	<i>E. melliodora</i> <i>E. blakelyi</i> <i>E. bridgesiana</i>	The native vegetation beside watercourses and on lower slopes at the intersection of Suntop Road and Renshaw McGirr Way is dominated by <i>E. melliodora</i> with occasional <i>E. blakelyi</i> best matching PCT277	

There are 28 scattered remnant paddock trees which comprise:

- Fuzzy Box (*Eucalyptus conica*) – a clump of 3 trees (not to be removed)
- White Box (*Eucalyptus albens*) – 8 scattered trees on the higher parts of the Site (to be removed)
- Kurrajong (*Brachychiton populneus*) – 2 trees (to be removed)
- White Cypress Pine (*Callitris glaucophylla*) – 15 scattered trees in the south west corner of the Site (to be removed).

There are up to 10 roadside trees that will be removed on Renshaw McGirr Way.

The remaining vegetation found in the very small planted areas on the Site range from 0.02 ha to 0.4 ha. The plantings all have very large perimeter to area ratios, being long and narrow, mostly only two trees wide, with a lack of mid-storey. The ground cover is very sparse or absent and comprises mainly exotic species.

Three introduced species regarded as High Threat Exotic weeds under the BAM (OEH, 2018a) were recorded on the Site, these being Khaki Weed, Bathurst Burr and Saffron Thistle. None of these are listed as Priority Weeds under the *NSW Biosecurity Act 2015* or as Weeds 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 habitat features were identified during the site assessment:

- Hollow-bearing trees (totalling 10 scattered paddock trees)
- Semi-permanent / ephemeral wet areas (second order stream)
- Waterbodies (including one small farm dam per paddock, varying between 0.2 and 0.5 ha in size).

A total of 26 species of vertebrate fauna were recorded during the survey and are listed in **Appendix D**. This included 21 species of bird (one of which was non-native), two exotic species of mammal, three species of reptile but no species of frog or fish.

The remaining trees within the Site are scattered and very isolated and in poor condition due to the previous and existing site disturbances. As a result, they offer little habitat to the listed species. The tree plantations on site contain mixed species and being relatively young have not developed hollows or other habitat features for threatened fauna.

Several mature Western Grey Box (*Eucalyptus microcarpa*) trees occur were recorded on the perimeter of the site. This species is regarded as a secondary food tree for koalas (OEH 2017a). No evidence was found of koalas in the trees and these trees are too remote from any other potential koala habitat which would prevent koalas being able to reach them. In addition, the remnant tree patches are quite small, highly exposed and totally surrounded by cleared paddocks.

6.1.3 Assessment of Potential Impacts

Threatened Ecological Communities

Two threatened ecological communities (EEC) may occur or are likely to occur within a 20km search area however, based on the survey results these EEC do not resemble the remnant native vegetation stands identified onsite. These native vegetation stands on site are highly disturbed with no mid-storey and an exotic groundcover. The remaining trees are in average health due to impacts associated with the high edge to area ratio of the clumps. Being long narrow stands of vegetation limits the amount of buffering and protection which surrounding vegetation can provide. This makes stands such as this more susceptible to impacts from both natural and man-made impacts.

The stands of trees on the perimeter of the Site are being retained and protected as part of the Proposal and will provide limited habitat for mobile species moving through the area. Vegetation removal is going to be limited to a number of scattered individual trees within the middle of the Site. These trees possess very limited habitat features and do not provide any value in relation to connectivity due to their isolation from other substantial areas of native vegetation. In view of this, no threatened ecological communities would be impacted by the proposal.

Remnant woodland of the Box-Gum Woodland EEC was identified at the intersection of Suntop Road and Renshaw McGirr Way and 0.04ha will be lost to achieve the proposed intersection upgrade works.

Listed Threatened Species

No threatened flora species, populations or critical habitat listed under the BC Act or the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) were identified during the Site survey, or during a fauna survey.

No suitable habitat was considered to be present on the Site for any of the threatened flora species identified by the BAM Credit Calculator as having potential to occur, and five ecosystem credit fauna species were considered to have a low potential to use the limited resources on the Site; the Little Lorikeet, Swift Parrot, Regent Honeyeater, Scarlet Robin and Flame Robin.

No credit fauna species were considered to have potential to utilise the Site owing to a lack of breeding resources and one threatened ecological community (TEC) listed under the BC Act and the EPBC Act is considered to have once occupied the Site, but this has been reduced to a few scattered paddock trees.

Additionally, no threatened fauna species were recorded on the Subject Land during the survey.

Wetlands of International Importance

The nearest wetland of international importance is over 300km upstream (Macquarie Marshes). Given the distance to this wetland, there will not be any impact from this Proposal.

Migratory species

A total of 12 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.

Three of the remnant eucalypt species on and around the Site are recognised as secondary Koala food trees (OEH, 2018e), these being Inland Grey Box, Fuzzy Box and White Box. The last of these 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 that a SEPP 44 plan of management is not required.

In addition to this, the Site already has a barrier in the form of a boundary fence and there are no historic or current observations of koalas within or near the site. The stands of vegetation are already isolated making it extremely difficult for koalas to reach them as koalas will generally not move across more than 200m of open ground. If koalas could reach the remnant areas of vegetation they would be unable to remain there long-term due to the poor condition of the existing trees.

Avoidance measures

The site survey was conducted to complete the flora and fauna impact assessment and to identify site constraints to guide detailed design. Following the site survey, the site layout has been revised to avoid impacts on the native vegetation on the northern perimeter of the site and existing narrow stands of vegetation along the southern and western boundaries. The vegetation proposed to be cleared is shown on Figure 6-4, this also illustrates the existing vegetation that will be retained along the perimeters to assist with visual screening and the buffer zones proposed along the flowlines and dams.

Specific impact avoidance measures include:

- Measures to avoid damage to patches of mature native perimeter trees on all boundaries of the Site
- Avoidance and protection of the block of planted native eucalypts
- The retention and avoidance of three Fuzzy Box trees adjacent to the northern boundary of the Site (Figure 6-5).

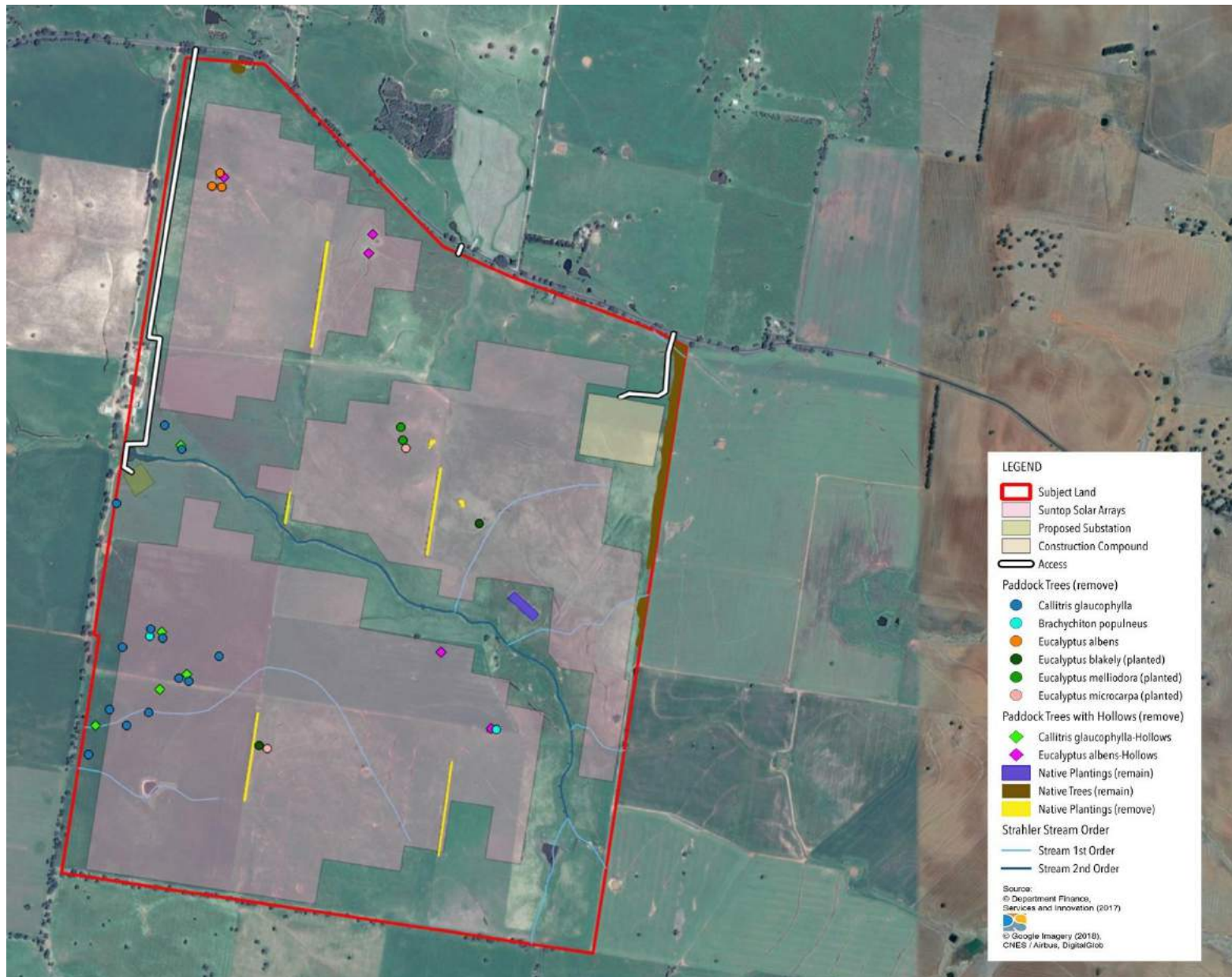


Figure 6-4 Vegetation to be cleared



Figure 6-5 Vegetation to be cleared at intersection

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
- Erosion of disturbed areas leading to sedimentation and dust affecting any downgradient habitat (see Section 6.8).

Removal of vegetation will not interfere with habitat connectivity as the trees to be removed are few in number and widely spaced. Most of the habitats within the Subject Land 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 area has been deemed to have low 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.

The main type of impact on fauna that could occur as a result of the Proposal include damage to potential water bird habitat near a dam in Lot 3 DP 506925, and damage to some of the Western Grey Box as a result of vehicle movements about the site. All of the other land to be used for the solar farm is land that has been cleared for agriculture and is devoid of woodland or native grasslands.

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 Subject Land, and have the potential to be directly or indirectly impacted upon as a result of the proposed works (refer **Appendix D**).

The seven-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.

Vegetation screening works for the proposal (refer **Appendix C**) will provide an opportunity to add biodiversity value to the Site.

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
- 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. A Weed Management Plan will also be developed as part of the CEMP to prevent unwanted vegetation becoming established on the Subject Land.

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 6.1.4.

Construction and operation of the proposal would result in the loss of:

- 1.25 ha of eucalypt plantings and 6 isolated planted native trees
 - 0.04ha of Box-Gum Woodland
 - 25 remnant paddock trees and up to 10 isolated roadside trees.
- No threatened ecological communities, populations, flora or fauna species meet the criteria for Serious and Irreversible Impacts as a result of the Project (OEH, 2018f)

Biodiversity Credit Report

The biodiversity credit report of the BAMC indicated that the plantings, which were assumed to represent PCT267 in order to run the calculator, are valued at 20 credits.

Paddock trees for removal were assessed according to Appendix 1 of the BAM (2017a), which valued them at 27.75 credits.

The total credit liability for the Project is 47.75 credits.

Offset

SSF will choose to acquit this liability of 47.75 credits by making a lump sum payment of equivalent value to the Biodiversity Conservation Trust Fund.

6.1.4 Mitigation / Management Measures

Reference	Mitigation Measures
Construction and Decommissioning Mitigation Measures	
B1	A 10-m buffer shall be established between the perimeter of the remnant vegetation stands and the works footprint.
B2	Erect barriers to protect remnant perimeter trees, planting in Paddock 12 and Fuzzy Box clump in Paddock 1
B3	The works (e.g. plant, material stockpiling) should not encroach into remnant vegetation and buffer areas.
B4	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.
B5	A Land Management Plan which will be developed (refer Appendix J) and 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.
B6	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.
B7	Speed limits should be set to 20km per hour on internal roads and tracks.
B8	A Vegetation Management Plan will be developed and incorporate tree protection measures to conserve the trees around the perimeter of the Site.
B9	Enhancement of buffer zones around the perimeter of the site to include additional planting of replacement trees for those lost due to the clearing of the paddocks
B10	Any works surrounding the dam located on the western boundary of the site will include implementation of appropriate erosion and sediment controls to prevent silt build up in the dam.
Operational Mitigation Measures	
B11	The OEMP will include: • The land management plan – which will have a procedure or plan for monitoring vegetation cover and composition and allow for adaptive management • The weed management plan – which will include weed monitoring and control • Vehicle speed limits, to reduce risk of collision with fauna • Prohibition of domestic pets on site.

6.2 Heritage

6.2.1 Aboriginal Cultural Heritage

An Aboriginal Cultural Heritage Assessment was undertaken by Kelleher Nightingale Consulting (Kelleher Nightingale) to determine the archaeological significance of the site (see **Appendix E**). A summary of the key findings of this assessment are outlined below.

6.2.1.1 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 Subject Land (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)
- *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 Subject Land
- Consultation with the WLALC
- A site inspection with the WLALC to both the Site and the intersection of Renshaw McGirr Way and Suntop Road.
- The Subject Land was traversed 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
- The development of mitigation and conservation measures in consultation with the registered Aboriginal stakeholders.

Desktop Assessment

A search of AHIMS was conducted on 5 March 2018 to identify registered (known) Aboriginal sites or declared Aboriginal places within or adjacent to the Subject Land, referred to as the study area (Figure 6-6).

The AHIMS Web Service database search was conducted with the following coordinates (GDA, Zone 55):

- Eastings: 0660300 to 0682700
- Northings: 6381900 to 6405250.

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
- Historic Heritage Information Management System (HHIMS).

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.

6.2.1.2 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. A common element that influences occurrence of sites is proximity to water. 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 over 7km 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 comprise the Arthurville (ar) soil landscape as mapped by NSW Soil and Land Information System (Murphy and Lawrie 1998:158-60). This Soil Landscape occurs on gently undulating rises and undulating low hills which are underlain by the Canowindra Porphyry and Hanover Formation. Topographically it lies between 280 and 560 metres above sea level, with slopes gently inclined at 2-6% and the local relief ranging between 20 to 80 metres. The drainage lines are approximately 1-2 kilometres apart, and colluvial and alluvial deposits are derived from the parent rock. Soils are Red- Brown Earths with some Yellow Podzolic-Solodic soils in depressions and on lower slopes. Soils consist of hard setting dark reddish-brown fine sandy loam occurring as upper topsoil (Horizon A1), overlying light yellowish-brown fine sandy loam occurring as lower topsoil (Horizon A2). Subsoils consist of reddish brown medium clays and reddish brown clays. The soils are susceptible to erosion particularly during and after cultivation or when the percentage of ground cover is low. They are well drained and slightly acidic to neutral with a variety of salts in varying levels throughout the landscape, these occur in low levels within drainage lines and depressions.

Characteristics of the Arthurville Soil Landscape indicate they would be prone to preserve archaeological material as they are hard setting sandy loams formed in situ by weathering of the parent rock material. In areas that have been subject to recent land use activities such as agricultural practices, cultural material could be moved and no longer be in its original context while not being removed entirely.

Previous land use modifications within the Subject Land include land clearing for cropping and grazing, informal vehicle tracks, cultivation, construction of dams, fences and other infrastructure such as grain silos. All of these land use practices would have displaced any possible Aboriginal cultural material and removed modified or scarred trees.

Archaeological Potential

The assessment found that whilst the regional environment provided resources, including water, flora and fauna and raw stone materials, the Site has limited water resources and it is likely that this would have made the area less attractive to Aboriginal people when more preferred sites would be located closer to the Macquarie River and its flood plain. Land clearance for agricultural purposes, including removal of trees, would have impacted on the topsoil and would have mixed the deposits, therefore possibly exposing any possible subsurface cultural material and causing a loss of archaeological context. The entire Subject Land was assessed as having low archaeological potential.

The following predictive statements can be made:

- Archaeological sites are likely to consist of open artefact scatters and/or isolated finds on the elevated, well-drained landform units, and scarred trees within areas of remnant mature vegetation
- It can be expected that 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 Subject Land and have the potential to display scars of Aboriginal origin
- Archaeological sites are more likely to be identified in areas that have been subject to less intensive disturbance

- The identification of archaeological sites is likely to be affected by 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 distance to water.

Database searches

The AHIMS search concluded that there are 47 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 6-4

Table 6-4 Frequency of site types from AHIMS database search

Site Context	Site Features	Number	%
Open Site	Modified Tree (Carved or Scarred)	17	36.2
	Artefact Scatter	9	19.2
	Restricted Site	8	17
	PAD; Artefact Scatter	3	6.4
	Grinding Groove	2	4.3
	Burial	2	4.3
	Stone Quarry; Stone Arrangement	1	2.1
	Stone Arrangement; Stone Quarry; Artefact Scatter	1	2.1
	Shell Midden; Artefact Scatter	1	2.1
	Hearth; Artefact Scatter	1	2.1
	Ceremonial Ring; Artefact Scatter	1	2.1
	Aboriginal Ceremony and Dreaming; Stone Arrangement	1	2.1
TOTAL		47	100

No previously recorded sites were situated within or adjacent to the study area. Six AHIMS registered Aboriginal sites were located within three kilometres of the study area, including modified (scarred) trees, a grinding groove site, three artefact scatters and one isolated artefact.

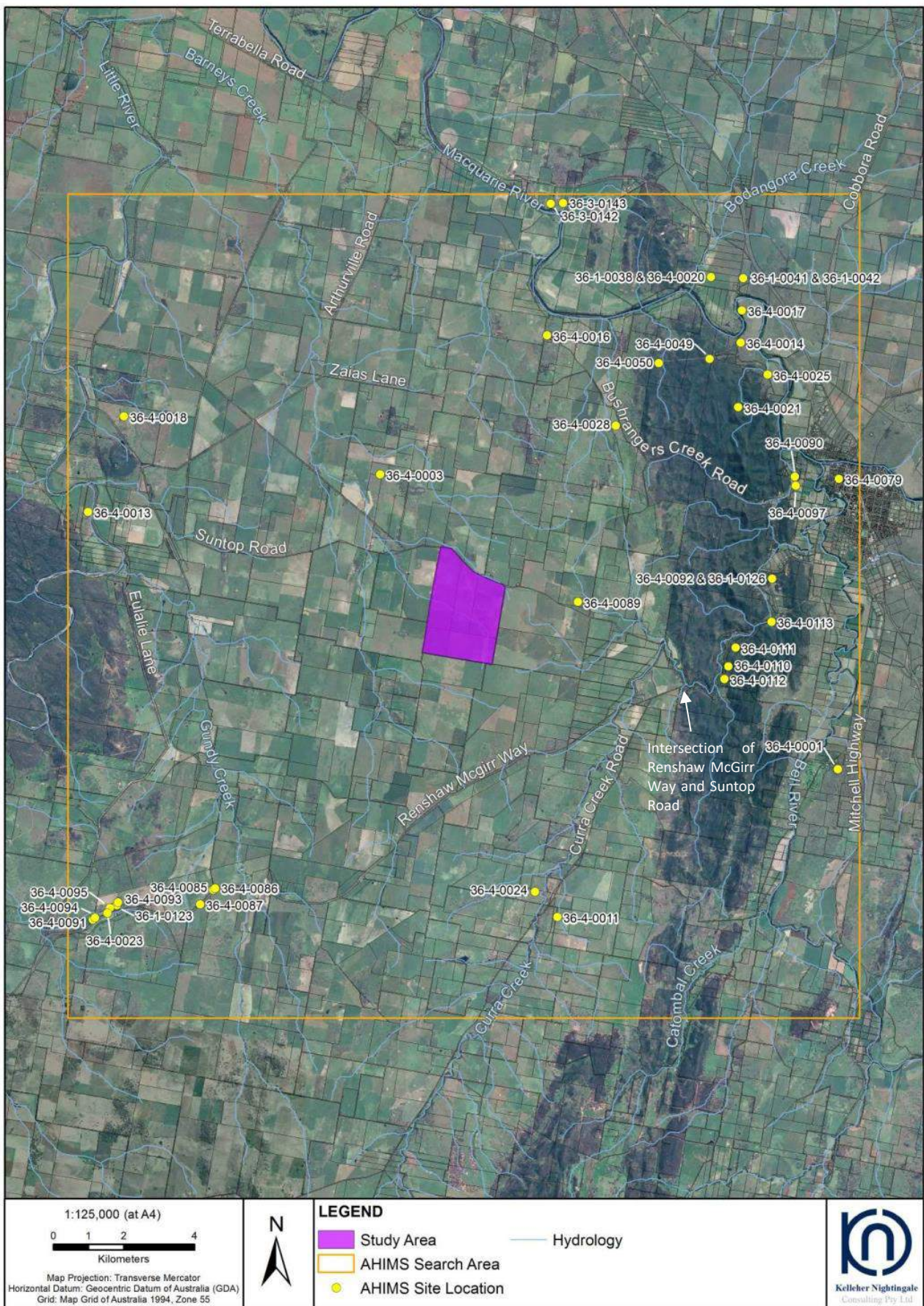


Figure 6-6 Previously recorded Aboriginal Sites

6.2.1.3 Assessment of Potential Impacts

WLALC was consulted at the commencement of the Proposal and invited to participate in a site inspection. Two site inspections were conducted, one to assess the Site on 26/02/2018, and another to assess the area for the proposed upgrades to Renshaw McGirr Way and Suntop Road, 14/05/2018. The archaeological field survey conducted by Kelleher Nightingale and the WLALC, identified three heritage sites within the study area, see Figure 6-7. The sites are all outside the Proposal footprint and will not be impacted by the proposal. The items are listed as:

- Aboriginal archaeological sites, Suntop IF 1 and Suntop IF 2, two isolated artefacts identified along a creek bank and retained within the riparian corridor; and
- Culturally significant tree as identified by the WLALC, situated outside the proposed solar farm footprint on the western boundary.

