Energy Projects Solar (EPS)
Bungama Solar Farm and Ancillary Infrastructure

Augusta Highway, Bungama, Locks Road, Napperby

TABLE OF CONTENTS

Bungama Solar Project

OVERVIEW

Application No	354/V004/18
KNET ID	2018/23534/01
Applicant	Energy Projects Solar (EPS)
Proposal	Bungama Solar Farm and ancillary infrastructure
Subject Land	Augusta Highway, Bungama, Locks Road, Napperby
Zone/Policy Area	Primary Production Zone
Relevant Authority	Minister for Planning
Lodgement Date	30 November 2018
Council	Port Pirie Council
Development Plan	Port Pirie Council Development Plan (Consolidated 31 October 2017)
Notification	Yes – development cost exceeds $4 million
Representations	7 representations. 5 wish to be heard
Referral Agencies	SACFS, DEW, DPTI – Commissioner of Highways, NRM, DEM
Report Author	Ben Green, Consultant Planner

EXECUTIVE SUMMARY

The Bungama Solar Project is a 280MW facility to be located approximately 6 kms east of the Port Pirie township and to the immediate south-west of the Napperby township.

The facility will be co-located with a 140MW capacity battery energy storage system with up to 560MWh of storage along with its associated infrastructure. The proposal will feed into the national electricity market through a 275kV connection to the adjoining ElectraNet's Bungama substation.

The proposal has been granted crown sponsorship as 'public infrastructure' pursuant to Section 49 of the *Development Act 1993*, and was referred to the local Council and relevant State and Commonwealth agencies with no objection raised.

Seven representations were received during the public notification process, with a number of concerns raised, including the potential visual impact, noise impacts, negative impacts on property values and construction traffic.

The Bungama Solar Project is a form of development prescribed within the Primary Production Zone as an envisaged land use and supports the wider objective of encouraging renewable energy facilities. The proposal has had suitable regard to public submissions and the technical advice of referral bodies. On balance it is considered that the proposal demonstrates sufficient merit to be recommended for approval, subject to conditions.

ASSESSMENT REPORT

1. DESCRIPTION OF PROPOSAL

Application details are contained in the ATTACHMENTS.

The proposal is for the construction of a 280MW utility solar photovoltaic plant and a 140 MW capacity battery energy storage system with up to 560MWh of storage to feed into the national electricity market via the adjoining ElectraNet Bungama Substation.

The proposal consists of the following:

- Approximately 800,000 solar PV modules mounted on single axis tracking racks (approximately 280MW)
    - Solar panels of approximately 2.0 x 1.2m mounted on steel frames
        - With a height above ground level of either 1m (at 5m row spacing and panel tilt height of 1.6m) or 3m (at 10m row spacing and panel tilt height of 4.0m)
- Battery Energy Storage System (140MW capacity)
- Invertor stations (at approximately 3m height) and transformers
- Switching yard and electrical substation
- One or more synchronous condensers
- Utility-scale battery facility (either 3-4 metres high containerised system or possible rural sheds up to 9 metres high)
- Connection to the adjoining Bungama Substation via an overhead 275kV and/or underground transmission lines
- In excess of 7km of visual buffering in the form of landscape screening along certain boundaries of the subject land
- Potential temporary construction camp
- Associated underground cables connecting groups of solar panels to inverter stations and invertor stations via overhead and/or underground transmission lines to a transformer in the substation
- Ancillary infrastructure and building, including a site office, maintenance sheds, laydown/compound area, internal access roads and car parking
- 1.8-metre-high chain wire mesh perimeter security fencing and CCTV
- Low-level night time lighting
- Drainage works, including stormwater management systems.

The applicant is seeking a commencement period of 4 years from the date of approval (if granted), with all works to be completed with 6 years of the operation date. The work will be undertaken in 2 stages – Phase 1 to incorporate approximately 140MW of solar PV modules and associated infrastructure. Phase 2 will incorporate the remaining 140MW of solar PV modules and associated infrastructure.

The Battery Energy Storage System would commence in Phase 1 and its size be increased incrementally to cater for increased solar PV modules – up to its 140MW capacity. The Battery Energy Storage System is proposed to be constructed on the western most allotment, north of Augusta Highway, and will cover approximately 12 hectares.

The proposed switching yard, substation area, office and maintenance sheds and car parking will be located in the western most portion of the area allocated for the Battery Energy Storage System. The buildings are to be grouped together to the west of an easement that contains existing electricity infrastructure.

The proposed development has a preference for utilising local accommodation within the Port Pirie township – however has identified an area to the south of the subject land that can cater for a temporary construction workers camp if insufficient accommodation suitable to meet the requirements of the development is not available. Approximately 3-5 hectares is allocated to cater up to an estimated 275 equivalent full-time workers during construction.

A 1.8-metre-high security fence is proposed around the perimeter of the subject land with CCTV equipment and low level night time lighting. Landscaping is also proposed along certain areas of the perimeter of the subject land, with key locations to improve the visual amenity when viewed from adjoining properties or key transport corridors.

2. SITE AND LOCALITY

2.1 Site Description

The site consists of ten allotments, described as follows:

Lot No	Street	Area	Hundred	Title Reference
A4 in DP 24997	Augusta Highway	Bungama	Pirie	CT 5949/272
A52 in DP 25903	Locks Road	Warnertown	Napperby	CT 5954/187
A558 in FP 188690	Locks Road	Napperby	Napperby	CT 6127/5
A20 in DP 80628	North Bungama Road	Napperby	Napperby	CT 6037/29
A559 in FP 1888691	Locks Road	Napperby	Napperby	CT 5390/999
A551 in FP 188683	Locks Road	Warnertown	Napperby	CT 5360/334
A1 in DP 24255	Warnertown Road	Bungama	Pirie	CT 5972/304
A55 in DP 71831	Warnertown Road	Bungama	Pirie	CT 5978/766
A501 in DP 52803	Warnertown Road	Bungama	Pirie	CT 5776/531
A502 in DP 52803	Warnertown Road	Bungama	Pirie	CT 5776/532

The subject land is located approximately 6 kms east of the Port Pirie township and to the immediate south-west of the Napperby township. Consisting of 10 allotments in an inverted 'L' shaped configuration, the subject land is located in the suburbs of Bungama, Warnertown and Napperby and is approximately 530 hectares in area.

The subject land is used primarily for primary production purposes in the form of broad acre farming and grazing. A small number of dwellings are found within the subject land along with existing electricity infrastructure. The western most allotment (south of Augusta Highway and north of Warnertown Road) contains a large area used for the Port Pirie Auto Dismantlers and the storage of damaged vehicles.

A number of easements traverse the subject land with both an overhead electricity transmission line and underground gas infrastructure located in the southern most allotments (Allotments 1, 4 and 52).

The subject land slopes from Augusta Highway towards the Napperby township and Mount Remarkable National Park.

2.2 Locality

The character of the locality is comprised of a range of land uses and built form primarily of a rural nature with allotments consisting of varying sizes and configurations.

Rural living sizes allotments and associated detached dwellings are found in areas to the south of Augusta Highway and to the north-east and east of the subject land adjoining the Napperby Township.

A notable feature in the immediate locality is the existing Electranet Bungama Substation to the west of the subject land and the above ground electricity transmission lines that traverse throughout the region. A small petrol filling station is also located at the intersection of Augusta Highway/Locks Road immediately adjoining the subject land.

The locality is heavily influenced by the open vista created by the use of the land for cropping/grazing and areas containing low grasses and native vegetation. The ranges

to the west, that incorporate the Mount Remarkable National Park is a defining feature in this locality.