The study area exhibited low archaeological potential due to combinations of archaeologically unfavourable topography, agricultural activity and various forms of disturbance to the land. These factors indicate that there is a low probability of unexpected finds during construction particularly as landform features such as flowlines will be buffered.

Proposed works associated with the solar farm development, including intersection upgrade will not impact on identified areas of Aboriginal cultural heritage significance. The culturally significant tree will be retained in its current setting along the western boundary of the study area and the two isolated finds will be retained within the riparian corridor of the central drainage line.

Provided the identified Aboriginal archaeological sites and culturally significant tree are avoided, the proposed construction and operation of the Suntop Solar Farm and upgrade works to the intersection of Renshaw McGirr Way and Suntop Road would not impact on Aboriginal heritage. The WLALC have stated their concurrence with the Proposal as long as these sites are afforded appropriate protection and the protection measures are to be detailed in the Construction Environment Management Plan (CEMP). In accordance with the *Due Diligence Code of Practice for the Protection of Aboriginal Objects in New South Wales* the proposed activities can proceed with caution.

It is recommended that the identified site locations (Suntop IF 1, Suntop IF 2 and culturally significant tree) should be included within the CEMP for the Suntop Solar Farm. It is considered no impact to Aboriginal heritage will occur as a result of the proposed Suntop Solar Farm.

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.

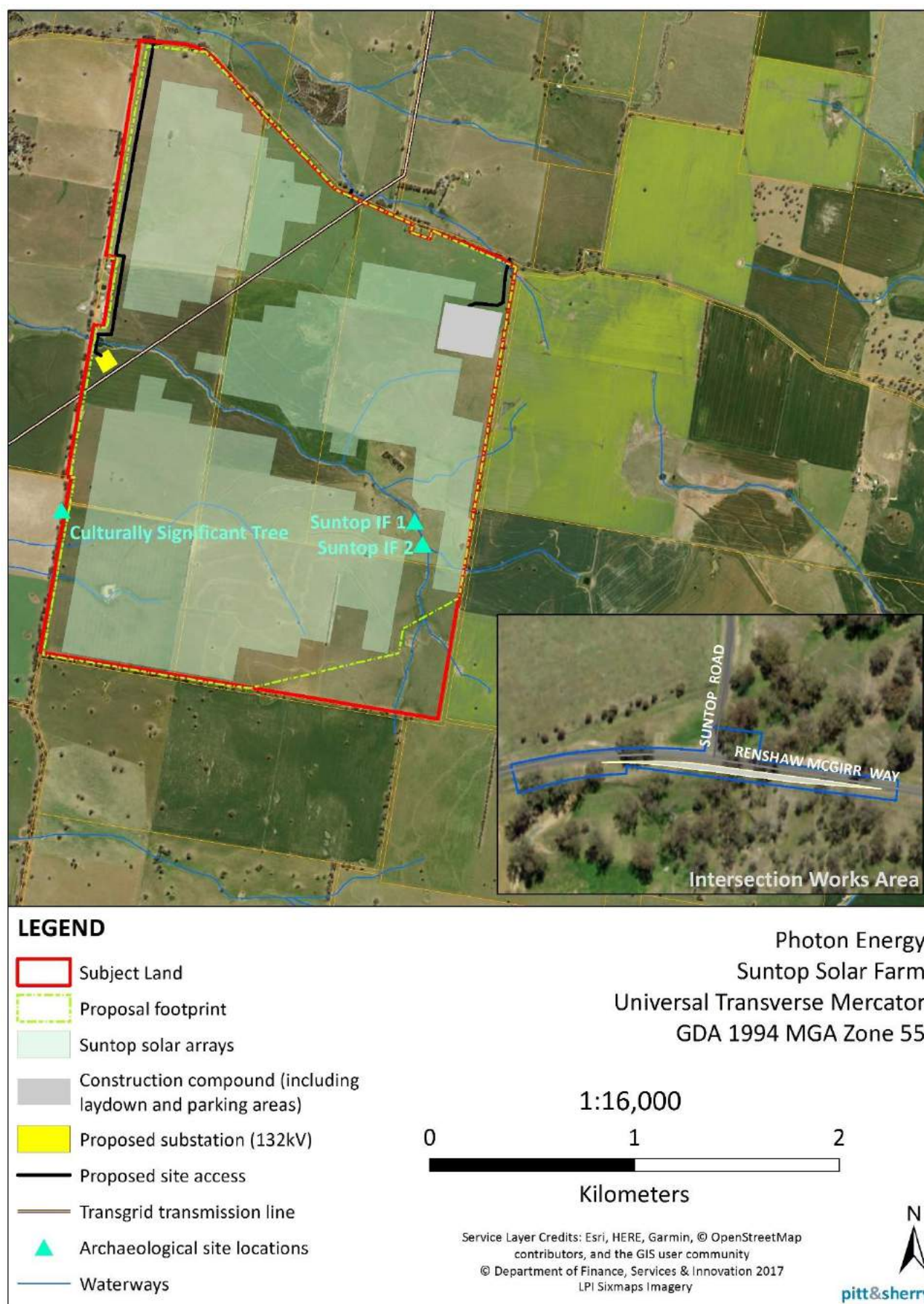


Figure 6-7 Location of Aboriginal archaeological sites

6.2.1.4 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, Suntop IF 1 and Suntop IF 2, (two isolated artefacts identified along a creek bank) and a 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 OEHL 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 OEHL may also be contacted at this time to assist in determining appropriate management.

6.2.2 Historic Heritage

6.2.2.1 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
- EPBC Protected Matters Search (World Heritage Properties and National Heritage Places).

A survey of the Site was undertaken on 22nd November 2017 by pitt&sherry to identify any evidence of structures or items that may have heritage significance. A summary of the investigations and key findings of this assessment are summarised in this chapter.

6.2.2.2 Existing Environment

The Proposal is located approximately 10km south-west from 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 reached 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 Ganai¹ 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 1340 in 1881 and mining operations had ceased in the district by 1914. The now former Wellington Shire Council was established in 1949. The region of Suntop has not been identified as historically significant, and limited information is readily available regarding its history.

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 10 km or more from the Proposal (refer Table 6-5) in the town of Wellington. The Wellington LEP lists one item in proximity to the intersection of Renshaw McGirr Way and Suntop Road.

Table 6-5 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	10.5km
NSW State Heritage Register	Wellington Convict and Mission Site	01859	Local	Curtis St Wellington	10km
NSW State Heritage Register	John Fowler 7nhp steam Road Locomotive	01867	State	9 Amaroo Drive Wellington	11 km
NSW State Heritage Register	Blacks Camp	01865	Local	University Road Wellington	13km
Wellington LEP	Mount Arthur Reservoir	I58	Local	100 Brennans Way	8.6km
Wellington LEP	Macquarie Farm – (former Wellington Police Station)	I53	Local	1 Lay Street	8.7km
Wellington LEP	Mountain View homestead	I68	Local	646 Mountain Valley Road	8.8km
Wellington LEP	Camelford Park	I67	Local	8745 Mitchell Highway	8.8km

¹ <http://www.environment.nsw.gov.au/heritageapp/ViewHeritageItemDetails.aspx?ID=5051556>

Register	Item Name	Item ID	Significance level	Location	Distance from the Site
Wellington LEP	Road Formations (Three Eras)	I17	Local	737 Renshaw McGirr Way	200m from intersection 5km for Site

The survey of the Site undertaken on 22nd November 2017 revealed no existing or relict structures or items of potential heritage significance within the Site or ancillary works areas. Historical aerial photographs of the site were unavailable.

6.2.2.3 Assessment of Potential Impacts

Database assessments and the site assessment did not identify any items of heritage significance within or near the site and one items of heritage significance near the intersection of Renshaw McGirr Way and Suntop Road.

This item (Road Formations-Three Eras) is located approximately 200m from the intersection on Lot 2 DP 519851. This is private property and would not be impacted by the proposed intersection upgrade works.

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.

6.2.2.4 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 Plant 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 <i>Heritage Act 1977</i>) and seeking advice for management of the object.

6.3 Visual

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

6.3.1 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
- ‘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 22nd November 2017.

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

1. Effect on the landscape character – the overall impact of the Proposal on an area’s character and sense of place.
2. 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 (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
- 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 Section 2.3 of the VIA (refer **Appendix C**).

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 6-6 (as adapted from Roads and Maritime, 2013).

Table 6-6 Level of Impact

Matrix of relationship between sensitivity and magnitude					
		Magnitude			
Sensitivity		High	Moderate	Low	Negligible
	High	High	Moderate-high	Moderate	Negligible
	Moderate	Moderate-high	Moderate	Low-moderate	Negligible
	Low	Moderate	Low-moderate	Low	Negligible
	Negligible	Negligible	Negligible	Negligible	Negligible

6.3.2 Existing Environment

The Site borders Suntop Road along its northern boundary with an existing 132KV transmission lines traversing the property in a roughly north-south alignment. There is an existing residence (unoccupied at present), agricultural sheds, fences, water tanks, silos and farm equipment located near the western boundary of the property which will be subdivided from the Site. The Site is located in a rural area with predominantly cleared mixed farms that provide a vista typical of the Wellington area refer Figure 6-8.

Separating Suntop and Wellington, and located approximately 5 km to the north of Suntop, is the Mount Arthur Reserve, a 2,123ha Crown Reserve set aside for Public Recreation and Environmental Protection. The Reserve lies within the northern most section of the Catombal Range and takes in three main peaks - Mounts Arthur, Wellesley and Duke - rising to 563m above sea-level. The Reserve is recognised on the Register of the National Estate for its natural values. A large portion of the Reserve has been protected in various forms since 1913.

West of the Reserve, land in the Suntop area has been developed for agricultural purposes and is primarily used for crops (wheat and canola) and grazing (sheep and cattle). Large paddocks of improved pastures, crops, rural residences, large farm sheds, stores of grain and stock feed, trucks and harvesters are common throughout the area.

Land in the vicinity is undulating. There are numerous small creeks and the nearest river is the Macquarie River at Wellington. The area can experience extremes in temperature. So far in 2017, the hottest temperature recorded has been 45 degrees and the coldest was -4.5 degrees. During harvesting, dust plumes are common.

Suntop is home to approximately 70 residents. Two local roads - Suntop Road and Renshaw McGirr Way - provide connection to the main NSW road and rail network.

The dominant background colours common to the area are the colours of the crops (seasonally changing from bright greens to pale, muted yellows), grazing pastures (light, bright greens to light browns and yellows), scattered tall vegetation (dark grey-green), soil (red-brown), surrounding vegetated ridges (soft deep blue) and occasional patches of exposed rocks (greys).

There are no local sources of large-scale artificial lights that would be associated with an industrial premises or commercial facility operating at night. Farm sheds and associated farming infrastructure are made of sheet metal, concrete or timber. Some surfaces, including galvanised iron roofs and silos, are highly reflective, while power lines and tall transmission lines cross the paddocks and run along the local roads.



Figure 6-8 Typical rural landscape around Wellington – open paddocks, scattered trees, farm structures



Figure 6-9 Typical landscape character around Wellington – scattered native trees, crops and pastures

6.3.3 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 Suntop 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 addressed in **Appendix C** 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 Proposal 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 472ha of land, on a moderately undulating landscape. It has been identified that at least some part of the solar footprint would be seen from 29 private viewpoints. Photomontages have been prepared for selected viewpoints surrounding the Site and provide an illustration of the scale of the Proposal (**Appendix C**).

Glare

The Solar PV modules proposed to be installed at Suntop are different to those used with concentrated thermal solar power which utilises mirrors to reflect the sun to one point concentrating the sunlight as they are designed to absorb the light rather than reflect it.

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 and the relatively low vehicle numbers using Suntop Road, this effect would only be visible on days during the warmer months and for a short period from vehicles passing the Site. 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.

Risks to Aviation

As the infrastructure is relatively low to the ground with the tallest structure measuring approximately 22m the development would not pose a risk to aviation. The solar facility is approximately 18km from the Wellington aerodrome and is not aligned with any other runways. 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 6-10 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 mention in the section above potential glare/reflectivity generated from on-site infrastructure towards public roads is limited.



Figure 6-10 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. There are two low rises on the southern and eastern boundaries and these areas have specifically been avoided and will not have solar panels constructed on them which will also reduce the potential for the sky lining effect to occur.

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.

The transmission infrastructure proposed for the development would increase the density of electrical infrastructure in the area. However, the Proposal would be generally consistent with existing transmission infrastructure in the immediate vicinity of the Proposal, and would largely occur in an existing electricity easement. Furthermore, TransGrid'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
- 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 is an attractive rural landscape common throughout the Central West Slopes and Plains agricultural area
- The patterning of the area is dominated by geometrical patterns and a patchwork of colours ranging from the black soils, green pasture to golden crops
- The surrounding area is sparsely populated with there being a small number of permanent residential viewers and the nearest road, Suntop Road, providing only local access to residents in this area.

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 low:

- The closest public views would be from Suntop Road, and the additional visual changes associated with the construction machinery, truck movements and a site compound would be of a short timeframe and temporary nature
- The private viewpoints located within 1km of the Site will experience visual changes associated with construction machinery and increased traffic. The location of the site compound away from Suntop road and existing vegetation screening reduces the visual impact of the temporary compound. The impact to private viewpoints located north of the Site will be highest during installation of panels within the northern area of the solar footprint
- The moderate sensitivity ranking, combined with the low magnitude of change during construction, leads to an overall low-moderate level of impact.

Due to the short term and minor nature of works associated with the intersection upgrade the potential to impact on landscape character and viewpoints is considered negligible.

Operation

Impacts to Landscape Character

During operations, there would be visual impacts to road users on Suntop Road and surrounding private properties which are assessed below. The PV panels have the potential to be a visual feature within the surrounding landscape. However, due to the height of the PV panels and the selective placement of them on Site the possibility of viewing the entire Site from an elevated view would be reduced, and therefore any change to the landscape character would not be easily perceived when viewing the landscape as a whole.

The magnitude of change to landscape character during operation is rated as moderate due to the following factors:

- The Site is on undulating terrain and is not visually prominent
- The nearest public viewpoint within 1km is Suntop Road and there are no elevated viewpoints frequented by many viewers, therefore it would not become the dominant feature of the scene in general

- Its scale and colour would produce some contrast; however, it is not substantially incompatible with the geometric 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

Public Viewpoints

The majority of the viewpoints assessed are from private residences. The closest recreational and scenic resource in the area is in the Mount Arthur Reserve and does not provide public viewing points.

The only ground-level public locations with views of the Proposal are from Suntop Road and Bennetts Road. Bennetts Road is an unsealed road providing local access to several properties to the north of Suntop while Suntop Road is the main public vehicular access through the Suntop area. Suntop Road has been assessed as a single viewpoint (VP Suntop Road), as the visual experience from the road is linear.

There would be a limited potential for views of the Proposal from aircraft using Wellington Airstrip, which is situated some 18km to the north. It is likely that some airborne viewers would find the solar (PV) farm interesting to look at, yet others may feel it reduces the quality of the landscape character. Nevertheless, it is considered that the overall visual impact would be low.

In summary, the assessment of impact to public viewpoints finds there is one public viewpoint with a moderate impact (Suntop Road).

All remaining ground-level viewpoints have a low impact rating. Visual impact from the air has been assessed as low.

Private Viewpoints

Fifty-seven potential viewing points (VP) were initially investigated during the site inspection (22 November 2017). Identification (ID) numbers were allocated to identify each viewpoint.

Access to four of the closest private properties was possible during the site inspection. For the remainder of properties, visibility was determined from the closest public access to each viewpoint and desktop analysis of aerial and topographic mapping.

Site verification determined that 29 viewpoints (of the 57 investigated) may see some sections of the proposed solar farm.

In summary, the assessment of impact to private viewpoints finds there is:

- 1 private viewpoint (VP) with a high impact (VP6)
- 3 private viewpoints with a moderate-high impact (VP1, VP3, VP4)
- 3 private viewpoints with a moderate impact (VP2, VP5, VP7).

All remaining viewpoints have a low impact rating.

Table 6-7 provides a detailed assessment of potential visual impacts from surrounding private viewpoints, with those viewpoints and the predicted visual impact level identified in Figure 6-11 and Figure 6-12. Proposed vegetative screening for visual mitigation is depicted in Figure 6-13.

Works associated with the intersection upgrade are considered to have negligible impact on landscape character and viewpoints as the intersection due to the minor nature and the introduction of standard road elements that already exist at the location.

Table 6-7 Assessed private viewpoints (all houses) and predicted visual impact levels (Source: Envisage 2018)

Viewpoints	Analysis (on base case of no landscape screening)	Distance to nearest and furthest view of panels	Approximate extent of Site potentially seen	Position in relation to panels	Sensitivity (Criteria In VIA Appendix C)	Magnitude of Change (Criteria in VIA Appendix C)	Impact level	Visual Screening Proposed (Y/N)	Revised impact Level (where relevant)
VP1 - Lot 53 DP 753238, approximately 490m from the Site boundary	In close proximity to panels The viewpoint is a private home with mostly unimpeded views A moderately large proportion of solar farm seen A side view of the panels seen Unlikely to see Substation	500m - 3.25km	Less than half (40%)	West	High	Moderate	Moderate-high	Yes Extent of panels likely to be seen could be reduced via screen planting along western boundary of the Site	Moderate
VP2 - 898 Suntop Road, Suntop (Lot 97 DP 753238), approximately 780m from the Site boundary	In close proximity to panels The view is from a private home; however, vegetation obstructs much of the view A moderate proportion of the solar farm possibly seen, although likely to be obstructed to a large degree by existing vegetation, potentially reducing the view substantially Front view of the panels seen. Potentially see temporary mirage effect Unlikely to see Substation	790m - 4km	Less than half (30%)	North-west	High	Low	Moderate	Yes Planting at the northern and western boundary would reduce views into the Site	
VP3 - 796 Suntop Road, Suntop (Lot 2 DP 983890), approximately	Is in close proximity to Site entry and panels The viewpoint is a private home with mostly unimpeded views	170m - 2km	Less than a quarter of Site (20%)	North-west front view	High	Moderate	Moderate-high	Yes Views could be reduced via screen planting along the northern 'Suntop Road' boundary	Moderate

Viewpoints	Analysis (on base case of no landscape screening)	Distance to nearest and furthest view of panels	Approximate extent of Site potentially seen	Position in relation to panels	Sensitivity (Criteria In VIA Appendix C)	Magnitude of Change (Criteria in VIA Appendix C)	Impact level	Visual Screening Proposed (Y/N)	Revised impact Level (where relevant)
160m from the Site boundary	Has a front view of the panels (therefore, more likely to experience changes in colour appearance of the panels during day and potentially see temporary mirage effect) A relatively small proportion of the Site would be seen Likely to see Substation								
VP4 – 14 Bennetts Road, Suntop (Lot 92 DP 753238), approximately 270m from the Site boundary	The viewpoint is in close proximity The panels would be viewed from the front (therefore, more likely to experience changes in colour appearance of the panels and possibly mirage effect) However, trees between property and solar farm likely to limit views A relatively small area of the solar farm would be seen Unlikely to see Substation	280m - 1.5km	Less than a quarter of Site (15%)	North	High	Moderate	Moderate - high	Yes Views could potentially be reduced via screen planting along the northern 'Suntop Road' boundary	Moderate
VP5 – Lot 51 DP 1082497, approximately 380m east of the Site boundary	The viewpoint is in close proximity However, trees between property and solar farm may limit views	420m - 1.5km	Less than a quarter of Site (5%)	North-east	High	Low	Moderate	Yes Views into the Site would potentially reduce via planting along the northern 'Suntop Road' boundary	

Viewpoints	Analysis (on base case of no landscape screening)	Distance to nearest and furthest view of panels	Approximate extent of Site potentially seen	Position in relation to panels	Sensitivity (Criteria In VIA Appendix C)	Magnitude of Change (Criteria in VIA Appendix C)	Impact level	Visual Screening Proposed (Y/N)	Revised impact Level (where relevant)
	The private home would have a front view of the panels (therefore, colour change of the panels may be noticeable and possibly mirage effect) A relatively small proportion of the Site would be seen Unlikely to see Substation								
VP6 – Lot 90 DP 657805, immediately north of the Site	Located immediately north of the Site, on the southern side of Suntop Road Although a relatively small proportion of the Site would be seen, the Proposal would occur on three sides of the property The predominant view would be of the front of the panels – colour changes and mirage effect possible from this location Unlikely to see Substation	10m – 1.5km	Less than a quarter of Site (15%)	North	High	High	High	Yes Impact could be reduced by implementing the proposed buffer between the property and the proposed solar panels to allow for a wide planting area around the property. Screen planting could be introduced on the three sides of the property bordering the Site	Moderate
VP7 – 582 Suntop Road, (Lot 50 DP 753238), approximately 950m north of the Site	Is in close proximity Would see a front view of panels over a moderately large proportion of the Site Private house in elevated position, although direct views from the house are not possible	1km - 3.25km	Less than a half of the Site (30%)	North	Moderate	Moderate	Moderate	No Planting along Suntop Road would not be seen from this viewpoint due to its elevation above the Site.	

Viewpoints	Analysis (on base case of no landscape screening)	Distance to nearest and furthest view of panels	Approximate extent of Site potentially seen	Position in relation to panels	Sensitivity (Criteria In VIA Appendix C)	Magnitude of Change (Criteria in VIA Appendix C)	Impact level	Visual Screening Proposed (Y/N)	Revised impact Level (where relevant)
	Unlikely to see Substation							Attempts to undertake consultation with this receiver were unsuccessful.	
VP Group A - ID16, ID15, and ID 31	More distant from Proposal (over 2km) with small proportion of the Site potentially visible Northern (front) views of the panels – possibly distant mirage effect However, existing vegetation likely to reduce potential viewing area Views of the substation unlikely	2.5 – 8.25km	Less than a quarter (5% - 40%)	North to North-west	Low	Low	Low	No	
VP Group B – ID34, ID55, ID56,	More distant from Proposal (over 5km) with large extent of Site potentially visible North-western views of the panels – therefore possibly see distant colour changes of panels However, existing vegetation likely to reduce potential viewing area Views of the substation unlikely Solar farm unlikely to be prominent in the view	6.75 – 10km	Over half of Site (80-90%)	North-west	Low	Low	Low	No	
VP Group C – ID20, ID30	More distant from the Site (over 5km) with only small proportion of the Site potentially seen	7 – 8.5km	Less than a quarter of Site (10%)	North-east to north west	Low	Low	Low	No	

Viewpoints	Analysis (on base case of no landscape screening)	Distance to nearest and furthest view of panels	Approximate extent of Site potentially seen	Position in relation to panels	Sensitivity (Criteria In VIA Appendix C)	Magnitude of Change (Criteria in VIA Appendix C)	Impact level	Visual Screening Proposed (Y/N)	Revised impact Level (where relevant)
	Northern (north-east to north-west) views of panels Distance likely to negate colour effects Substation would not be seen Solar farm unlikely to be prominent in the view								
VP Group D – ID13, ID32, ID35, ID38, ID41, ID42	More distant from the Site (over 2km) A moderate to large proportion of the Site possibly seen with side or rear view of panels Views likely to be obscured by trees Substation unlikely to be seen Solar farm unlikely to be prominent in the view	2.25 – 11.5km	Over a half of the Site (40-90%)	West and south	Low	Low	Low	No	
VP Group E – ID26, ID28, ID46, ID47, ID37	Distant from the Site (over 4km) Small proportion of the Site possibly seen with side or rear view of panels View likely to be obscured by existing trees Solar farm unlikely to be prominent in the view	4.5 – 9.75km	Less than a quarter of the Site (>5-15%)	West and south	Low	Low	Low	No. Preventing panel installation over the two highest ridges within the Site will eliminate views or reduce views from these viewpoints.	
VP Group F – ID40, ID50, ID52	Distant from the Site (over 5km)	6.75 – 9.25km	20-30%	South and west	Low	Low	Low	No	

Viewpoints	Analysis (on base case of no landscape screening)	Distance to nearest and furthest view of panels	Approximate extent of Site potentially seen	Position in relation to panels	Sensitivity (Criteria In VIA Appendix C)	Magnitude of Change (Criteria in VIA Appendix C)	Impact level	Visual Screening Proposed (Y/N)	Revised impact Level (where relevant)
	Moderately large proportion of the Site seen with side or rear view of the panels seen Substation would not be seen Solar farm unlikely to be prominent in the view								
VP Suntop Road (linear viewpoint)	Travellers using Suntop Road pass immediately to the north of the site Close proximity Front views of the panels would be seen and colour changes may be noticed when driving past the Site Views are temporary A relatively small proportion of the site seen Unlikely to see Substation	20-600m	15%	North	Moderate	Moderate	Moderate	Yes Views into the Site likely to reduce via planting along the northern 'Suntop Road' boundary	

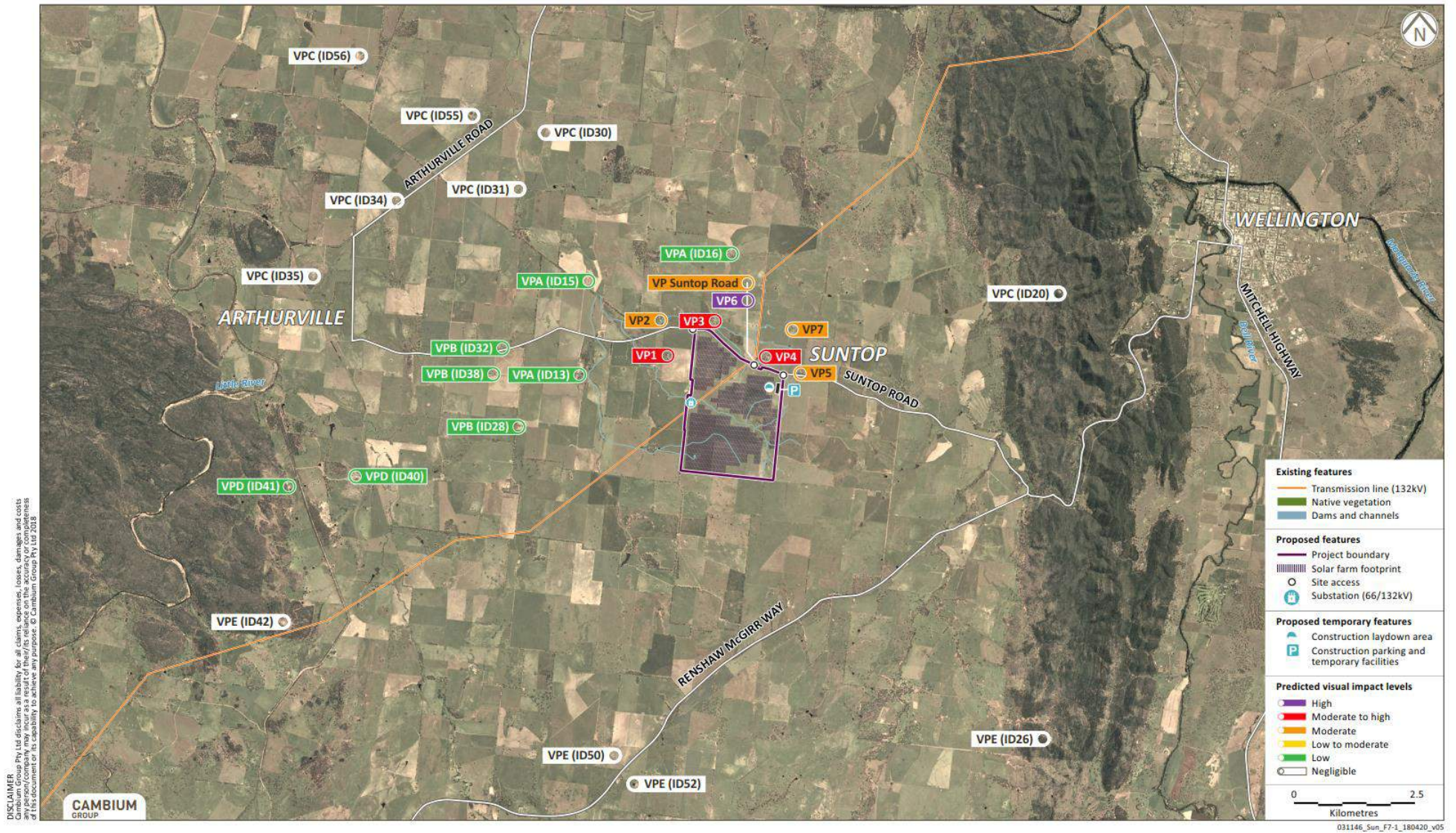


Figure 6-11 Viewpoints and Impact Rating



Figure 6-12 Photomontage viewpoint locations

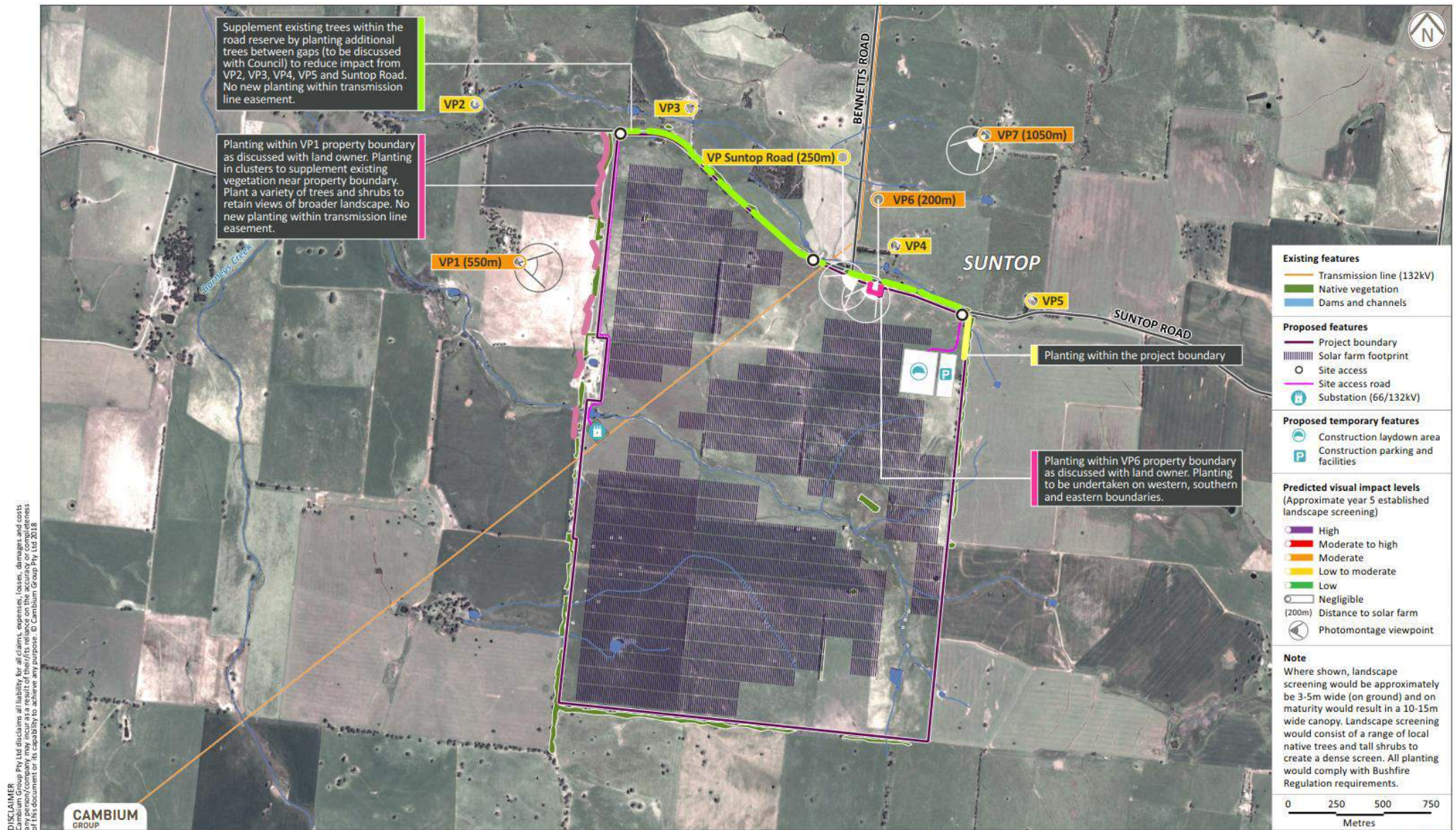


Figure 6-13 Proposed landscape screening as visual mitigation

Photomontages

Photomontages have been prepared for VP1, VP6, VP7 and VP Suntop Road (refer Section 8 of **Appendix C**). The selected viewpoints were based on the potential level of visual impact and concerns raised by landowners. 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).

VP1 is a private residence on an elevated ridge approximately 490m west of the western Site boundary. Direct views from the VP1 residence are not possible, however the Site can be seen from the paddock immediately east of the residence, this is the only viewpoint that could potentially see the substation.

VP6 is located immediately north of the proposed solar farm, on the southern side of Suntop Road. It is the closest private residence to the Site. The property is lower in elevation than the surrounding slopes of the Site and the outlook is toward Suntop Road.

VP7 is a private residence approximately 950m north of the Site. Direct views from the house to the Site are not possible, however, the Site can be seen from the paddock immediately south-west of the residence.

VP Suntop Road is a linear viewpoint. Suntop Road passes immediately to the north of the Site. Views from Suntop Road are in close proximity of the proposed solar farm, however, are temporary and for short-periods.

DISCLAIMER
pitt&sherry and its advisors all undertake full and complete due diligence, including but not limited to, the review of all relevant documents and records, and the conduct of field visits and interviews with relevant personnel. However, any person/company may incur a liability as a result of their/its reliance on the accuracy or completeness of this document or its capability to achieve any purpose. © Cambium Group Pty Ltd 2018

CAMBIUM
GROUP



Figure 6-14 VP1 Existing view

DISCLAIMER
Cambiium Pty Ltd disclaims all liability for all claims, expenses, losses, damages and costs
any person/company may incur as a result of their/its reliance on the accuracy or completeness
of this document or its capability to achieve any purpose. © Cambiium Group Pty Ltd 2018

CAMBIUM
GROUP



Figure 6-15 VP1 Likely view post construction



Figure 6-16 VP1 Likely view with landscape screening 5 years after construction



DISCLAIMER
Cambium Group Pty Ltd disclaims all liability for all claims, expenses, losses, damages and costs
any person/company may incur as a result of their/its reliance on the accuracy or completeness
of this document or its capability to achieve any purpose. © Cambium Group Pty Ltd 2018

CAMBIUM
GROUP

031140_Sun_FB-2_to_FB-21_180422_V04

Figure 6-17 VP6 – View A - Existing view



Figure 6-18 VP6- View A – Likely view of proposal post construction



DISCLAIMER
Cambium Group Pty Ltd disclaims all liability for all claims, expenses, losses, damages and costs of this document or its capability to achieve any purpose. © Cambium Group Pty Ltd 2018

CAMBIUM
GROUP

031140_Sun_FB-2_to_FB-21_180422_v04

Figure 6-19 VP6 -View A– Likely view with landscape screening 5 years after construction



Figure 6-20 VP6 – view B - Existing view



pitt&sherry ref: Suntop Solar EIS - Main document.docx/DP/vg



Figure 6-22 VP6 – view B - Likely view with landscape screening 5 years after construction

INFORMER
m Group Pty Ltd disclaims all liability for all claims, expenses, losses, damages and costs
on/compensation may incur as a result of their/its reliance on the accuracy or completeness
document or its capability to achieve any purpose. © Canarium Group Pty Ltd 2018



Figure 6-23 VP 7 - Existing view

DISCLAIMER: Pitt & Sherry Ltd disclaims all liability for all claims, expenses, losses, damages and costs, any person/company may incur as a result of their/its reliance on the accuracy or completeness of this document or its capability to achieve any purpose. © Cambium Group Pty Ltd 2018

CAMBIUM
GROUP



Figure 6-24 VP 7 - Likely view of proposal post construction

2
Sun Pty Ltd disclaims all liability for all claims, expenses, losses, damages and costs
any person may incur as a result of their reliance on the accuracy or completeness
of the information provided in this document for any purpose. © Suntop Group Pty Ltd 2018



Figure 6-25 VP – Suntop Road - Existing view



Figure 6-26 VP – Suntop Road - Likely view of proposal post construction



Figure 6-27 VP – Suntop Road - Likely view with landscape screening 5 years after construction

A summary of the levels of impact for each private viewpoint is given in Table 6-8.

Table 6-8 Summary of identified potentially affected private viewpoints

Impact level	Number of viewpoints	Residential/private viewpoints identified as potentially impacted
High impact	1	VP6
Moderate – high impact	3	VP1, VP3, VP4
Moderate impact	3	VP2, VP5, VP7
Low impact	22	As per Figure 6-9

6.3.4 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
V3	Implement Concept Landscape Plan, which includes visual screening. (refer Appendix C).
V4	Minimise vegetation removal and retain existing trees and other native vegetation by including: • Temporary fencing around vegetation • Demarcating area as a no-go zone.
V5	Retain as much existing grass cover beneath solar panels as possible.
V6	Progressively stabilise disturbed area with pasture grasses.
Operational Mitigation Measures	
V7	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.
V8	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.
V9	An OEMP will be prepared for the Proposal and will incorporate a complaints management process.
V10	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.

6.4 Noise

A Noise Assessment (NA) was undertaken by Muller Acoustic Consulting Pty Ltd (MAC) to investigate the potential acoustic impacts of the Proposal (see **Appendix I**). A summary of the key findings of this assessment are outlined below.

The report 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
- Standards Australia AS/IEC 60942:2004/IEC 60942:2003 (IEC60942) – Australian Standard – Electroacoustics – Sound Calibrators.

6.4.1 Assessment Methodology

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 which have been reproduced in Table 6-17 to Table 6-19.

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 receptor located near the Proposal between Wednesday 22nd November 2017 to Thursday 30 November 2017. Background noise levels are given in Section 6.4.2

Noise modelling was used to determine the impact of project noise emissions to neighbouring receivers for typical construction activities and operations.

Noise emission data and assumptions used in this assessment are summarised in Table 6-9.

Table 6-9 Construction Equipment Sound Power Levels (L_w) dBA re 10⁻¹² W

Noise Source/Item	Utilisation %	Quantity	L _w /Item		Total L _w
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

Noise Source/Item	Utilisation %	Quantity	Lw/Item		Total Lw
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 in Table 6-10.

Table 6-10 Operational Equipment Sound Power Levels dBA re 10⁻¹² W

Noise Source / Item	Activity	Quantity	Lw/Item	Total Lw
PV Panel Tracking Motor1	All tracking motors in operation 1 minute per 15-minute period	12380	78	102
Transmission Kiosk – each consisting of the following				
Inverter	Constant	69	75	99
Transformer	Constant	69	70	94
Capacitor Battery	Constant	69	75	99
Transmission Kiosk – Total	Constant	69	79	102
Substation	Constant	1	90	90
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 tonality. Note 3: -5dB applied to account for power station/ kiosk vented enclosure.				

6.4.2 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 17 sensitive receivers were identified as having the potential to be affected by noise. The identified receivers are presented in Figure 6-28.