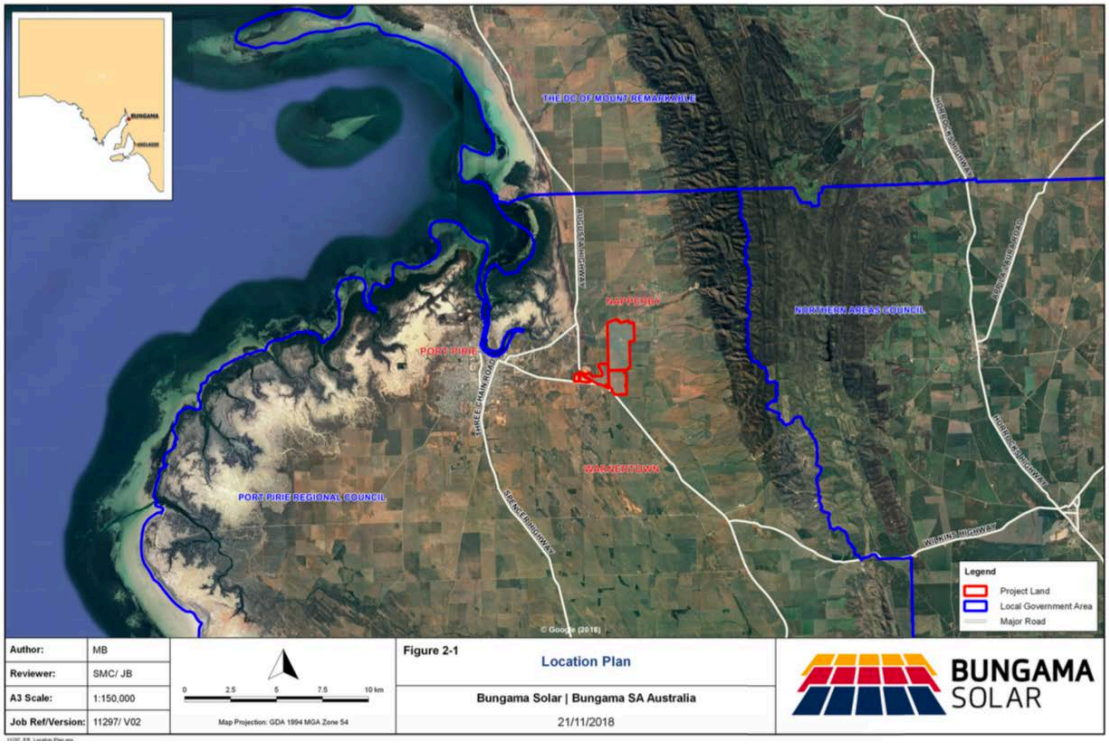


Figure 1 – Location Map (Source: EPS Energy, Nov 2018)

Figure 2 - Site Photo (Source: EPS Energy, Nov 2018)

Figure 3 - Site Photo (Source: EPS Energy, Nov 2018)

Figure 4 - Site Photo (Source: EPS Energy, Nov 2018)