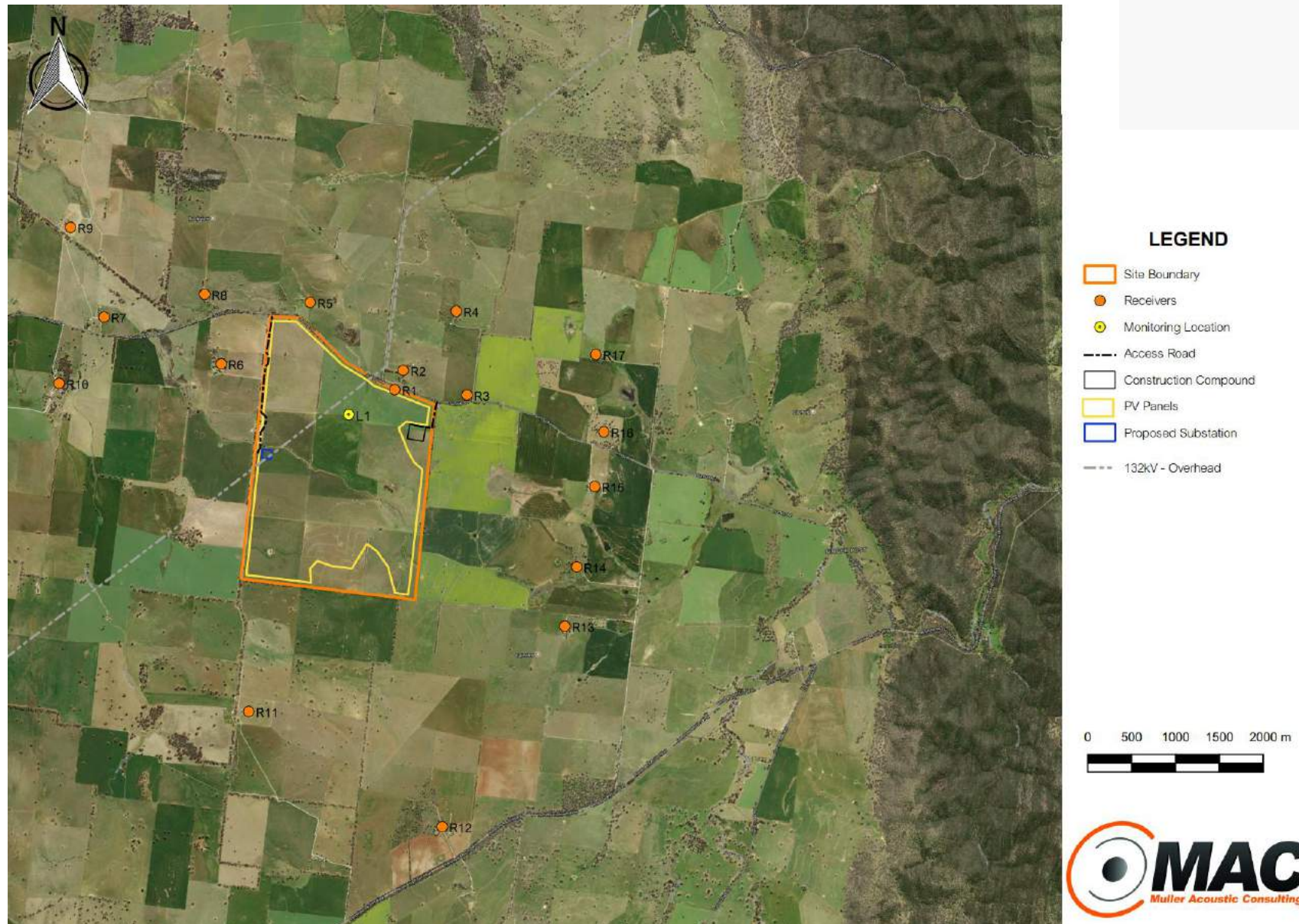


Figure 6-28 Sensitive receiver locations (Figure 1 of MAC Noise Assessment, 2018)

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 a representative receptor located near the Proposal, this location is presented in Table 6-11 and Figure 6-28.

Noise measurements were carried out using a Svantek Type 1, 977 noise analyser from Wednesday 22 November 2017 to Thursday 30 November 2017 to measure the existing road traffic noise and the background and ambient noise environment in the vicinity of the Proposal site.

Table 6-11 Noise Monitoring Location

ID	Unattended Noise Monitoring Locations	Site Description	Coordinates (MGA 56)	
			Eastings	Northings
L1	Project Site	Off Suntop Road	672143m E	6394263m S

The results of the unattended noise measurements, including derived RBLs are summarised Table 6-12

Table 6-12 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	26	66
	Evening	26	59
	Night	26	59
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			

Based on the relevant section of the INP Guidelines, where background noise levels are less than 30dB(A), the minimum applicable background noise level is recommended to be set at 30dB(A). Therefore, this minimum background noise level has been adopted for all receiver locations nominated during the night time assessment period.

As there is a potential for construction road traffic noise impacts, road traffic noise was assessed at the noise monitoring location L1 – Off Suntop Road.

6.4.3 Criteria

Construction Noise Criteria

In NSW, noise impacts arising from construction activities are managed in accordance with the ICNG. According to the guideline, a quantitative assessment of noise impacts is warranted when works are likely to impact an individual or sensitive land use for more than three weeks in total. Table 6-13 below (reproduced from Table 2 of the ICNG) sets out the noise management levels for residences and how they are to be applied.

Table 6-13 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) • 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.		

Construction Noise Management Levels (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 6-14.

Table 6-14 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)

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)
- Maintaining noise level amenity for particular land uses (Amenity Criteria).

The intrusiveness criterion can be summarised as $LA_{eq, 15 \text{ minute}} \leq \text{RBL background noise level} + 5 \text{ dB(A)}$ (refer Table 6-15). The Project Noise Trigger Levels (PNTLs) is the lower of either the Intrusiveness Noise Level or the PANL (refer Table 6-15).

The amenity criterion and project amenity noise levels (PANL) defines 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 6-16.

Table 6-15 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 Amenity Noise Level dB LAeq, period	PANL dB LAeq, 15 min ²	PNTL dB LAeq, 15 min
All Residential Receivers	Day (7am to 6 pm)	26	35	40	50	53	40
	Evening (6 to 10pm)	26	30	35	45	48	35
	Night (10pm to 7am)	26	30	35	40	43	35
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: Includes a +3dB adjustment to the amenity period level to convert to a fifteen-minute assessment period as per Section 2.2 of the NPI.							

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. The category that is relevant to the proposal is listed in Table 6-16

Table 6-16 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	Renshaw McGirr Way	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	Suntop 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.				

For this assessment, the ‘local road’ category, as specified in the RNP, was adopted for Suntop Road, and ‘sub arterial road’ category for Renshaw McGirr Way. The functional classification of Renshaw McGirr Way is a ‘Collector Road’ in accordance with the Roads and Maritime Services Noise Criteria Guideline (April 2015). However, the Road Noise Policy 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.

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

In addition to meeting the assessment criteria, any significant increase in total traffic noise at receivers must be considered, however, the relative increase criteria are not applicable to local roads and Suntop Road is classified as a local Road.

6.4.3 Assessment of Potential Impacts

Construction

Construction activities would result in temporary increase in localised noise levels, particularly for sensitive receivers located close to the proposal site or along the haulage route. Construction would be carried out within standard construction hours (i.e. Monday to Friday 7 am to 6 pm; Saturday 8 am to 1 pm; No work on Sundays or public holidays) with no out of hours’ work proposed. The key noise generating activities that will occur are listed below:

- Earthworks involving trenching for cabling
- Piling of panel supports
- Assembly of the panels.

It is envisaged that all three-key noise generating activities would occur simultaneously at up to 10 locations across the Site, along with substation construction, vehicle movements on the site and deliveries of material to site.

Table 6-17 presents the maximum noise levels from each construction scenario that are likely to be experienced at the nearby affected receiver locations during the construction works. The results show that the works do not comply with the NMLs at 5 residential receptors for the day period.

Table 6-17 Predicted Construction Noise Levels

Receiver ID	Description	Highest Predicted Construction Noise Level dB LAeq,15min	NML Standard Hours dB LAeq,15min	Comply
R01	675 Suntop Road	56	45	No
R02	14 Bennetts Road	51	45	No
R03	586 Suntop Road	46	45	No
R04	582 Suntop Road	42	45	Yes
R05	796 Suntop Road	51	45	No
R06	1834 Arthurville Road	48	45	No
R07	Lot 17 1094 Suntop Road	37	45	Yes
R08	898 Suntop Road	43	45	Yes
R09	Lot 86 1094 Suntop Road	29	45	Yes
R10	69 Frogleys Road	32	45	Yes
R11	1570 Renshaw McGirr Way	37	45	Yes
R12	1420 Renshaw McGirr Way	29	45	Yes
R13	193 Bestwicks Lane	34	45	Yes
R14	233 Bestwicks Lane	36	45	Yes
R15	433 Suntop Road	35	45	Yes
R16	440 Suntop Road	34	45	Yes
R17	18 Ringwood Road	32	45	Yes

Construction noise emissions are anticipated to satisfy relevant NMLs at most receivers, however, the noise levels are predicted to exceed the NMLs at several receivers along Suntop Road (R1, R2, R3, R5, R6). The Proposal is committed to managing noise emissions within the community and will adopt suitable procedures to minimise noise emissions. These are listed in the Mitigation Measures listed in Section 6.4.4

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.

Noise levels were predicted at each assessed receptor assuming receiver heights of 1.5m above ground level. Table 6-18 summarises the predicted operational noise levels which are demonstrated to comply with the PNTLs at all residential receptors. A detailed maximum noise level assessment is not required as predicted noise levels for night time operations do not exceed the maximum noise level screening criterion of 40dB LAeq,15min and/or 52dB LAmax.

Table 6-18 Predicted Operational Noise Levels

Receiver ID	Description	Predicted Operational Noise Level dB LAeq,15min	Limited Night time PNTL dB LAeq,15min	Compliant
R01	675 Suntop Road	32	35	Yes
R02	14 Bennetts Road	26	35	Yes
R03	586 Suntop Road	22	35	Yes
R04	582 Suntop Road	19	35	Yes
R05	796 Suntop Road	25	35	Yes
R06	1834 Arthurville Road	23	35	Yes
R07	Lot 17 1094 Suntop Road	15	35	Yes
R08	898 Suntop Road	19	35	Yes
R09	Lot 86 1094 Suntop Road	<15	35	Yes
R10	69 Frogleys Road	<15	35	Yes
R11	1570 Renshaw McGirr Way	<15	35	Yes
R12	1420 Renshaw McGirr Way	<15	35	Yes
R13	193 Bestwicks Lane	<15	35	Yes
R14	233 Bestwicks Lane	<15	35	Yes
R15	433 Suntop Road	<15	35	Yes
R16	440 Suntop Road	<15	35	Yes
R17	18 Ringwood Road	<15	35	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.

Road Traffic

During construction, traffic generated by the project would include employee/subcontractor vehicles and delivery vehicles. During the peak construction period, the traffic volume over a typical day for standard construction hours is expected to be 40 heavy vehicles (semi - trailers) movements and 140 light vehicle movements per day (including mini buses for employee transport). Road traffic noise calculations are based on the parameters adopted for average and peak flows of traffic to and from the Site.

Predicted LAeq,1hr noise levels from Proposal related construction traffic at the closest receptor on Suntop Road were assessed and detailed in Table 6-19. The results indicate that Proposal construction traffic noise levels would comply with the relevant RNP criteria.

Table 6-19 Predicted Construction Road Traffic Noise Levels

Road Name	Nearest Offset Distance to Receiver	Predicted Noise Level	RTN Criteria	Comply
Suntop Road site access	23m	48dB LAeq,1hr	55dB LAeq,1hr	Yes
Suntop Road	65m	49dB LAeq,1hr	55dB LAeq,1hr	Yes
Renshaw McGirr Way	30m	54dB LAeq,15hr	60dB LAeq,15hr	Yes

Sleep disturbance

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

Intersection Upgrade

The works to be undertaken for the intersection upgrade are expected to be of general low (noise) intensity and a short duration. The nearest receivers are more than 200 metres away. Given the existing background noise environment, a construction noise management level of 45dBA for standard construction hours would be expected. Typical equipment noise levels of a sound power of 110dBA would result in noise levels at the nearest receiver of approximately 50dBA. Given that this noise level is less than 10dB above the NML, there is no requirement for additional mitigation measures in accordance with the Roads and Maritime Construction Noise and Vibration Guideline.

Summary

The Noise Assessment (NA) demonstrates that construction noise levels will satisfy relevant NMLs at all the assessed noise receivers, with the exception of those identified along Suntop Road. The rise in noise levels would be most prevalent when noise intensive works are being conducted near these locations. The implementation of mitigation measures such as localised barriers, scheduling and respite would contribute to minimising noise emissions at these receivers and the potential impacts would be of short duration and of a temporary nature.

Operational noise levels are predicted to satisfy the project noise trigger levels at all assessed receivers. The noise assessment demonstrates that the road noise criteria as specified in the RNP will be satisfied at all receivers on the proposed transport route.

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

6.4.4 Mitigation/ Management Measures

Reference	Mitigation Measures
Construction and Decommissioning Mitigation Measures	
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
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

Reference	Mitigation Measures
	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	Limiting and scheduling the number of work areas along the northern boundary for piling, trenching and assembly activities to minimise noise levels at receptors along Suntop Road.
Operational Mitigation Measures	
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.

6.5 Traffic, Transport and Road Safety

A Traffic Impact Assessment (TIA) was undertaken by Seca Solution to investigate the potential traffic impacts of the Proposal (see **Appendix H**). A summary of the key findings of this assessment are outlined below.

6.5.1 Assessment Methodology

The assessment included:

- A site visit to assess the existing condition of the local road network
- Traffic surveys taken during the AM and PM period at a key intersection 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 road upgrades potentially required
- The review of potential impacts from the temporary increase in heavy vehicle flows along the local and regional roads for the various stages of the development.

6.5.1 Existing Environment

The site is located with road frontage to Suntop Road only. The existing road environment related to the proposal is described in Table 6-20.

Table 6-20 Existing road environment

Road	Local/ State Road	Width/ Movements	Condition	Speed Limit	Connection
Suntop Road	Local	6m wide Two-way traffic movements as required	Sealed	100km/h	Renshaw – McGirr Way connects with Suntop Road to the east via a T intersection with Renshaw – McGirr Way the priority road.
Renshaw – McGirr Way	Local	7m wide Two-way traffic movements	Sealed road	100km/h	Connects with Showground Road and Bushrangers Creek Road to the east via a T intersection with Bushrangers Road/Showground Road being the priority road.
Show ground Road	Local	7m wide Two-way traffic movements	Sealed Road	50 – 80 km/h	Joins with Bushrangers Creek Road at the intersection of Renshaw – McGirr Way.
Mitchell Highway	State	7m wide Two-way traffic movements	Sealed road	100 - 110 km/h	Connects with Showground Road on the outskirts of Wellington.

Existing Traffic Volumes

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

Suntop Road provides access to rural land holdings and does not provide a direct access for through traffic movements nor does it provide access to a town or village. Accordingly, traffic flows on this road are considered to be less than 100 vehicles per day two-way. Renshaw McGirr Way similarly carries low traffic flows but does provide local access to Yeoval. Whilst it would carry higher traffic flows than Suntop Road it is still considered that it would carry less than 500 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) shows 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.

6.5.2 Assessment of Potential Impacts

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.

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 routes will be documented as the Haulage Route for all delivery vehicles to enter and exit the site for the vehicles associated with haulage of construction equipment to the site.

These roads carry a high number of heavy vehicles, associated with local and regional agricultural demands. These agricultural 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 are currently very low based on-site observations. The additional 70 light vehicle movements (per direction) associated with staff movements and 20 daily truck movements (per direction) will have a minimal and acceptable impact upon the operation of these local roads during construction. Once operational, the traffic movements will be much lower due to the lower number of staff based on site and as such, the impact will be negligible.

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.

Public vehicle access within the work site during the construction works will not be permitted with site access off Suntop 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.

There is no school within the general locality of the site and the majority of the heavy vehicle route proposed, however, a school bus run does utilise Suntop Road in the morning and afternoon and provides a pick up and drop off service for school aged children living along Suntop Road. 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.

There will be no impact upon public transport services with no diversions required and no bus stops will be impacted upon by the proposal and there will be minimal impact for emergency vehicles and heavy vehicles with no diversions required.

It is considered that the heavy vehicle route (as shown in Figure 6-29) can safely accommodate the additional traffic movements associated with the Proposal. The heavy vehicle route within Wellington will be included within the Driver's Code of Conduct and will form part of the inception meeting for all staff and drivers.

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.

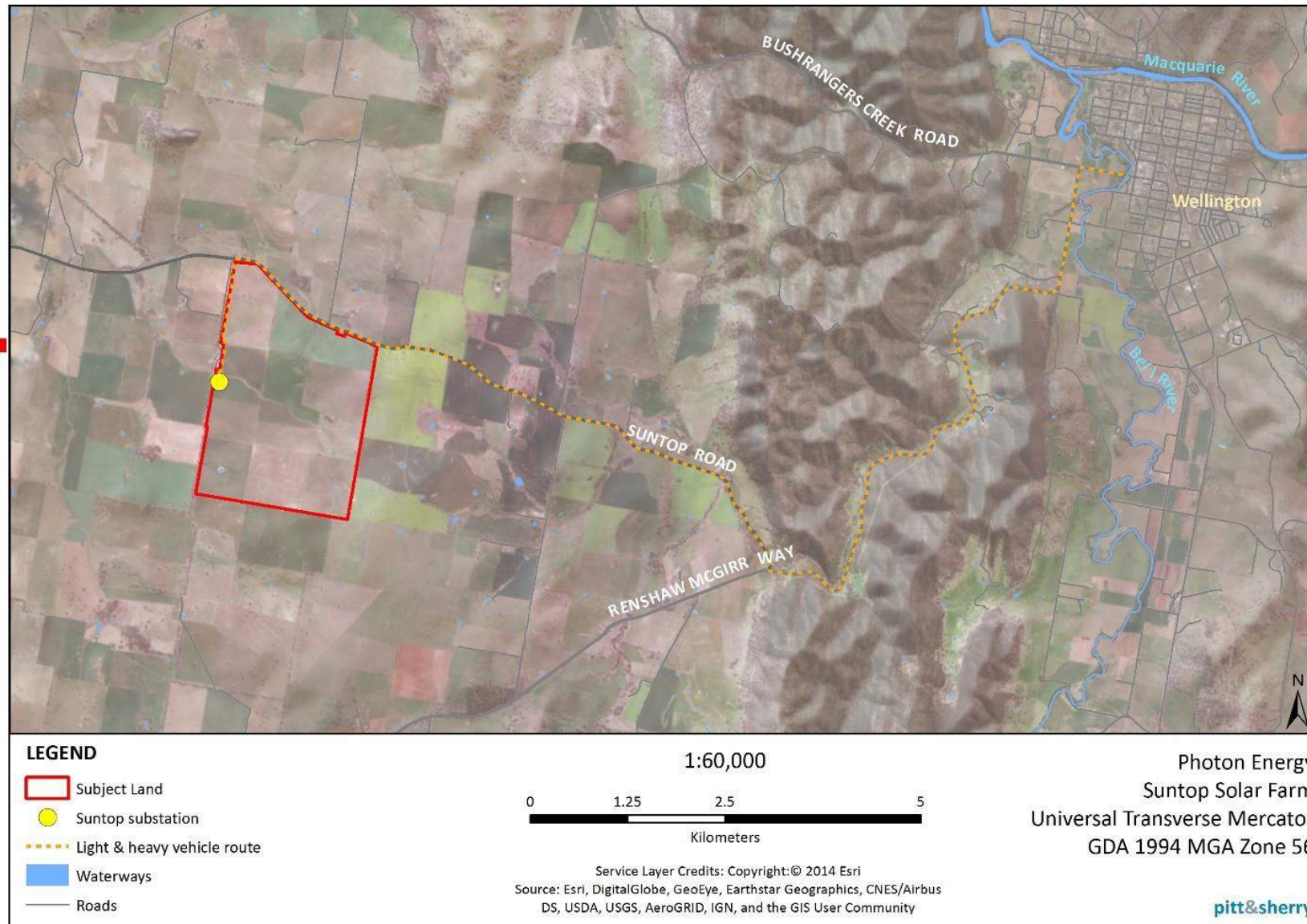


Figure 6-29 Light and heavy Vehicle access and route to Proposal site

Site Access

Access to the site will be facilitated by two new access roads. A new permanent access road off Suntop Road (near western boundary) and a temporary access in the north east corner of the Site also off Suntop Road. The temporary access road will be used to access the construction compound and site parking (north east corner of the Site). The temporary access road would be utilised by light vehicles associated with staff working on site and heavy vehicles associated with delivery of materials and removal of waste.

To facilitate safe turning movements in and out of the site, existing full width seal on Suntop Road will be maintained.

The access roads 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 Suntop Road.

Construction

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

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

Increased Vehicle Numbers

Staffing requirements will vary over the 12-month construction period. Approximately 250 people are expected during peak periods with a lower level outside peak construction periods. The staff will be sourced locally where appropriate with some specialist and project management staff being temporarily located in Wellington.

Suntop Solar Farm propose to use the same methodology to maximise local staff participation in the Proposal as they have for other sites in Australia which includes holding a community information session and creating an Expressions of Interest (EOI) for interested local suppliers and contractors. Staff will be encouraged to car pool as appropriate with other staff transferred to and from the site via mini coaches to reduce vehicle demands. Due to the size of the site footprint, these same vehicles will also be used on site to move staff across the site.

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 within 45 minutes of the Wellington town centre. 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, no footpaths available in the locality and excessive travel time which is estimated to be over 2 hours.

The level of heavy vehicles accessing the site will vary throughout the Proposal timeframe. At the beginning of the Proposal there will be a requirement for some earthwork moving equipment to construct the access tracks and some minor earthworks across the site as required. 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 Proposal construction work. 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.