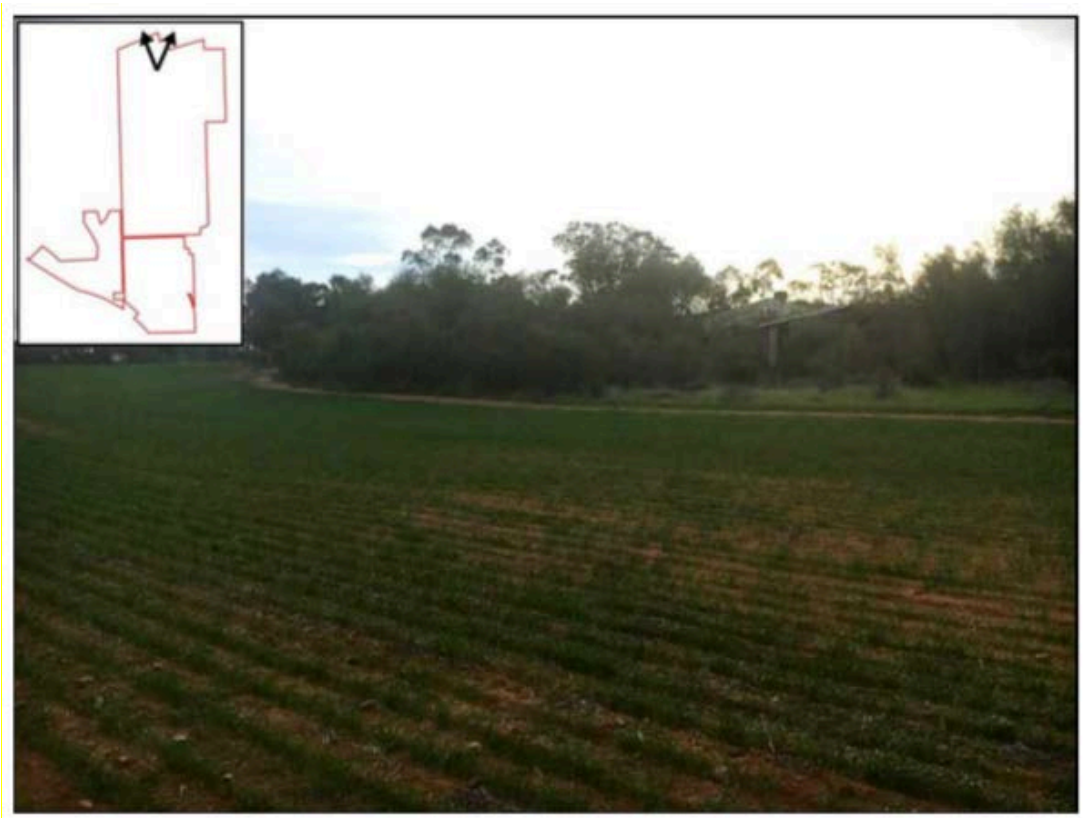


Figure 5 - Site Photo (Source: EPS Energy, Nov 2018)

Figure 6- Site Photo (Source: EPS Energy, Nov 2018)

Figure 7 - Site Photo (Source: EPS Energy, Nov 2018)

Figure 8 – Bungama Substation (Source: EPS Energy, Nov 2018)

3. PROCEDURAL MATTERS

The Bungama Solar Project received the endorsement of the Department for Energy and Mining on 18 October 2018 pursuant to Section 49(2)(c) of the *Development Act 1993*, enabling the application to be dealt with as a Crown (public infrastructure) project.

The proponent has previously obtained a certificate from the Officer of the Technical Regulator on 27 June 2018 in accordance with the *Development Regulations 2008*.

A development application was then lodged with the State Commission Assessment Panel on 30 November 2018 for assessment under the crown process.

4. PORT PIRIE COUNCIL COMMENTS

Port Pirie Council has no objection to the proposed solar farm and it associated infrastructure. Council's position is however subject to the following considerations:

- *The Indicative PVS Operations Layout provided within Appendix 3 shows site entries to laydown areas are from Gulf View Road and Bungama North Road. As these roads have not been designed for heavy vehicle traffic it is suggested internal tracks via Locks Road/Augusta Highway be used during construction, and entry and use of these roads be minimised to any post-construction maintenance works. Any costs associated with traffic management or upgrading any roads (including widening or wear and tare of local roads) be borne by the applicant.*

  It is noted in the EPS Energy Report a Traffic Management Plan and Dilapidation Report will be established with the terms agreed upon with Council prior to the commencement of construction

- *The collection treatment of wastewater onsite requires the proponent to seek Wastewater Approval from Council*

- *In reference to the allowance with the plans for a construction camp, which is proposed if there is insufficient accommodation for staff employed as part of the project, the Council has completed recent investigations showing the city comprises sufficient capacity for local lodging – over a thousand available bed numbers – and therefore the proponent is encouraged to strongly consider supporting local businesses by using existing amenities, wherever possible.*

Applicant response:

- A Traffic Management Plan will be prepared by the applicants, in consultation with both Council and DPTI. This Plan will identify final entry site points and traffic routes proposed as part of the development.
- A Dilapidation Report will be prepared prior to the commencement of the proposal. This Report will be undertaken with consultation with Council.
- Wastewater Approval will be sought from Council for the treatment of wastewater on-site. This will be sought as part of the final designs of the development.
- Preference is for the use of local accommodation; however, approval is still sought for a temporary construction camp to avoid delays to construction if there is insufficient existing accommodation to meet the requirements of the project.