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 subject site. The vehicles as they are approaching the site will be spread out ensuring the impact is not occurring all together and with unloading of vehicles taking up to 30 minutes or more, trucks exiting the site will also be spread out.

Light vehicle movements associated with staff travelling to Site for construction are estimated at 70 vehicle movements inbound and outbound. This has been estimated based upon 250 staff (the peak labour force) for construction 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.

A summary of the anticipated vehicle movements, excluding the above staff movements, is provided in Table 6-21 below.

Table 6-21 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	40
	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	500
	Plant delivery and removal: excavators, compactors drill rig	Low loader	40
	Concrete deliveries for maintenance container hardstands	Concrete agitator	120
Generating Equipment	Tool container delivery and removal	Low loader	4
	Module deliveries	Semi-trailer	2000
	Mounting structure and pile deliveries	Semi-trailer	1600
	Inverter Station deliveries	Low loader	40
	DC cabling trays and combiner boxes	Semi-trailer	400
AC Cable Installation	AC Cable delivery	Semi-trailer	400
	Backfill material delivery	Dump Truck	1800
Plant Delivery and removal	Telescopic handler and excavator	Low loader	50
Overhead Line	Conductor delivery	Semi-trailer	25
	Pole deliveries	RAV	6
	Pole dressing delivery	Semi-trailer	2
Other	Miscellaneous deliveries	Light vehicle	40
	Monitoring equipment fibre SCADA servers etc	Truck	2
	Waste Collection	Truck	400
	Consumables (Oil and Fuel)	Truck	40
TOTAL			7,581

Based upon the vehicle movements outlined in Table 6-21 the heavy vehicle movements associated with peak construction periods are estimated to be in the order of 42-57 inbound and outbound movements per day depending on the duration of the overall construction period of 9-12 months. The number of heavy vehicles during peak periods will depend on the stage of construction and potential for overlapping of these stages of work.

Average heavy vehicle movements will be in the order of 20 inbound and outbound movements per day.

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.

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.

All staff vehicles will be able to park within the 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 overall site footprint however will allow for all construction staff vehicles to park on site. As part of the Proposal construction it is proposed to maximise the local workers content (from Wellington and Dubbo) and car-pooling will be encouraged as part of these trips. Shuttle bus arrangements from Wellington will also be arranged for non-local staff reducing the vehicle numbers and parking requirements.

Increased Collision Risk

As part of the Proposal work, there will be an increase in the number of heavy vehicle movements associated with the construction work which will impact along the local road network along the haulage route. The major road safety impact is associated with traffic entering and exiting the Solar Farm site off Suntop Road as well as their impact upon the operation of intersections along the haulage route.

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 be conducted in a safe manner.

Intersection sight distances

The intersection sight distances from four key intersections along the primary haulage route are shown in Table 6-22. Traffic control Plans have been developed for the intersection of Renshaw McGirr Way and Suntop Road, and for the access points from Suntop Road into the Site. These are included with the Traffic Impact Assessment (TIA) in **Appendix H**.

Table 6-22 Intersection sight distances

Intersection	Speed Limit	Austrroads Guidelines (sight visibility requirement)	Sight distance measured onsite	Upgrade works required
Showground Road and Renshaw McGirr Way	60 km/h	114 m minimum	>200 m	No upgrade required.
Renshaw McGirr Way an Suntop Road	100 km/h	225 m	130-150m	Tree removal. Shoulder widening. Crash barriers.
Site Access and Suntop Road	100km/h	248 m	>300 m	Two new access (one permanent and one

Intersection	Speed Limit	Austrroads Guidelines (sight visibility requirement)	Sight distance measured onsite	Upgrade works required
				temporary) to be constructed.

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 be negligible due to the existing capacity of the road network. Local roads in the locality 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 Existing Services

There are no pedestrian paths around the Subject Land, and pedestrian movements are not expected due to the distance of the Site to Wellington Township. As such no impacts for pedestrians are expected as a result of the Proposal.

There is no school within the general locality of the Subject Land however a section of the haulage route along Renshaw McGirr Way and Suntop Road forms part of the local school bus run. 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.

Associated noise and dust impacts from traffic are assessed in Section 6.4 and Section 6.8.

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.

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.

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 Improvements

The intersection of Suntop Road and Renshaw McGirr Way would be upgraded to meet AUSTROAD Guidelines and a safe intersection stopping distance (SISD) for 100km/h including:

- Removal of 10 trees to improve sight distances and facilitate upgrade works
- Installation of crash barriers on either side of Suntop Road at the intersection with Renshaw McGirr Way
- Rural Basic Right turn treatment to widen the should of Renshaw McGirr Way to allow through vehicles to pass to the left of the turning vehicles

A concept design for the upgrade works is provided in Figure 6-30 and **Appendix H**.

A concept design for both the permanent and temporary new access roads from Suntop Road into the Site are provided in Figure 6-31 and Figure 6-32 respectively.



Figure 6-30 Concept design for upgrade works at Renshaw McGirr Way and Suntop Road

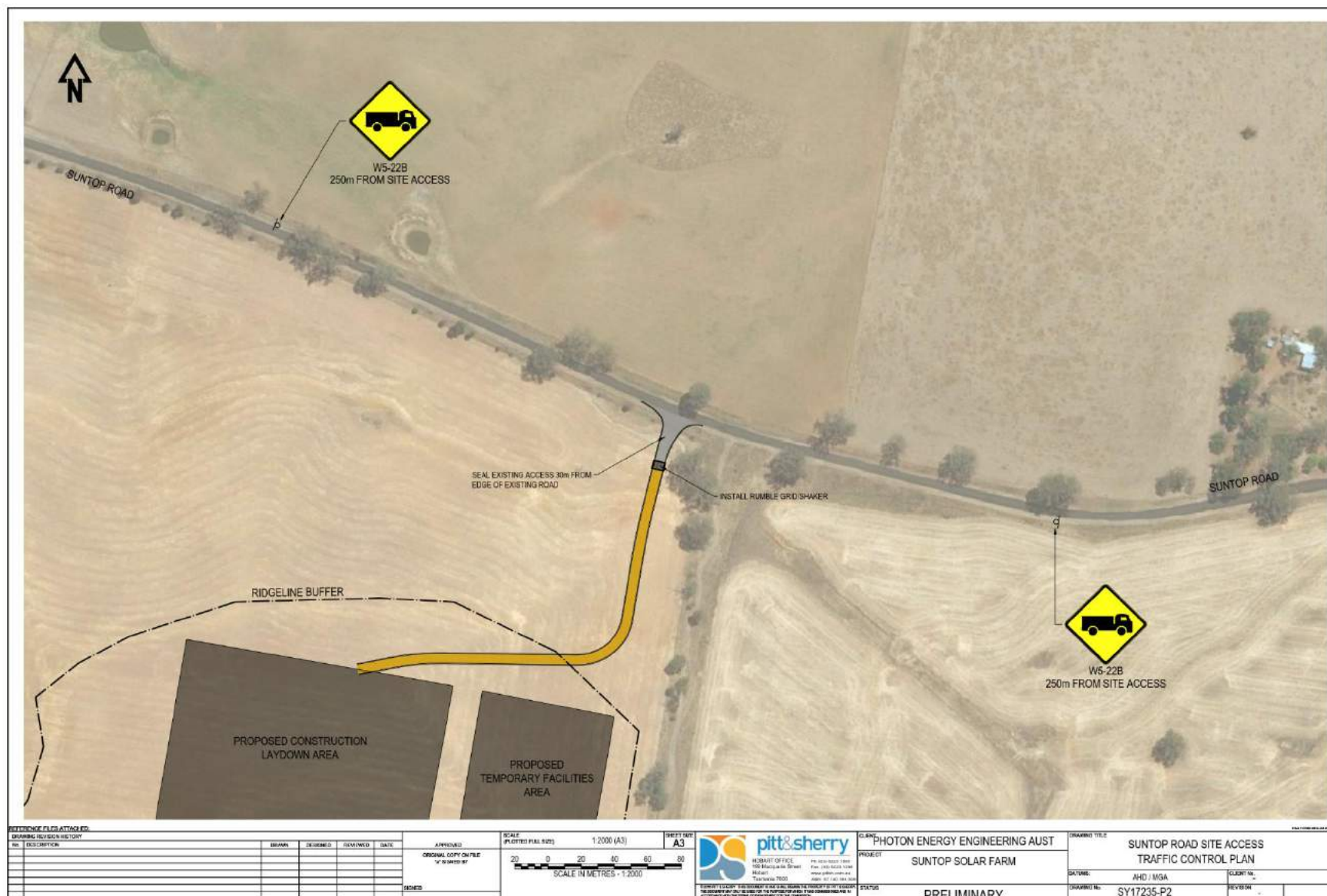


Figure 6-31 Concept design for temporary access road

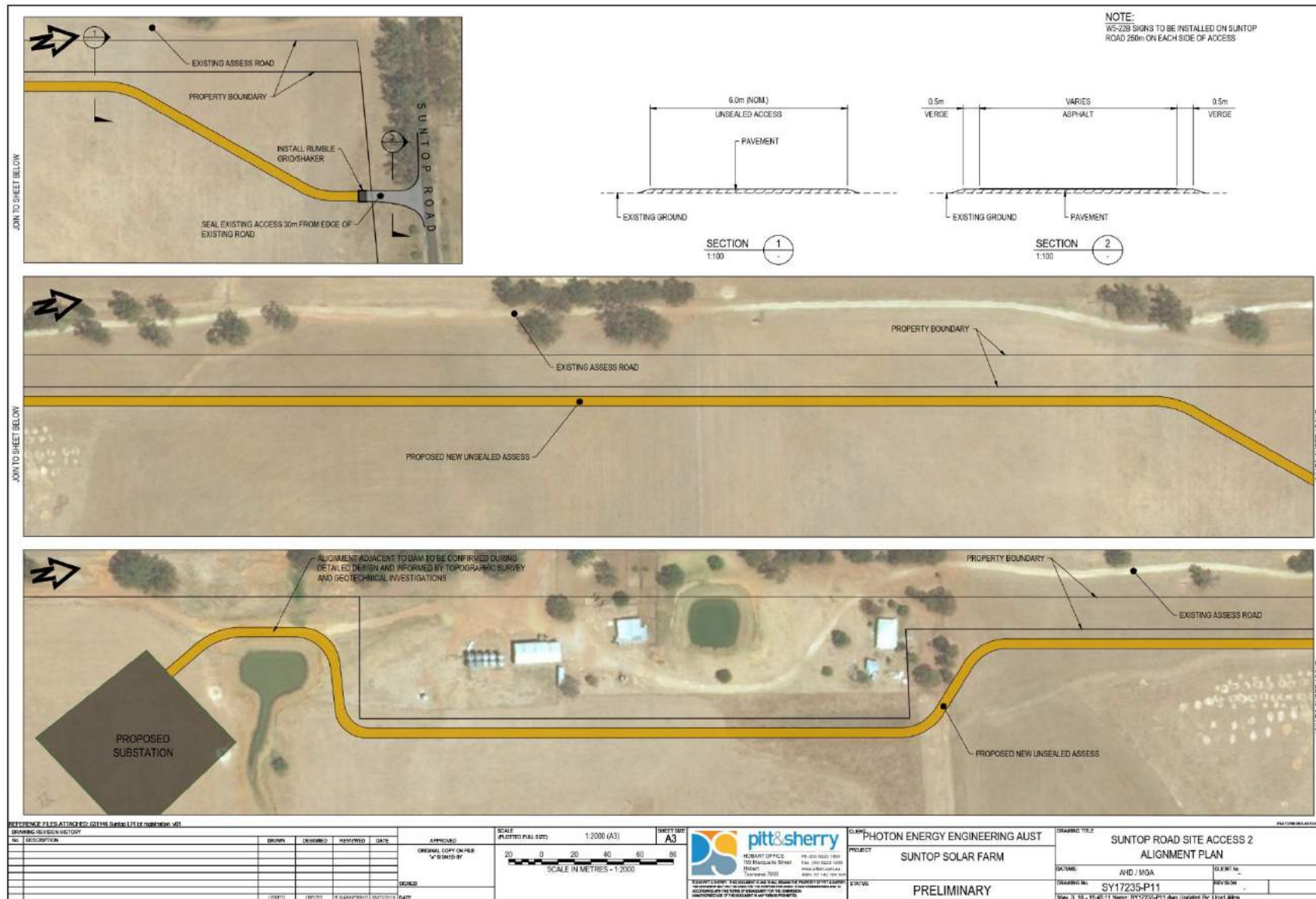


Figure 6-32 Concept design for permanent access road

6.5.3 Mitigation / Management Measures

Reference	Mitigation Measures
Construction and Decommissioning Mitigation Measures	
T1	The proposed road improvements, as stated above, and any ancillary road works should be completed 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.
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	Develop a protocol which will be provided for undertaking dilapidation surveys and making any necessary repairs following construction. The dilapidation surveys will assess the existing condition of Suntop Road prior to construction and identify any damage once construction is complete. Should any damage be identified the road will be repaired in line with Council standards.

Reference	Mitigation Measures
T10	A dilapidation survey will be completed along Suntop Road prior to upgrades on this road and after the works are complete. A dilapidation survey protocol is provided in Appendix H .
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.

6.6 Land Use

This section assesses the potential impact on property and land use within the study area as a result of the proposal. The assessment presented in this section draws on desktop information, observations from the site inspection and responds to the relevant SEARs.

6.6.1 Existing Environment

Existing Land Use

The site and the surrounding land are zoned RU1 Primary production under the Wellington LEP 2012.

The site is privately owned and currently used for agricultural purposes including cropping (cereal crops) and grazing of sheep.

The locality is dominated by rural properties which are mostly cleared of native vegetation and used for a variety of agricultural enterprises including cropping and grazing of livestock (cattle and sheep). Land uses around the footprint comprise of road infrastructure (e.g. road pavement on Suntop Road and vacant land located within the road reserve), utility easements (comprised of overhead electricity supplies), rural residential and other privately-owned rural property. The land to the south, east and west of the Site are used for grazing and rotational cropping. The land to the north of Suntop Road is also consist of cleared agricultural land and several rural residences.

Mineral Resources

A search of Department Resources and Energy's MinView database found a small portion of the south west corner of the site is covered by a current Mineral Title. This is described in Table 6-23. Exploration licences entitle the holders to carry out exploration and prospecting for minerals within the specified area.

Table 6-23 Exploration licences currently in force over the proposed solar farm proposal boundary

Mineral Title/ Licence Number	Owner	Type of Title or Licence
EL8463	Lachlan Resources Pty Ltd PO Box 1573 WEST PERTH WA 6872	Minerals Exploration licence (Metallic minerals (Group 1))

Consultation with proposal site mineral titleholders for the proposal is outlined in Section 5

6.6.2 Assessment of Potential Impacts

Nature of the proposed land use change

The proposal will result in a change from cropping agriculture to electricity generation accompanied by grazing agriculture. The major activities associated with the land use change are:

- Purchase of the Site for a Solar Farm

- Site establishment and preparation for construction including minor vegetation clearing
- Installation of steel frames, PV panels, and underground cabling
- Construction of a 132kV substation and connection to an existing transmission line
- Operation of the facility for approximately 30 years
- Routine and ad-hoc maintenance work.

The change in land use is mitigated by several factors:

- The Proposal will rest the soils and allow the chemical and physical structure to improve while the solar farm is in operation
- The Proposal has a reversible nature as it can be easily decommissioned and rehabilitated returning the land to its former agricultural use at the end of the operational period.

Compatibility of proposed land use and adjoining activity

Adjoining activities to the proposed solar farm are limited to cleared agricultural land and rural residences. Solar farms and agriculture can be seen as both 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 under and around the solar panels the land can be used for sheep grazing as well as energy production
- The panels will provide shade, which will 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 Subject Land and existing electricity easements
- The proposal is not expected to impact or sterilise surrounding land from routine agricultural practices
- 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
- Diversification of land use providing sustainable income for the landowners
- 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
- Risk of weed infestation.

BSAL

The land within the site is not mapped as Biophysical Strategic Agricultural Land (BSAL) and therefore the proposal will not have any long-term impact on prime agricultural land. Temporary loss of the site for agricultural production would occur for the life of the proposal, approximately 30 years.

During the operational phase of the Proposal a land management plan will be employed (refer **Appendix J**) so that upon decommissioning the land will be available for agricultural use. If the Site is to be decommissioned after the operating period, the Site would be returned to being used solely for agricultural purposes and Site would either be leased or placed on the market and sold.

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.

Intersection Upgrades

The upgrades to be undertaken at the intersection of Renshaw McGirr Way and Suntop Road will result in temporary construction in an active road corridor. Operational use at this intersection will be a continued use of current operations as a road and would provide safety improvements for the community using this intersection.

6.6.3 Mitigation / Management 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.
L3	Implement the Landscape Plan (refer Appendix C)
L4	All pesticides will be used in accordance with the <i>Pesticides Act 1999</i> , such that only registered pesticides are used based on label instructions that are designed to minimise impacts on surrounding land
L5	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.
Operational Mitigation Measures	
L6	An OEMP will be prepared for the Proposal and will incorporate: • The land management plan including a weed management • Ongoing landscaping commitments

6.7 Surface Water, Hydrology and Groundwater

This chapter summarises the site hydrological conditions and provides an assessment of potential impacts on surface water and groundwater. The surface water drainage conditions are described and an assessment provided of potential impacts on surface water drainage patterns. The flood potential of the site is described based on available flood information and the likely flood interactions with the Proposal assessed. Groundwater conditions are described based on desktop searches, existing published data (where available) and site observations. Potential groundwater interactions and impacts are assessed. Potential impacts of the Proposal have been identified and assessed for the construction and operation of the Proposal, and mitigation measures developed to address specific risks.

This chapter addresses the requirements of the SEARs, in particular the following matters:

- Surface water and groundwater conditions
- Identification of riparian land and groundwater dependent ecosystems
- Water requirements and supply arrangements for the Proposal
- Existing licensed groundwater users
- Potential hydrological impacts during construction and operation
- Management and mitigation measures to minimise potential hydrological impacts

6.7.1 Assessment Methodology

Surface Water

Surface water drainage patterns were identified using published resources such as the Department of Lands 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 natural watercourse, this being the Macquarie River approximately 7.7km to the north 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 6.7.2.

6.7.2 Existing Environment

Surface Water drainage

The Proposal is located within the Macquarie River Catchment with the closest major water course being the Macquarie River, which is located approximately 7.7km north of the Site (Figure 1-3).

The Macquarie River is located in the Macquarie – Bogan Catchment and is one of the Murray-Darling Basin's major sub-catchments. The Macquarie-Bogan catchment covers an area of 74,800 square kilometres with the headwaters of the Macquarie River originating in the Great Dividing Range south of Bathurst, where the river flows in a general north-westerly direction until it joins the Barwon River near Brewarrina.

The major NSW cities and towns relying on the rivers in the Macquarie catchment include Bathurst, Orange and Oberon upstream of Burrendong Dam, and Dubbo, Wellington and Nyngan on the Macquarie River below Burrendong Dam. Mudgee, Peak Hill, Narromine, Warren, Lithgow, and Brewarrina also draw their water from rivers in the catchment. Burrendong Dam to the east of Wellington is located on the Macquarie River and is the largest storage in the catchment with a capacity of 1,190,110 megalitres. This storage water a range of uses including irrigation, town water, stock and domestic use.

There is a creek / flowline (unnamed) that runs through the Site in an east to west direction and flows into Barney's Creek, approximately 2.5km to the north of Site. This creek (unnamed) is classified a first order stream, as it is located at the top of a catchment as a 'headwater' flow. Barney's Creek, flows into Little River which is a major tributary of the Macquarie River.

The Site has a large amount of low "rollover" banks which can be driven over and are regularly cultivated. These serve to reduce velocities of surface water flows and reduce the erosion potential of these flows. These structures follow the contour and water which follows the banks discharge into a series of small farm dams located across the Site.

The intersection of Suntop Road and Renshaw McGirr Way encompasses a portion of an unnamed second order north flowing tributary of Curra Creek which is approximately 100 metres north of the study area. Curra Creek flows north east for approximately 6 kilometres before joining Bell River and Macquarie River near Wellington. The second order tributary runs beneath Renshaw McGirr Way through a culvert and no water was present in the drainage line during the site inspection (15 May 2018).

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.

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.

A search of the Department of Primary Industries (Office of Water) groundwater database identified three groundwater bores in the vicinity of the Site with one located on the southern side of the Site and two located on the northern side of Suntop Road. These varied in depth from 25 – 30m with a standing water level of 15m.

The Wellington LEP (2012) has mapped this Site as part of 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
- 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)
- Any appropriate measures proposed to avoid, minimise or mitigate the impacts of the development.

Groundwater Dependent Ecosystems

The site has not been mapped by the BoM as a containing a Groundwater Dependent Ecosystem.

Water use and Access Licenses

The current owners detail that water from a bore is accessed for the Site and the adjoining landholders to the west for stock and domestic purposes, and a series of small farm dams provide water for livestock. A check of records indicate that the existing bore is not currently licensed with WaterNSW. As part of the property purchase, SSF have negotiated to maintain access to this bore.

Negotiations have also taken place between SSF and the adjoining neighbours who also currently access this bore. To allow continued water access for the adjoining property, the establishment of new bore on their property is being investigated.

Table 6-24 summarises the existing water access licenses and water use approvals at and adjacent to the property.

Table 6-24 Water Licenses and Approvals

Approval	Location	Type	Use
GW056551	Lot 3 DP 506925	Bore	Basic Rights

6.7.3 Assessment of Potential Impacts

Water Quality

Construction

Construction activities with the potential to impact upon surface water flows include those with the potential to disturb soils and lead to sediment runoff. During construction, the soils will be subject to disturbance associated with site preparation, access and construction activities. However, due to the distance from any major watercourses near the Site and the staged construction program leading to progressive stabilisation of disturbed soils, any potential erosion and water quality impacts to nearby waterways from the Proposal are considered low. These are capable of being managed through implementation of conventional erosion and sediment controls along with the continued use of the existing erosion control structures.

The major flowlines on the Site will be afforded protection by the implementation of a buffer along them which will ensure vegetative cover is retained to assist in maintaining water quality. The dams will also have a buffer area maintained around them with the exception of one very small dam in the southern section of the Site which is proposed to be filled in.

Works at the intersection of Suntop Road and Renshaw McGirr may occur in close proximity to the existing culverts however Curra Creek is located approximately 100m to the north east of the works area.

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 would be sourced from runoff water collected in the dams on site. Water for the intersection upgrade works and should any additional water for the Site be required it will 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 dams and bore. 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 commensurate with the current demands from agriculture on the Site.

Groundwater and Groundwater Dependent Ecosystems

Construction

Impacts to groundwater during construction are considered unlikely due to the depth of groundwater anticipated across the site. The closest groundwater bores indicate a standing water level exceeding 15m. Excavation on site will not exceed 4m associated with pile driving for the mounting structures and open trenching will not be deeper than about 1.2 m. As such, works on site are not anticipated to intercept or impact upon groundwater.

Works associated with the intersection upgrade are likely to consist of shallow excavation and are unlikely to impact on 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.

It has been documented that groundwater in some section of this district can be slightly saline. It has also been documented that some of the gullies and lower lying areas are most susceptible to salinity if water tables are able to rise without control.

A salinity specialist from the NSW Local Land Services at Wellington was consulted in relation to this issue 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 the growing pasture plants. The infiltration rates would also be lower than those that currently occur when the soil is exposed after cultivation.

The management of the Site will be subject to a Land Management Plan, and this will document measures for pasture management.

6.7.4 Mitigation / Management 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.
Operational Mitigation Measures	
SW5	Implement the Land Management Plan to ensure at least 80% groundcover is restored and maintained (Refer Appendix J)

6.8 Soils, Geology and Contamination

An assessment of soils, geology and contamination has been undertaken for the Proposal. Information on the existing environment was obtained through a combination of desktop searches, site observations and a soil survey. Potential impacts of the Proposal have been identified and assessed for the construction and operation of the Proposal, and mitigation measures developed to address specific risks.

This chapter addresses the requirements of the SEARs, in particular the following matters:

- Geology and landform
- Existing soil conditions
- Potential soil contamination
- Soil and landscape suitability, and limitations to development
- Potential soil impacts during construction and operation
- Management and mitigation measures to minimize potential impacts on soils.

6.8.1 Existing Environment

Landform

The study area is located in the Central West subregion with the main rivers in this subregion being the Macquarie, Castlereagh and Bogan rivers all of which are 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 to the north west to the Barwon River. The Site lies within the Macquarie River catchment system and the Macquarie River is located approximately 7.7 km north of the study area, see Figure 1-3. One second order drainage line flows east-west through the central part of the study area, which empties into Barneys Creek approximately two kilometres west of the study area. Barneys Creek is a tributary of Little River that empties into the Macquarie River, approximately 20 kilometres north west of the study area.

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 Mount Duke (540m, Mount Arthur (525m AGD) and Bushrangers Hill (406m AGD). Mount Arthur is part of the Mt Arthur Reserve which is located approximately five kilometres east of the study area and this is one of the last areas of remnant vegetation in the Wellington area.

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 Wellington 1:100,000 Geological Series Sheet (Department of Planning and Environment (DP&E)) has mapped the area as 'Scuc' – Canowindra volcanics (Garnetiferous quartz-feldspar-cordierite porphyritic lava, tuff, ashtone, ignimbrite) and Scuh – Hanover Formation (massive siltstone and chert).

The geology at the intersection of Suntop Road and Renshaw McGirr Way comprises Garra Formation (Dgg) and Curra Creek Conglomerates (Dtcu). The Garra Formation is an Early Devonian Volcanic that outcrops on shallow valleys and low broad ridges and is comprised of fossiliferous limestone that formed under shallow marine conditions. The Curra Creek Conglomerates form part of the Late Devonian Catombal Group and overly Garra Formation geologies. The Curra Creek Conglomerates were formed from the high-energy deposition of alluvial fans from the east.

The Department of Primary Industries (Office of Water) water monitoring database lists two groundwater bores near the Proposal Site. The Geologists Log revealed a shallow to medium topsoil thickness (0m-1m), a clay B horizon (1m – 3m) and a granite bedrock, with an intermediate weathered profile between hard granite and clay B horizon (3m – 25m).

A region within the neighbouring eastern lots, of approximately 350ha has been identified as Karst landscape. A Karst landscape is characterised by the presence of underground cavern networks created from the dissolution of bedrock by surface water or groundwater. The geology mapping for this area as shown on Figure 6-29 indicates that the geology of the area would not produce karst landscapes. The proposed construction activities on site will be shallow in their nature and will not go to a depth that would impact on karst if it was to occur beneath the Site. The proposal will not impact on any karst landscape in this area.

The geology of the Site is categorized as shown in Figure 6-33 and described in Table 6-25.

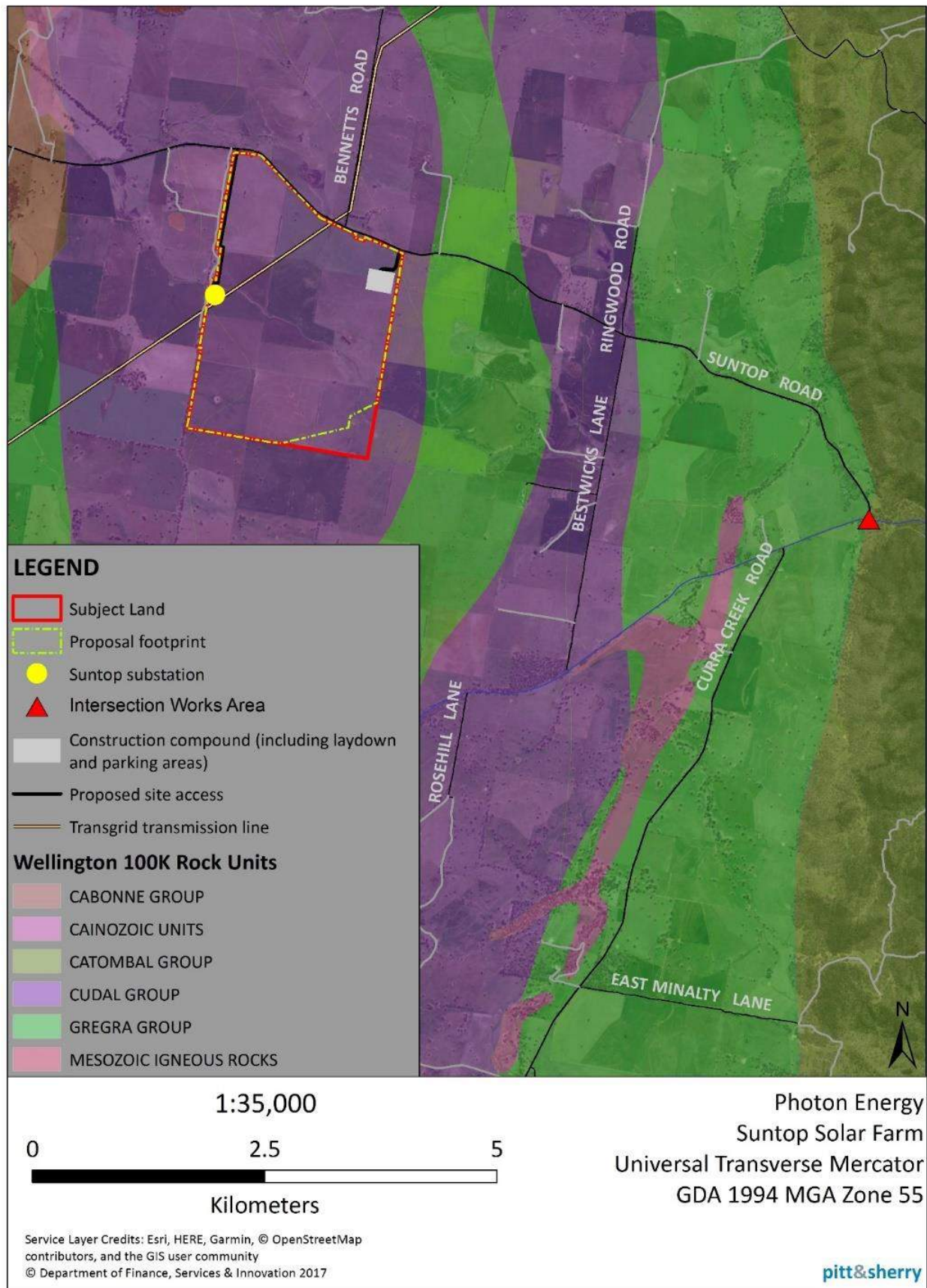


Figure 6-33 Geology of the Suntop area (Extract from Wellington 1:100000 Geological Map)

Table 6-25 Site Geology Descriptions

Symbol	Name	Description
Scuc	Canowindra Volcanics	Garnetiferous quartz-feldspar-cordierite porphyritic lava, tuff, ashtone, ignimbrite
Scuh	Hanover Formation	Greenish-buff almost massive siltstone with some purple siltstone and chert near base
Dgg	Garra Formation	Fossiliferous limestone with minor cherty and volcanoclastic sandstone, fissile shale and marly siltstone, with minor rare tuff.
Dtcu	Curra Creek Conglomerates	Red-purple conglomerate, minor interbedded red-purple sandstone and siltstone.

Soil Landscape

Soils at the Site have been mapped as being in the Arthurville Soil Landscape and as detailed in the DLWC Dubbo 1:250000 Sheet (1998). This is an area of approximately 682 km² and the soils are predominantly Red-brown Earths with some Yellow Podzolic-Solodic soils being present. 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 soils chemical fertility of this soil landscape as moderate with common deficiencies such as Nitrogen, Phosphorous and Sulphur. The surface soils also exhibit some areas of slight acidification and aluminium toxicity. The physical fertility is generally moderate, with some of the lighter textured surface soils being subject to structural degradation which can have consequences of higher runoff, increased erosion and surface sealing. The subsoils, particularly the Red-brown Earths are well structured and this has the benefits of allowing large amounts of root growth.

The erosion hazard has been described as moderate to high given the long slopes, 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 subject 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 III Rural Land Capability. This gives them a general rating of being suitable for cropping and for the construction of dams and other erosion control earthworks including banks and waterways.

Table 6-26 details the qualities and limitations for soils found in the Arthurville Soil Landscape.

Table 6-26 Soil qualities and limitations

Qualities	Limitations
Complex soils	Long slopes (high erosion hazard)
Fertile	Some gravel lenses on lower slopes (can lead to leaking earth structures e.g. dams)
Productive arable land	
Rural Land Capability III	

Soils at the intersection of Suntop Road and Renshaw McGirr Way have been mapped as Tillings Lane Soil Landscape and as detailed in the DLWC Dubbo 1:250000 Sheet (1998). This is an area of approximately 77km² and the soils are predominantly red-brown earths. This landscape is formed from in situ, colluvial and alluvial parent rock. Soil salinity problems are not present in this landscape and the soils are erosional due to long slopes particularly in tilled conditions or with poor cover

Potential contamination

A search of the NSW contaminated land register was conducted on 19th March 2018. This register contains three sites in the Dubbo Regional Council LGA and these are all within the township of Wellington, and are former or existing Service Station sites (Refer Table 6-27).

Table 6-27 Registered contaminated sites within Wellington (Dubbo LGA) (Source: NSW EPA)

Suburb	Address	Site Name	Distance from the site
Wellington	124-128 Lee Street	Former Caltex Service Station	10km
Wellington	35A Maxwell Street	BP Wellington Service Station	10km
Wellington	35A Maxwell Street	BP Wellington Service Station	10km

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.

6.8.2 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 6-35 and the soil log sheets are included as **Appendix K**
- Collecting a representative sample (approx. 1kg) of each soil layer. Samples were placed in sealed plastic bags and labelled appropriately

- Analysing soils to assess soil fertility and a range of general constraints to land development.

Figure 6-34 shows the approximate location of the test pits in relation to the solar farm boundary.

No soil testing was undertaken at the intersection of Suntop Road and Renshaw McGirr Way due to the small scale of the works to occur at this location.

Soil Description

As previously described the topography of the site is undulating with the Site being 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.

The following general observations were made:

- The site soils can be characterized as red brown earths and some smaller areas of yellow podzolic
- Soils on site display a moderate amount of shrink / swell in response to moisture
- The site presents a moderate to high hazard for rill and gully erosion
- Sheet erosion may be exacerbated by surface sealing when left unvegetated, this can lead to reduced infiltration and increased runoff
- Wind erosion may be experienced when soils are left bare or fallow between cultivation cycles

Table 6-28 provides a brief summary of the soil materials sampled.

Table 6-28 Soil Sample Descriptions

Sample Name	Sample Depth	Description
TP1/1	0 – 150 mm	Sandy loam, grey - brown
TP1/2	150 – 450 mm +	Sandy loam, yellowish brown
TP2/1	0 -200 mm	Sandy loam, dark brown
TP2/2	200 – 500 mm +	Sandy loam, reddish brown
TP3/1	0 -200 mm	Sandy loam, reddish brown
TP3/2	200 – 400 mm+	Light sandy clay loam, reddish brown
TP4/1	0 -200 mm	Sandy loam, reddish brown
TP4/2	200- 450mm+	Sandy loam, light reddish brown
TP5/1	0- 100mm	Sandy loam, light brown
TP5/2	100 – 400mm +	Medium heavy clay, light brown
TP6/1	0 – 100 mm	Sandy clay, light brown
TP6/2	100- 400mm +	Medium clay loam, light brown

Soil analysis

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 6-29 lists the schedule of analysis and a brief summary of the results is provided in Table 6-30 and the following sections. Certificates of analysis containing the complete laboratory results are contained in **Appendix K**. The laboratory provides a number of different packages which test for various suites of chemical traits of the soil. As indicated the cropping package was chosen for six of the sites sampled. The cropping package includes an analysis of the following:

- pH (water)
- Ph (CaCl₂)
- EC (water)
- Available phosphorous (Colwell)
- Phosphorous buffer index
- Available sulfur (KCl₄₀)
- Exchangeable cations
- Walkley & Black organic carbon
- Total Nitrogen

The remaining sites were tested for pH (water) and EC and six of the samples were also sent to another laboratory for K factor (erodibility) testing.

Table 6-29 Laboratory analysis schedule

Sample ID	Horizon	Depth mm	K factor (incl PSA and OC)	pH (water) EC	Cropping Package
TP1/1	A	100	X		X
TP1/2	B	300	X		X
TP2/1	A	100	X		X
TP2/2	B	300		X	
TP3/1	A	100		X	
TP3/2	B	300		X	
TP4/1	A	100	X		X
TP4/2	B	400		X	
TP5/1	A	50	X		X
TP5/2	B	300	X		X
TP6/1	A	50		X	
TP6/2	B	300		X	
Note – “X” denotes the sample was analysed					

Table 6-30 Summary of laboratory results.

Factor	Units	Maximum	Sample No.	Minimum	Sample No.
pH (Water)	pH units	6.8	TP5/1	5.3	TP1/1
pH (CaCl ₂)	pH units	6	TP5/1	4.4	TP2/1
Electrical Conductivity	dS/m	0.2	TP1/1	0.021	TP3/2
Sulfur (KCl ₄₀)	mg/kg	11	TP5/1	<2	TP1/2
Bray Phosphorus	mg/kg	140	TP5/2	1.1	TP1/2
Organic Carbon	%	1.1	TP4/1 TP5/2	0.28	TP1/2
Total Nitrogen	%	0.13	TP2/1 TP4/1	0.04	TP1/2
Aluminium	cmol(+)/kg	0.32	TP1/1 TP2/1	< 0.1	TP1/2
Calcium	cmol(+)/kg	17	TP5/1	3.2	TP1/2

Factor	Units	Maximum	Sample No.	Minimum	Sample No.
Potassium	cmol(+)/kg	1.8	TP1/1	0.39	TP1/2
Magnesium	cmol(+)/kg	4.1	TP5/1	0.4	TP1/2
Sodium	cmol(+)/kg	0.07	TP5/1	<0.03	4 pits
CEC _(effective)	cmol(+)/kg	22	TP5/1	4	TP1/2
Calcium/ Magnesium		12	TP4/1	4	TP5/1
Percent Aluminium Saturation	% of ECEC	6	TP2/1	2	TP4/1
Exchangeable Calcium	% of ECEC	81	TP4/1 TP5/2	62	TP1/1
Exchangeable Potassium	% of ECEC	25	TP1/1	3.7	TP5/1
Exchangeable Magnesium	% of ECEC	19	TP5/1	6.7	TP4/1
Exchangeable Sodium Percentage	% of ECEC	0.54	TP4/1	0.32	TP5/1

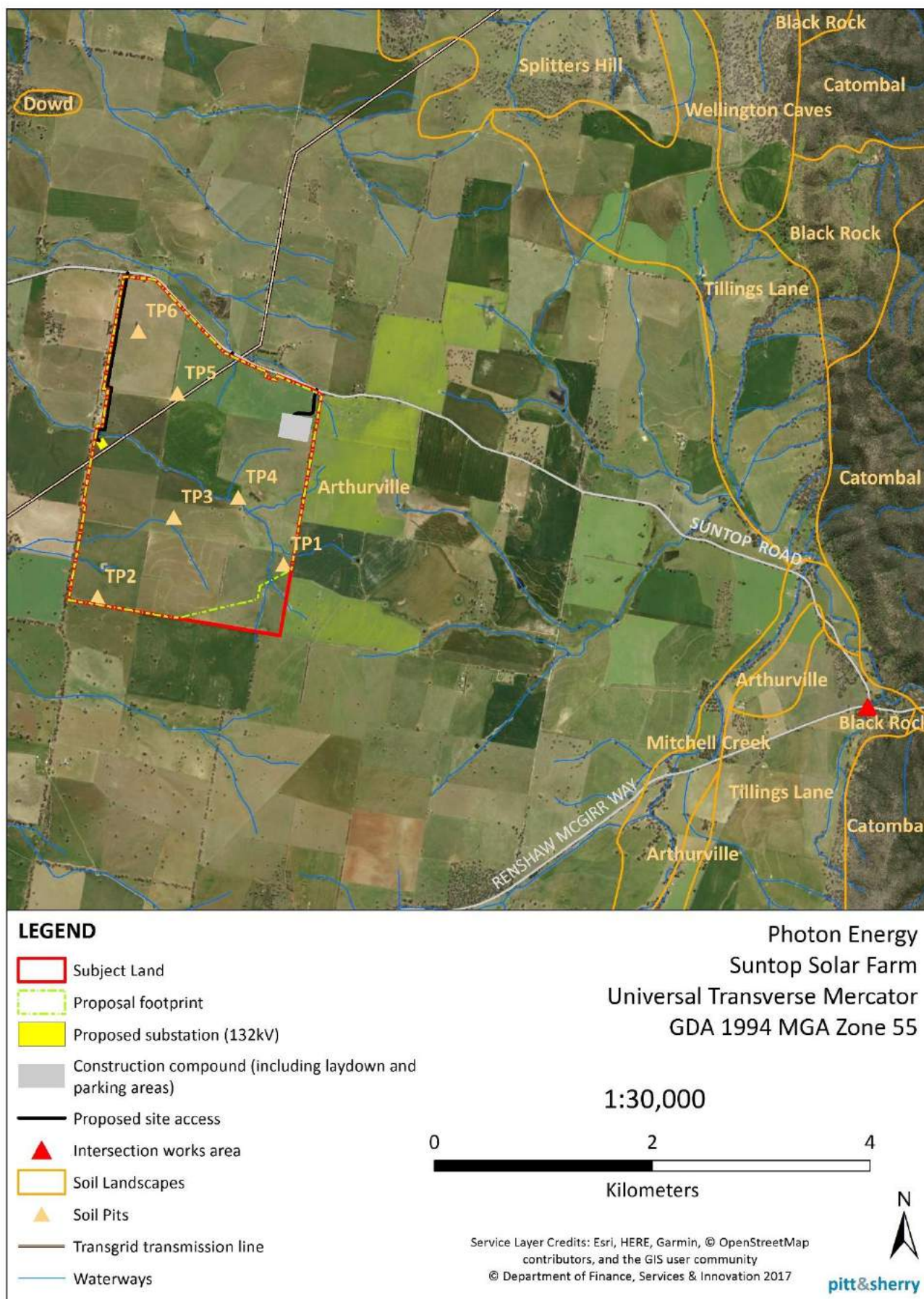


Figure 6-34 Soil test pit locations

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 pH's. Laboratory analysis of the soils sampled indicates a pH (water) range of 5.36 (slightly acid) to 6.8 (neutral).