5. AGENCY REFERRALS

<u>SA Country Fire Service</u>

No objection. The SA Country Fire Service supports development in regional and rural areas of South Australia, however requests that a number of conditions be included in

any approval to minimise bushfire hazard risk in relation to road construction and access, water supply and on-site availability, fire-fighting equipment and appropriate vegetation management and clearance.

Northern and Yorke Natural Resource Management Board

No objection other than ensuring appropriate weed/pest plant management controls is in place. It has been recommended that consideration be provided for:

- earth moving equipment and vehicle traffic management and hygiene
- removal/destruction of vegetation potentially containing pest plant material or seeds
- the storage or removal of soil also potentially containing pest plant materials or seeds

Department of Energy and Mines

No objection subject to the owners/holders of three mining and exploration tenements being consulted and any concerns being suitably addressed.

Commission of Highways (DPTI)

No objection subject to the final haul route for the construction phase being developed as part of a Traffic Management Plan in consultation (and agreement) with both DPTI and Port Pirie Council.

The proposed development is to be accessed primarily from the Augusta Highway / Locks Road junction and Locks Road. No direct access is proposed onto Augusta Highway. An alternate access via Scenic Drive (rather than Augusta Highway / Locks Road) is recommended as it is not possible to provide a suitable right hand turn at this junction.

Reference has been made to the Glint and Glare Assessment undertaken as part of the development application. It has been acknowledged that minor glare was identified for some houses in adjoining areas and that vegetation is proposed to minimise impacts. Should glint and/or glare issues arise and cause road safety (distraction) issues on the arterial road network, the Commissioner of Highways reserves the right to investigate measures with the applicant to reduce any impacts.

Two options of connecting the proposed Solar farm substation to ElectraNet's Bungama substation (on the opposite side of Augusta Highway) – an underground connection or an overhead 275kV transmission line. Preference is for the underground option, however minimum clearance requirements have been specified should the aboveground option be chosen.

Department of Environment and Water

No comment.

Technical Regulator

A signed declaration form was provided by the applicant in accordance with Schedule 5 Clause 2A of the *Development Regulations 2008*.

Other Referral bodies

The applicant has separately engaged with EPIC Energy as an easement traverses the subject land. EPIC Energy has also been formally invited to public information sessions held in Port Pirie. No objection has been raised.

Applicant Response

- The CFS was directly consulted in February 2019 with suggestions for improving access requirements (ie turning circles for fire control vehicles). The applicant has agreed to continue to liaise with the CFS as the project progresses. The applicant has also agreed to prepare a Bushfire Management and Emergency Response Plan in consultation with the CFS.
- A Construction Environment Management Plan (CEMP) will be prepared that details weed/pest plant management.
- The 3 holders of the mining and exploration tenements have been contacted as per the request of the Department of Energy and Mines. One holder is a 'project landowner' and has been thoroughly consulted throughout the process. The remaining two holders have been invited to a range of public consultation events and more recently have been sent a letter informing them of the project deliverables.
- A Traffic Management Plan will be prepared in consultation with both DPTI and Council. This Plan will detail the final construction traffic route and address any further concerns raised.
- Although the Glint and Glare Assessment concludes that existing vegetation, in addition to the proposed landscape screening will substantially ameliorate expected low-level glare, the applicants accept that that Commission of Highways reserves the right to investigate and ameliorate measures proposed.
- Final designs of the proposed transmission line to the ElectraNet substation will be submitted to the relevant authority prior to the commencement of construction. Should an overhead connection option be selected, suitable vertical clearances and placement of towers (as suggested by DPTI) will be incorporated.

6. PUBLIC NOTIFICATION

The applicant was subject to public notification in accordance with Section 49(7d) of the *Development Act 1993* as the development exceeds $4 million.

Public notification was undertaken in accordance with the legislative requirements with a public notice published in the Adelaide Advertiser and Port Pirie Recorder on 31 January 2019. A total of 7 representations were received.

A number of representors have requested to be heard personally before the Commission in support of their submissions.

The below table provides a summary of the issues raised by the Representors, and the response provided by the Applicant.