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 ECse range for non-saline soils to extremely saline soils are listed in Table 6-31.

Table 6-31 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 subject land including no:

- Visible signs of scalds (during the site inspection – some minor scalds have since been identified by the landholder)
- Poor crop growth in low-lying areas where water cannot drain freely due to poor layout and drainage
- Waterlogging-tolerant plant species becoming dominant
- Die back of native vegetation.

Table 6-32 Site Electrical Conductivities (1:5 solution)

Sample	Electrical Conductivities dS/M	ECse
TP1/1	0.2	2.76
TP1/2	0.026	0.359
TP2/1	0.059	0.814
TP2/2	0.042	0.58
TP3/1	0.082	1.132
TP3/2	0.021	0.199
TP4/1	0.054	0.745
TP4/2	0.028	0.386
TP5/1	0.068	0.938
TP5/2	0.064	0.371
TP6/1	0.11	1.518
TP6/2	0.041	0.353

The laboratory analysis shows a range of 0.026 to 0.2 dS/m in a 1:5 water solution (refer Table 6-32). When adjusted for the sandy loam textures for EC_{se}, these soils are all non – saline soils.

Soil data and records indicate that salinity outbreaks are present further to the west of the Site and lower in the topography. It is also documented that salinity outbreaks are more prone to occur in gullies and low lying areas in this district. As has been documented in Section 6.7.3, 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 in relation to this issue 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 Sites 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 magnesian 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. Table 6-33 presents the measured sodium and magnesium concentrations for the soils tested.

Table 6-33 Exchangeable Sodium and Magnesium in the Cation Exchange Complex (%)

Sample	Exchangeable Sodium (%)	Exchangeable Magnesium (%)
TP1/1	N/A	8.4
TP1/2	N/A	10
TP2/1	N/A	9.4
TP4/1	0.54	6.7
TP5/1	0.32	19
TP5/2	N/A	7.6

The soil test results show ESP levels below 2 which indicates the soils are non- sodic, the majority of test pits also recorded relatively low exchangeable magnesium percentages. The majority of test pits recorded relatively low organic carbon levels of less than 1, this indicates these soils would potentially be subject to crusting and associated high runoff if the 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 4 and 12 which indicate this should not pose a problem if a vegetative cover is maintained.

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.

Following is a general guide to K-factor based on soil texture:

- Soils high in clay typically have low K values, about 0.005 to 0.015, because they are resistant to detachment
- Similarly, coarse textured soils such as sands usually have low K values, about 0.005 to 0.02, due to the associated high profile permeability and low runoff, even though these soils are easily detached
- Medium textured soils, such as the silt loam soils, have moderate K values, about 0.025 to 0.04, because they are moderately susceptible to detachment and they produce moderate runoff
- Soils having a high silt content are most erodible of all soils. They are easily detached; tend to crust and produce high rates of runoff. Values of K for these soils tend to be greater than 0.04.

Six of the test pit samples were analysed for K factor and the test results show a range between 0.021 and 0.057 with the results shown in Table 6-34. The data indicates the soils tested have a low to moderate K-factor value.

Table 6-34 Particle size analysis and K factor

P7C/2 Particle Size Analysis – mechanical (%)							
Sample ID	OC (%)	Clay	Silt	F sand	C sand	Gravel	Soil Erodibility – K Factor
Suntop TP1/1	0.88	7	17	32	38	6	0.043
Suntop TP1/2	0.28	4	15	31	37	13	0.049
Suntop TP2/1	1.24	1	18	35	37	9	0.049
Suntop TP4/1	0.85	1	23	33	35	8	0.055
Suntop TP5/1	0.65	3	15	36	24	22	0.057
Suntop TP5/2	0.44	33	17	6	21	23	0.021



Test Pit 1



Test Pit 2



Test Pit 3



Test Pit 4



Test Pit 5



Test Pit 6

Figure 6-35 Test Pit Photos

Nutrients

Phosphorus

Phosphorus levels vary widely across the site. They range from 140 mg/kg, TP5/2, to 1.1 mg/kg, TP1/2. 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. A proportion of the samples at depth indicate that there is the possibility there has been some leaching of phosphorous down the profile, this can sometimes occur if fertiliser is not fully taken up by the plants.

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 the 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 0.04% 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 <2 mg/kg to 11mg/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 6-35 summarises the Revised Universal Soil Loss Equation (RUSLE) factors and assumed values for the site.

Table 6-35 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	0.057	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	174	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 174 tonnes per hectare per year, which has a soil loss class of low. A conventional suite of erosion and sediment controls should be sufficient to manage the erosion and sedimentation risks associated with construction activities.

6.8.3 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
- Installation of environmental controls
- Minor vegetation clearing (grasses, shrubs and isolated trees)
- Targeted clearance of low laying vegetation around trenching areas to steel post installation to minimise disturbance to existing ground cover
- Preliminary civil works including:
 - Drainage works
 - Setting up foundations for the substation
 - 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.
- Upgrade works at the intersection of Suntop Road and Renshaw McGirr Way
- Construction of the 132kV substation
 - Site Establishment and clearing (if required)
 - Bulk earthworks via a range of plant that may include scrapers, bulldozers, excavators, rollers, trucks and loaders
 - 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
- Potential disturbance of historical land contamination
- 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. By utilising the undulating topography, existing water management structures (roll over banks and culverts), maintaining well established vegetation cover, and standard erosion and sediment control measures, the

potential for erosion and the movement of sediments could be managed effectively. 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 susceptible to sheet erosion if left unvegetated for long periods
- pH's are generally within the acceptable range.
- Soils on site are non-saline
- K factors suggest soil erodibility is low to moderate.

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 roads) throughout the operational phase of development. The objective is to maintain a vegetative groundcover, preferably an improved pasture, throughout the construction phase which will minimise the erosion hazard. Apart from the permanent hardstands and formal access roads, areas disturbed by construction would be revegetated promptly and progressively including throughout the solar arrays.

The site is susceptible to westerly winds which can be problematic for wind erosion. The soils are susceptible to powdering with the use of heavy machinery and concentrated construction activities. This could expose them to wind erosion and a high risk of dust if left in a dry powdery condition. Conventional dust management activities such as watering of soils using a water cart and application of synthetic dust suppressants, can be employed effectively to manage wind erosion and reduce dust. These should form a key part of the erosion and sediment control plan.

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. The existing earth roll over banks will continue to act as diversions to capture and divert stormwater on the site. This will assist in reducing potential impacts from sheet erosion and stormwater runoff.

In relation to engineering suitability, limited soil laboratory data has currently been collected to determine specific properties for design of structures such as drains, roads and building bases. 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. Compacted structures such as roads and laydown areas should present no issues if constructed well. Disturbed areas will need to be revegetated as quickly as possible.

The soils at the intersection of Suntop Road and Renshaw McGirr Way have a moderate to high erosion hazard and as such works at this location have the potential to increase erosion and sedimentation in this area. Implementation of an Erosion and Sediment Control Plan for the duration of works will mitigate this risk.

Operation

The potential for the Solar Farm to impact on site soils during operation, after all areas disturbed during construction have been rehabilitated and groundcover has been established, is minimal. The site will be accessed regularly for maintenance of the Solar Farm and management of grazing livestock, generally using 4WD vehicles. 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. 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
- Promote and continue productive agriculture alongside electricity generating operations
- 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. 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.

Livestock are proposed to be used to graze the area to reduce maintenance costs (i.e. to reduce the need for slashing, mowing and herbicides), and as such the area needs to be established to improved pasture consisting of a mix suitable grasses and legumes with suitable fertiliser prior to major construction works. Strategic electric fencing and watering points would also need to be established to assist with management of grazing livestock.

The issue of livestock management will be included in the Land Management Plan to address stock movement on site to assist with management of groundcover and weeds (**Appendix J**).

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

6.8.4 Mitigation / Management 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.

Reference	Mitigation Measures
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.
Operational Mitigation Measures	
S11	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 • Monitoring programs for soil fertility and groundcover.

6.9 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 Proposal and how these risks could be suitably reduced and managed (see **Appendix F**). A summary of the key findings of this assessment are outlined below.

6.9.1 Existing Environment

Vegetation within the site is largely cleared of native vegetation excluding several remnant patches (refer 6.1.2) and crops. The Subject Land is isolated from the forested Mount Arthur Reserve which is located approximately 5km to the north-east of the proposal with predominantly cleared agricultural land surrounding the property to the east, west and south and the sealed Suntop Road to the north. The topography of the Site is undulating with gentle slopes and several gullies running through the Site (refer Section 6.8.1).

Fire History

Mapped fire records from the Rural Fire Service (2001 to 2017) indicate that there were 14 grass or bush fires within 20 km of the Site during this period. The area impacted by these fires ranged from 0.3 to 56 ha, with no fires occurring within 3 km of the solar farm site.

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:

- Lightning
- Crop harvesting equipment.

Water resources on the Subject Land include a series of small farm dams in various locations across the Site and one registered water bore. There are several natural watercourses or flowlines within the Site which are intermittent in flow, and these generally only carry water after rainfall events.

The intersection of Suntop Road and Renshaw McGirr Way is on the edge of bushfire prone land in the area however the works proposed in this location present a low fire risk during both construction and operation.

Fire Climate

Data from the Bureau of Meteorology weather station at Wellington (site 065034 D&J Rural), which is 10 km from the solar farm site, indicate the frequency of occurrence of grassland fire weather Table 6-38. 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 6-36 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 6-37).

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 6-37 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							

6.9.2 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
- Existing ignition sources such as 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 (lightning and crop harvesting equipment) will remain however as the area will be only be used for grazing, the ignition risk from crop harvesting equipment on site will be reduced significantly and lightning protection including lightning arrestors will be installed at the solar farm.

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 vegetated clusters within the Subject Land are not connected to a larger vegetated area
- 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
- 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 6.9.3.

Works at the intersection of Renshaw McGirr Way and Suntop Road would be temporary in nature and the operation of this intersection does not present any further bushfire risks.

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
- Existing ignition sources such as 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 6.9.3.

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. Any fire-fighters from the RFS or neighbouring farms attending bushfires in this area may not be equipped with appropriate breathing apparatus and are unlikely to be trained in structural fire-fighting.

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
- 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 SSF'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 APZ with a capacity of 50,000L will be located near the substation.

6.9.3 Mitigation/ Management 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 track must be trafficable by Category 1 fire appliances.
Construction and Decommissioning Mitigation Measures	
BF3	Maximise use of construction components using materials such as glass, silicon, steel and aluminium rather than plastic
BF4	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 (e.g. rubber fire fighter's boots and gloves, a self-contained breathing apparatus) – 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 – Evacuation triggers and protocols • Suppression response strategies and tactics, including aerial suppression options/management.
BF5	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.
BF6	An Asset Protection Zone (APZ) will be constructed around the solar farm with the following requirements:

Reference	Mitigation Measures
	- 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 treed areas 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) or a heavily grazed area. - Trees and tall shrubs associated with the landscape plan should not be planted close to the APZ. - APZ preferably located external to any security fence. - The substation should have a 20m APZ with no internal vegetation (gravel surface).
BF7	The APZ or a fire break is to be constructed as part of the first stage of the development.
BF8	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.
BF9	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.
BF10	Install a water supply tank with a capacity of 50,000L outside the APZ near the substation.
Operational Mitigation Measures	
BF11	Fit PV arrays with an earthing and lightning protection system connected to the main earth link.
BF12	Vegetation fuel levels internal to the APZ and throughout the solar farm will be maintained by grazing, slashing or mowing.
BF13	The solar farm will be monitored via off-site control centres to ensure systems are working correctly, investigate any alarms and monitor panel performance.

6.10 Hazards

Hazards that could be associated with the Proposal and the Subject Land include risks associated with bushfire (refer 6.9), hazardous goods and electromagnetic interference.

6.10.1 Existing Environment

Hazardous goods

Current sources of hazardous goods on the Subject Land are:

- Petrol
- LPG

- Lubricating and hydraulic oils and greases
- 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
- Existing electrical wiring in residences
- Cell phones and cell towers
- Radio and TV station broadcasts.

6.10.2 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 6-38.

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 6-38 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 Electric and Magnetic Fields (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 6-39.

Table 6-39 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

6.10.3 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 6-40. 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 6-40 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	Not subject to regulations	Not subject to regulations	Not subject to regulations	Compressed in a steel bottle and housed in the construction compound	2	No
LPG	10 tonnes or 16m3 (above ground)	>500 cumulative >30/week	2-5 tonnes	Cylinders stored in a secure area within the Proposal boundary	<1 tonne	No
	Class 3 – Flammable liquids					
Fuel (Petrol)	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
- 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 6-39, 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 6-39 are below the public and occupational exposure levels recommended by the ICNIRP Guidelines.

Central Inverters

Up to 60 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 adjacent to 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, aside from new electricity transmission lines similar to those already present in the area.

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 250 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 six residents within 1km of the proposed Site, and five residences located within 1 to 2km of the Site.

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 (six 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.

6.10.4 Mitigation / Management Measures

Reference	Mitigation Measures
Construction and Decommissioning Mitigation Measures	
<i>Hazardous Goods</i>	
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.
<i>Electromagnetic Interference</i>	
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.

6.11 Air Quality

Air quality can be affected by dust caused by soil disturbance and emissions from vehicles, plant and equipment. This can impact the amenity of the local area and become a nuisance to nearby sensitive receivers (such as residences and staff on the adjoining farm properties).

6.11.1 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 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 Suntop Road. Some of the smaller local roads and farm access roads in the vicinity of the site are unsealed 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.

6.11.2 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. 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.

Furthermore, 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. As such, air quality impacts during construction are anticipated to be minor.

Works associated with the upgrade of the intersection of Suntop Road and Renshaw McGirr Way may generate dust for a short period associated with excavation for the widening of the shoulder.

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.

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.

6.11.3 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 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 for the site.

6.12 Socio-Economic and Property

6.12.1 Existing Environment

At the 2016 census, the former Wellington LGA had a population of approximately 9000 and an area of 4113km². The population of the former Wellington LGA is projected to grow to 9550 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, 1362 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 6-41.

Table 6-41 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
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 being \$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 6-42).

Table 6-42 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.

Type	Facilities and Services in Wellington
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 • 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

Type	Facilities and Services in Wellington
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, consultants, veterinary, 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 6-42 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. Two other solar farms have been proposed on the northern side of Wellington with one already approved and one in the planning stages. These are detailed in Section 7.

Photon / Canadian Solar/ Polpo also have another two proposals in the preliminary planning stages with one at Maryvale approximately 15km to the north of Wellington and one located near Mumbil approximately 20km south west of Wellington.

A smaller facility has been constructed on the eastern approach to Dubbo and is nearing completion.

6.12.2 Stakeholder and Community Engagement

As part of the EIS, a Community and Stakeholder Engagement Plan (CESP) has been developed to inform the level of engagement required, identify key stakeholders and included an implementation plan. The intent is to speak to the Community and other stakeholders to understand the potential constraints and opportunities for the proposed development and consider this feedback through the environmental and engineering design components of the development.

The following key stakeholders have been identified

- Local residents surrounding the proposal area
- Dubbo Regional Council
- Various government agencies including DP&E, Roads and Maritime Services, SES, OEH, DPI, DRG, and RFS
- Local aboriginal community and local aboriginal land council
- TransGrid.

A summary of consultation undertaken, consultation findings as well as responses to issues raised and any ongoing consultation requirements is summarised in Section 5 of this EIS.

6.12.3 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). They surveyed 2,000 individuals over the age of 18 across seven regions of NSW with strong results around recognition and knowledge of 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
- 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
- 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 (refer Figure 6-36). At closer proximity, more respondents would strongly support a solar farm than a wind farm.

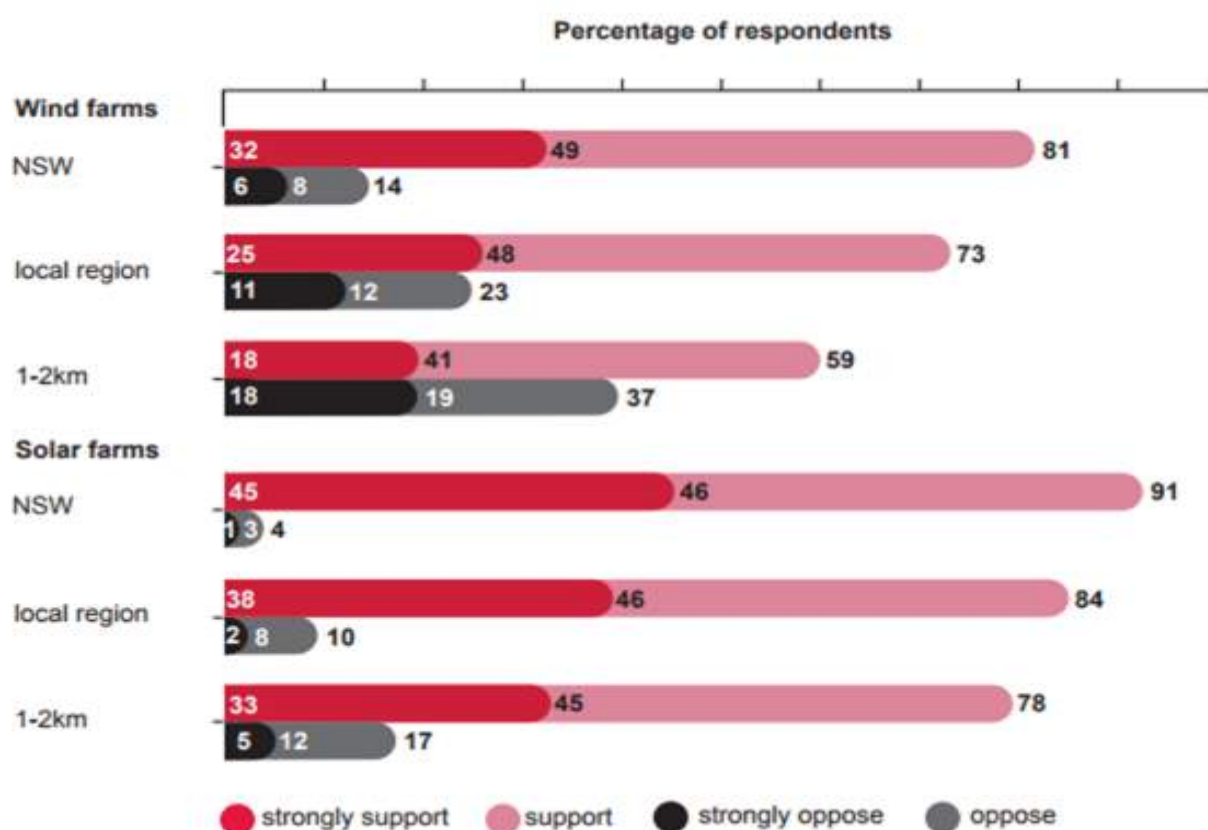


Figure 6-36 Support for and opposition to building wind/solar farm in three proximities – in NSW, within the respondent's local region, and within 1-2km of where the respondent lived.

Community feedback on this proposal

The feedback from the community in relation to this Proposal has identified a number of 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 5.

6.12.4 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) slightly less than this Proposal.

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
- 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.*).

Suntop Solar Farm

The Proposal will generate 379 gigawatt hours (GWh) of electricity each year. The Proposal represents a total investment of \$262 million and is estimated to provide 250 direct construction jobs at peak period. Section 6.12.5 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 65,000 average Australian Homes (based on *AER data (AER 2013-14)*). Additionally, the Proposal will reduce greenhouse gas (GHG) emissions by over 357,000 tonnes of CO₂ equivalent per annum, assuming a rate of 0.948 tonnes per MWh of electricity. This is roughly equivalent to removing approximately 25,000 cars from the road. Particulate and heavy metal emissions will also be reduced.

The upgrade to the intersection of Suntop Road and Renshaw McGirr Way will provide a long term benefit to local residents and the community by improving safety at the intersection for all road users.