Rep No	Matters Raised	Applicant Response
R1	• Noise and dust caused during construction period • Glare from panels • Visual impact • Ongoing noise of operations • Inappropriate land use adjoining residential areas	• A Construction Environmental Management Plan will be prepared to ensure that dust management is addressed. A number of mitigation measures have already been identified (ie dust suppression activities) that will assist. A Noise Assessment undertaken as part of this proposal expects construction noise to be less than 45dBA at existing and identified potential future receptors (dwellings) – this ensures compliance with the Environmental Protection

		(Noise) Policy 2007. Traffic noise during construction has also been considered to mitigate impacts on all receptors • A Glint and Glare analysis has been undertaken. The dwellings sited in Napperby (to the east of the subject land) may experience up to 12 minutes per day in Autumn through to Spring (without considering existing vegetation). The analysis has however further confirmed that both the existing vegetation and proposed buffer area ameliorates any glare from the proposed solar panels. Dwellings sited to the north-east of the subject land (in the main area of the Napperby township) is not expected to experience any glare. Any dwellings to the north of the subject land may experience some glare, however this is also addressed by existing vegetation and the proposed buffer area. • A Visual Impact Assessment was undertaken that considered the surrounding areas affected by the proposed development. In addition, the extensive community consultation process uncovered that the visual impact was a key concern to some, but not all land owners. A key mitigation measure is the inclusion of more than 7kms of landscape screening to form a 'buffer zone' in targeted sections of the project area. The visual amenity buffer will: • Setback the location of PVS behind a 50 metre buffer zone from parts of the project boundary (where in proximity to a residential receptor or potential future receptor) • Establish and maintain with the 50 metre buffer zone a 10 metre wide landscape screen of vegetation approximately 3-5 metres in height, thereby helping to screen the proposed development The proposed buffer zone and associated landscaping was exhibited at the February 2019 public consultation event and received position feedback from the majority of attendees. • The proposed 'buffer area' sets all noise generating components of the project a minimum 50 metres from the project boundaries. A noise assessment has been undertaken and concluded that a worst case scenario

		would result in noise levels less than 35dBA during the daytime and 38dBA during the night time. It is however recognised that noise at night will be less than stipulated as the invertors and panels do not work at night. Both day and night time noise levels comply with the Environment Protection (Noise) Policy 2007. • The proposed development is located within the Primary Production Zone and this zone specifically encourages 'Solar and ancillary development'. It is considered that the zoning is appropriate for the proposed development.

R2	• Impact on local community
	• Devaluation of property value
	• Visual impact
	• Glare from panels
		• Extensive community consultation has been provided as part of the proposals 4 days of engagement (173 attendees) and over 200 telephone calls, emails and meetings with the public and neighbouring landowners. Feedback from the community has been generally supportive of the proposal.
		A Socio-Economic Impacts Assessment was undertaken and concludes that:
		  • Economic benefit of $292.5m for the broader economy and $164m as direct domestic expenditure;
		  • Generates an estimated 275 equivalent full-time jobs during construction and a further 410 indirect full-time jobs;
		  • Generate equivalent 8 full-time jobs during operations
		  • Establishment of a community fund
		The positive socio-economic benefits are considered to outweigh any perceived negative effects.
		• An analysis of sales within Napperby since the initial community engagement process began in May 2018 has been undertaken. This has been compared with sales prior to this announcement. Due to the small number of sales, it is difficult to draw meaningful conclusions regarding the overall changes in property values over this limited time.
		A literature review has also been undertaken with particular regard taken to an Urbis report published in July 2016. This report concluded:
		  • Proximity to solar panels has not deterred sales of nearby agricultural or residential property;
		  • That there is insufficient data to provide a definitive answer to the impacts of renewable energy