6.12.5 Impacts

The Proposal will change the character of the Subject Land to electricity generation coupled with grazing agriculture. 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 91 % of the site and the remaining area will continue to be used for agriculture
- The solar farm will help rest the land from cultivation and allow the physical and chemical fertility of the soil to improve
- The reversible nature of the development also means they can easily be decommissioned and the land returned to its former agricultural use at the end of the operational period.

The change in land use can be seen as positive or negative depending on the individual. 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 6.5
- Additional traffic may be noticeable and could present an adverse effect on local tourism, if coinciding with local festivals
- Influx of workers 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 6.3, 6.4 and 6.11 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
- Developing regional skills in renewable energy technology.

Socio-economic 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 \$36 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 250 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 the 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.

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 six 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 6-43

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
- Administration and construction support roles.

Table 6-43 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)	200 (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.	250 (peak)	Civil, Trade Assistant, Sub-contract, Electrician, Electrician QA	6 Months

Stage of the Proposal	Estimated Number of Employees	Job type	Estimated employment time Timeframe
Underground cabling (trenching) and installation of inverter stations.			
Construction of 132kV substation and new transmission line from substation to existing 132 kV transmission line.	200 (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		30 years

The labour force may be constrained by:

- Access to accommodation within a reasonable distance from the proposed development and during tourism events
- 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 6-43) 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.

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 they are staying to minimise the impact.

Amenity

The potential adverse social impacts associated with the Proposal relate to amenity aspects including, visual, noise, traffic and air quality during construction and visual amenity during operation. These potential impacts are assessed in detail in Sections 6.3, 6.4, 6.5 and 6.11, but a short summary is provided below.

Amenity impacts from noise would involve construction noise from plant and equipment during the 12-month period of construction during standard construction hours.

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
- Visual impact to the surrounding viewpoints, both public and private.

The assessment results of Impact to landscape character finds there is a moderate impact. The assessment of visual impact to public viewpoints finds that there would be a moderate impact to views from Suntop Road. Additionally, there were 29 potentially affected private viewpoints. Of these 29, the visual impact assessment found that there was one viewpoint with a high impact, three viewpoints with a moderate-high impact, three with a moderate impact and twenty-two with a low-moderate impact.

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.

6.12.6 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 • 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 Waste

6.13.1 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
- 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 6-44.

Table 6-44 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 be 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. Photon 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.
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	General Solid Waste (non-putrescible)	Metals will be separated for recycling.

Waste material and description	Waste classification	Management Details
Repair, replacement or removal of infrastructure components		
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.
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
- 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 6-45 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 6-45 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	23km
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 Waste Management Plan (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.

6.13.2 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	
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

Reference	Mitigation measures
	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. 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 Impacts

The cumulative impact assessment has considered the local government area of Wellington which is now part of the larger Dubbo Regional Council.

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
- Mumbil Solar Farm
- Maryvale Solar Farm.

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 15 km by road and 12 km in a straight line from the Suntop Site.	The current timing of this proposal for construction is unknown. Currently the EIS is being prepared. 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. • 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 Solar proposal.
Wellington North Solar Plant This includes the construction, operation and decommissioning of a	The current timing of this proposal for construction is unknown. Currently the EIS is being prepared. If the development proceeds the timing may overlap with this Proposal. Cumulative construction impacts may include:	There are not expected to be any cumulative impacts resulting from the operation of the

Project	Cumulative construction Impacts	Cumulative operational Impacts
photovoltaic (PV) solar farm that would produce up to 300 MW of electricity. The proposal footprint is approximately 650 ha with the site approximately 5 km to the north of Wellington on the Goolma Road and approximately 17km by road and 14 km in a straight line from the Suntop Site.	• 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 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.
Mumbil Solar Farm This includes the construction, operation and decommissioning of a photovoltaic (PV) solar farm that would produce up to 138 MW of electricity. The proposal footprint is approximately 201 ha with the site approximately 20 km to the south east of Wellington on the Burrendong Way and 2km north of the Village of Mumbil. This is approximately 33 km by road and 19 km in a straight line from the Suntop site.	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 Mumbil Solar Farm
Maryvale Solar Farm This includes the construction, operation and decommissioning of a photovoltaic (PV) solar farm that would produce up to 115 MW of electricity. The proposal footprint is approximately 150 ha with the site approximately 15 km to the north west of Maryvale and Seatonville	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 Mumbil Solar Farm

Project	Cumulative construction Impacts	Cumulative operational Impacts
Roads. The site is approximately 25 km by road and 15km in a straight line from the Suntop site.		

The cumulative impacts from projects in the Wellington district of the Dubbo LGA can be grouped into four 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.

Traffic generation

The major road networks affected by the additional projects include the Mitchell Highway and the Golden Highway. The Wellington Solar Farm and the Wellington North Solar Plant are both located on the northern side of Wellington, whereas Suntop is located to the west side of the township and will utilise a different series of local Roads to provide access to the Site.

Both the Mitchell Highway and Golden Highway have suitable capacity to cater for construction and operational traffic as both 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.

As discussed, the Site is located to the west of Wellington, and Renshaw - McGirr Way and Suntop Road are two roads that will provide direct access to the site. 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 H**).

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 6.5).

Pressure on local accommodation and services

Should several projects occur at the same time local labour may not be available to all projects and non-local labour will 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 by 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 6.12.5). The increased creation of jobs and economic input into local businesses would provide a benefit to local communities.

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.

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.

Mitigation

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.

7.1.1 Mitigation / Management Measures

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. Environmental Management

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.

Mitigation Measure Reference	Description
	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 vegetation stands and the works footprint.
B2	Erect barriers to protect remnant perimeter trees, planting in Paddock 12 and Fuzzy Box clump in Paddock 1
B3	The works (e.g. plant, material stockpiling) should not encroach into remnant vegetation and buffer areas.
B4	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.
B5	A Land Management Plan which will be developed (refer Appendix J) and 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.
B6	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.
B7	Speed limits should be set to 20km per hour on internal roads and tracks.
B8	A Vegetation Management Plan will be developed and incorporate tree protection measures to conserve the trees around the perimeter of the Site.
B9	Enhancement of buffer zones around the perimeter of the site to include additional planting of replacement trees for those lost due to the clearing of the paddocks
B10	Any works surrounding the dam located on the western boundary of the site will include implementation of appropriate erosion and sediment controls to prevent silt build up in the dam.
Heritage	
<i>Aboriginal Heritage</i>	
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, Suntop IF 1 and Suntop IF 2, (two isolated artefacts identified along a creek bank) and a 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.

Reference	Mitigation Measure
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 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 <i>Heritage Act 1977</i>) 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 roads 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
V3	Implement Concept Landscape Plan, which includes visual screening. (refer Appendix C).
V4	Minimise vegetation removal and retain existing trees and other native vegetation by including: - Temporary fencing around vegetation - Demarcating area as a no-go zone.
V5	Retain as much existing grass cover beneath solar panels as possible.
V6	Progressively stabilise disturbed area with pasture grasses.
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
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

Reference	Mitigation Measure
	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	Limiting and scheduling the number of work areas along the northern boundary for piling, trenching and assembly activities to minimise noise levels at receptors along Suntop Road.
Traffic, Transport and road Safety	
T1	The proposed road improvements, as stated above, and any ancillary road works should be completed 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.
T3	All Proposal personnel will be provided training on the requirements of the TMP through site inductions, toolbox talks or specific training

Reference	Mitigation Measure
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	Develop a protocol which will be provided for undertaking dilapidation surveys and making any necessary repairs following construction. The dilapidation surveys will assess the existing condition of Suntop Road prior to construction and identify any damage once construction is complete. Should any damage be identified the road will be repaired in line with Council standards.
T10	A dilapidation survey will be completed along Suntop Road prior to upgrades on this road and after the works are complete. A dilapidation survey protocol is provided in Appendix H .
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.
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.
L3	Implement the Landscape Plan (refer Appendix C)
L4	All pesticides will be used in accordance with the <i>Pesticides Act 1999</i> , such that only registered pesticides are used based on label instructions that are designed to minimise impacts on surrounding land
L5	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.
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

Reference	Mitigation Measure
	waterways.
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 a stabilised site entrance 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.
Bushfire	
BF1	All electrical components would be designed and managed to minimise potential for ignition
BF2	The design would consider that the access track must be trafficable by Category 1 fire appliances.
BF3	Maximise use of construction components using materials such as glass, silicon, steel and aluminium rather than plastic
BF4	Develop an Emergency Response Plan (ERP) in consultation with the NSW RFS District Fire Control Centre prior to construction. The FMP 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 (e.g. rubber fire fighter's boots and gloves, a self-contained breathing apparatus)

Reference	Mitigation Measure
	– 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 – Evacuation triggers and protocols Suppression response strategies and tactics, including aerial suppression options/management.
BF5	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.
BF6	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 treed areas 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) or a heavily grazed area. • Trees and tall shrubs associated with the landscape plan should not be planted close to the APZ. • APZ preferably located external to any security fence. • The substation should have a 20m APZ with no internal vegetation (gravel surface).
BF7	The APZ or a fire break is to be constructed as part of the first stage of the development.
BF8	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.
BF9	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.
BF10	Install a water supply tank with a capacity of 50,000L outside the APZ near the substation.
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.

Reference	Mitigation Measure
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.
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.

Reference	Mitigation Measure
	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. 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	
B11	The OEMP will include: - The land management plan – which will have a procedure or plan for monitoring vegetation cover and composition and allow for adaptive management - The weed management plan – which will include weed monitoring and control - Vehicle speed limits, to reduce risk of collision with fauna - Prohibition of domestic pets on site.
Visual	
V7	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.
V8	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.
V9	An OEMP will be prepared for the Proposal and will incorporate a complaints management process.
V10	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.
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.
Land Use	
L6	An OEMP will be prepared for the Proposal and will incorporate:

Reference	Mitigation Measure
	- The land management plan including a weed management - Ongoing landscaping commitments
Surface water, Hydrology and Groundwater	
SW5	Implement the Land Management Plan to ensure at least 80% groundcover is restored and maintained (Refer Appendix J)
Soils, Geology and Contamination	
S11	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 - Monitoring programs for soil fertility and groundcover.
Bushfire	
BF11	Fit PV arrays with an earthing and lightning protection system connected to the main earth link.
BF12	Vegetation fuel levels internal to the APZ and throughout the solar farm will be maintained by grazing, slashing or mowing.
BF13	The solar farm will be monitored via off-site control centres to ensure systems are working correctly, investigate any alarms and monitor panel performance.
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

This chapter provides the justification for the Proposal 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*.

9.1 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 4.1 of the EP&A Act. As noted in Section 4.1, 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 whilst the project would have some impacts on:

- Biodiversity
- Aboriginal Heritage
- Visual amenity
- Traffic and Transport
- Erosion and sediment control
- 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, operational, and decommissioning phases.

Biodiversity

A biodiversity assessment was undertaken by flora and fauna specialists to assess the impacts of the development on biodiversity. The project will require minor land clearing to facilitate the installation of the solar PV panels. The Site has historically been predominantly cleared for agricultural use and clusters of native vegetation will be retained along the southern and western boundaries as part of the proposal. No threatened species or EECs will be impacted as part of the proposal.

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.

Three sites of Aboriginal archaeological potential were identified within the study area but outside the proposed footprint of the development. These consisted of two scatters on the edge of a flowline in the south east of the Site, and a tree of cultural significance located to the north of an existing row of trees. These trees will be retained as part of the vegetation management for the Site.

The Wellington Local Aboriginal Land Council (WLALC) were present and participated in the Site assessment. They have supplied a letter stating that they have no objection to the proposal proceeding, but stipulated that the three areas need to be protected from impacts during construction. Accordingly, they have requested that these sites be addressed in the Construction Environmental Management Plan (CEMP). No further Aboriginal cultural heritage assessment is warranted for the Proposal and an unexpected Aboriginal heritage finds procedure will be developed prior to construction.

Visual Amenity

The Proposal would be visible to 29 potentially affected private viewpoints as well as one public viewpoint being Suntop Road. A Visual Impact Assessment (VIA) was prepared and concluded that one viewpoint had a high impact and three viewpoints had a moderate to high impact. The VIA also concluded that these impacts could be reduced through the implementation of mitigation strategies, such as landscape screening.

Traffic

A traffic impact assessment (TIA) 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 which have the potential to impact on the local road network. Heavy vehicles will use a designated route which currently caters for a large number of heavy vehicles. It is considered that this route can safely accommodate the additional traffic movements associated with the project.

The major road safety impact is associated with the heavy vehicles accessing the site and their impact upon the operation of the intersections along the haulage route. In particular, the intersection of Renshaw McGirr Way and Suntop Road will need upgrading to accommodate the movement of heavy vehicles at this corner in a safe manner. Proposed works will include, widening the turning area at the corner, installation of a sheltered right turn lane from Renshaw McGirr Way into Suntop Road and the provision of safety barriers over a culvert on the north east side of the corner. Suntop Road and Renshaw McGirr way are part of a local school bus route. Traffic associated with the proposal will made aware of this and deliveries by heavy vehicles will be scheduled to avoid school bus pick up and drop off times.

Erosion and Sediment Control

The construction phase has the potential to increase dust levels from the Site. 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. 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 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.

9.2 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 cropping agricultural land for a period of approximately 30 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 9.3.
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 from the Site boundary.
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. Several items of Aboriginal heritage were identified and will be managed in accordance with an approved CEMP and OEMP. Additionally, 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 5. Suntop Solar Farm will continue to consult the community and stakeholders during the Proposal's development.

9.3 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.

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

- An assessment of the risk-weighted consequences of various options.

This EIS assesses environmental aspects and impacts associated with the Proposal 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.

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 GHG 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. 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.

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. The assessment included avoidance of areas of higher conservation value and management prescriptions to minimise and manage residual impacts. The Proposal is expected to have negligible adverse impacts on biodiversity.

Improved valuation, pricing and incentive mechanisms

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.

10. References

AER, N.D., Understand and compare your home electricity usage, viewed online 02/01/2018, <www.energymadeeasy.gov.au/benchmark>

AGL, N.D., How we source Energy: Nyngan Solar Plant, webpage, viewed 03/01/2018 <<https://www.agl.com.au/about-agl/how-we-source-energy/renewable-energy/nyngan-solar-plant>>

Aussie Towns, 2018, Wellington, NSW: History, webpage, viewed online 14/03/2018, <www.aussietowns.com.au/town/wellington-nsw>

Australian Heritage, 2018, Historical Towns Directory: Wellington, webpage, viewed online 14/03/2018, <www.heritageaustralia.com.au/preview.php?state=NSW®ion=101&view=555>

Australian Bureau of Statistics, ABS, 2017a, 2016 Census QuickStats: Wellington State Suburb, webpage, viewed 18/04/2018, <www.censusdata.abs.gov.au/census_services/getproduct/census/2016/quickstat/SSC11812?opendocument>

Australian Bureau of Statistics, ABS, 2017b, 2016 Census QuickStats: Wellington LGA, webpage, viewed 18/04/2018, <www.censusdata.abs.gov.au/census_services/getproduct/census/2016/quickstat/LGA13550?opendocument>

Bureau of Meteorology (BOM), 2017, Climate Statistics for Australian Locations: Monthly Climate Statistics - Summary Statistics Wellington Research Station, webpage, accessed 11/04/2018, <www.bom.gov.au/climate/averages/tables/cw_055023.shtml>

Clean Energy Council, 2016, CLEAN ENERGY AUSTRALIA REPORT 2016, Report, viewed online on 3/01/2018, <<https://www.cleanenergycouncil.org.au/policy-advocacy/reports/clean-energy-australia-report.html>>

Department of Environment and Climate Change (DECC), 2007, Guidelines for Threatened Species Assessment, August 2007, published by DECC, accessed online January 16, <www.environment.nsw.gov.au/resources/threatenedspecies/tsaguide07393.pdf>

Department of Environment and Energy (DoEE), 2016, The Renewable Energy Target (RET) Scheme, viewed 4/10/2016, <www.environment.gov.au/climate-change/renewable-energy-target-scheme>

Department of Environment and Energy (DoEE), 2017, Australian Energy Update 2017, viewed 09/02/2018, <www.environment.gov.au/system/files/resources/f02a388d-74eb-4200-96fb-fe2a9d0caf5b/files/energy-update-report-2017.pdf>

Department of Planning and Environment: Resources and Planning (DP&E Resources and Planning), 2016, Electricity generation, viewed 09/02/2017, <www.resourcesandenergy.nsw.gov.au/investors/electricity-generation>

Department of Planning and Environment (DP&E), 2016, Population Projections: 2016 NSW Population and household projections, webpage, Viewed 14 /12/2017, <www.planning.nsw.gov.au/Research-and-Demography/Demography/Population-projections>

Department of Trade and Investment, 2011, Land Use Conflict Risk Assessment Guide, Factsheet, Published by the Department of Primary Industries, a part of the Department of Trade and Investment, Regional Infrastructure and Services.

EMFs.info, 2018, Electric and magnetic fields and health, webpage, viewed 24/01/2018, <www.emfs.info/sources/overhead/specific/132-kv/>

First Solar, N.D., Industry Development and Job Creation in Australia, brochure, viewed online 03/01/2018, <<http://www.pac.nsw.gov.au/resources/pac/media/files/pac/projects/2017/10/beryl-solar-farm/other-information-provided-by-the-applicant/3-first-solarindustry-development-australia-brochure.pdf>>

Hoen, B., Wiser R., Cappers P., Thayer M., and Sethi G., 2010. The impact of wind power projects on residential property values in the United States: A multi-site hedonic analysis. Lawrence Berkeley National Laboratory.

Hoen, B., Brown, J.P., Jackson, T., Wiser, R., Thayer, M. and Cappers, P., 2013. A spatial hedonic analysis of the effects of wind energy facilities on surrounding property values in the United States.

OEH, 2014a, Biobanking assessment methodology (BBAM), published by OEH September 2014, accessed, <www.environment.nsw.gov.au/resources/biobanking/140661BBAM.pdf>

OEH, 2014b, Framework for Biodiversity Assessment (FBA), published by OEH September 2014, accessed, <www.environment.nsw.gov.au/resources/biodiversity/140675fba.pdf>

OEH, 2015, Community Attitudes to Renewable Energy in NSW, published by OEH 59 Goulburn St, Sydney, NSW 2000, viewed online 03/01/2018, <<http://www.environment.nsw.gov.au/resources/actionmatters/community-attitudes-renewable-energy-150419.pdf>>

OEH, 2017, Land and Soil Capability Mapping for NSW, NSW Office of Environment and Heritage, Sydney.

OEH, 2018, Search air quality data, viewed online 22/12/2017, <www.environment.nsw.gov.au/AQMS/search.htm>

OEH and Office of Agricultural Sustainability & Food Security (OASFS), 2013, Interim Protocol for site verification and mapping of biophysical strategic agricultural land, report, accessed 10/01/2018.

TransGrid, N.D., Electric and Magnetic Fields, Brochure, accesses online, viewed 24/01/2018, <www.transgrid.com.au/being-responsible/public-safety/Documents/Electric%20and%20Magnetic%20Fields.pdf>

Vyn, R.J. and McCullough, R.M., 2014. The effects of wind turbines on property values in Ontario: does public perception match empirical evidence?, Canadian Journal of Agricultural Economics/Revue canadienne d'agroeconomie, 62(3), pp.365-392.

World Health Organisation (WHO), 2018, Electromagnetic Fields (EMF): Summary of Health effects, viewed online 5/03/2018, <www.who.int/peh-emf/about/WhatisEMF/en/index1.html>

Contact

Jessica Berry
0438 598 793
jberry@pittsh.com.au

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



Brisbane

Level 10
241 Adelaide Street
PO Box 5243
Brisbane City QLD 4000
T: (07) 3058 7499

Launceston

Level 4
113 Cimitiere Street
PO Box 1409
Launceston TAS 7250
T: (03) 6323 1900
F: (03) 6334 4651

Newcastle

Level 1
81 Hunter Street
Newcastle NSW 2300
T: (02) 4910 3600

E: info@pittsh.com.au
W: www.pittsh.com.au

incorporated as
Pitt & Sherry (Operations) Pty Ltd
ABN 67 140 184 309

Devonport

Level 1
35 Oldaker Street
PO Box 836
Devonport TAS 7310
T: (03) 6451 5599

Melbourne

Level 1, HWT Tower
40 City Road
Southbank VIC 3006
PO Box 259
South Melbourne VIC 3205
T: (03) 9682 5290
F: (03) 9682 5292

Sydney

Suite 902, Level 9,
1-5 Railway Street
Chatswood NSW 2067
PO Box 5487
West Chatswood NSW 1515
T: (02) 9468 9300



Hobart

Level 1, Surrey House
199 Macquarie Street
GPO Box 94
Hobart TAS 7001
T: (03) 6210 1400
F: (03) 6223 1299

pitt&sherry