		projects; • Literature review concludes that there is likely no impact or a limited definable impact of renewable energy projects on property values. The project has however has had due regard to the value of surrounding properties by seeking to minimise visual and amenity impacts where possible. • Refer to R1 for response to Visual Impact • Refer to R1 for response to Glare
R3 + R4	• Obstruction of views • Devaluation of property value • Impact on primary producing land	• The visual impact assessment undertaken considered the current views afforded from the representors land towards Port Pirie. Existing rural residences and vegetation currently obscure sections of the representors view over the region. The solar development will not further inhibit this view and it is considered to have a low impact. • Refer to R2 for response to Devaluation • The loss of approximately 5.3km^2 of agricultural land is not considered to be significant in the context of the regions 3.2 million hectares of agricultural production potential.
R5	• Devaluation of property value • Impact upon existing views • Inappropriate land use	• Refer to R2 for response to Devaluation • Refer to R3 for response to views • The proposed development is located within the Primary Production Zone and this zone specifically encourages 'Solar and ancillary development'. It is considered that the zoning is appropriate for the proposed development.
R6	• Devaluation of property value • Change of zoning to industrial • Visual impact • Noise and traffic impact • Glare from panels • EMF and RFI impacts • Heat Island effect • Inappropriate location	• Refer to R2 for response to Devaluation • The subject land is located within the Primary Production Zone. This zone anticipates renewable energy facilities including solar. It is not proposed to rezone the subject land to an industrial zone. • Refer to R1 for response to visual impact • Refer to R1 for response to construction noise and ongoing noise impacts • Refer to R1 for response to Glare • It is recognised that solar facilities contain components that may impact upon Electric and Magnetic Fields (EMF) and Radio Frequency Interference (RFI). The invertors being considered for the proposal have been proven to not disturb radio signals (except within 5 metres of the invertor). Although it is considered that the project will have 'low' impacts, a number of key mitigation measures are proposed to ensure that adjoining land owners are

		not effected. • It is acknowledged that solar developments slightly vary temperature conditions within the subject land and a short distance beyond the boundary. It is however widely accepted that any heat generated would dissipate rapidly beyond the boundary and especially during the night time. It is considered that the rapid dissipation coupled with the proposed buffer areas (the increased setbacks from boundaries) will result in the potential for 'heat island effects' outside the subject land to be low. • The subject land was chosen as it met a stringent set of criteria that includes (but not limited to): • Close to Bungama Substation • Substation has capacity to accept new electricity generation • Landowners were receptive to hosting a solar farm • Subject land is currently used for agricultural purposes – thereby minimise impacts upon native vegetation, aboriginal cultural heritage items or other environmental constraints The other areas suggested by respondents were considered but not selected as they did not meet the selection criteria and specifically; • Located in areas identified as 'Wetlands of International Importance' • Covered in native vegetation • Zoned Coastal Conservation (Port Davis land) •
R7	• Interface with rural-residential dwellings. • Construction impacts (noise, dust, vibration, operational hours). • EM interference. • Light spill, glare. • House and property devaluation. • Landscape screen.	• Refer to previous responses in respect to interface and construction impacts, visual amenity and mitigation measures. Note: Devaluation of property is not a valid planning consideration.


REP #4,5
REP #3
REP #3
REP #1,2
REP #6
REP #7
Project Area
Gulf View Rd East
Gulf View Rd
Scenic Dr
Muster Dr
Historic Dr
Sentosa Rd
Gum Rd
Oaks Rd
South Tce
North Tce
Sixth St
Second St
Third St

7. POLICY OVERVIEW

The subject land is located within the Primary Production Zone as depicted on Maps PtPi/1, PtPi/14 and PtPi/16 of the Port Pirie Council Development Plan (Consolidated 31 October 2017). The land is not situated within a Policy Area or Precinct.

Neighbouring land to the north and east is located within the same zone and subject to the same policy requirements. Land to the west is located in the Industry Zone that contains the existing ElectraNet Bungama Substation. Land to the south (and on the southern side of Augusta Highway) contains rural living allotments with similar Rural Living Zoned allotments to the north-west surrounding the Napperby township.

The Primary Production Zone seeks economically productive, efficient and environmentally sustainable primary production and the protection of such from encroachment of incompatible land uses and protection of scenic qualities of rural landscapes.

Renewable energy facilities are supported throughout the zone with emphasis placed on both wind and solar farms. Both land uses are envisaged forms of development within the Primary Production Zone.

Such facilities should be located in areas that provide opportunities for the efficient generation of electricity. The location, siting, design and operation of wind and solar farms should avoid or minimise adverse impacts on the natural environment and adjoining land uses.

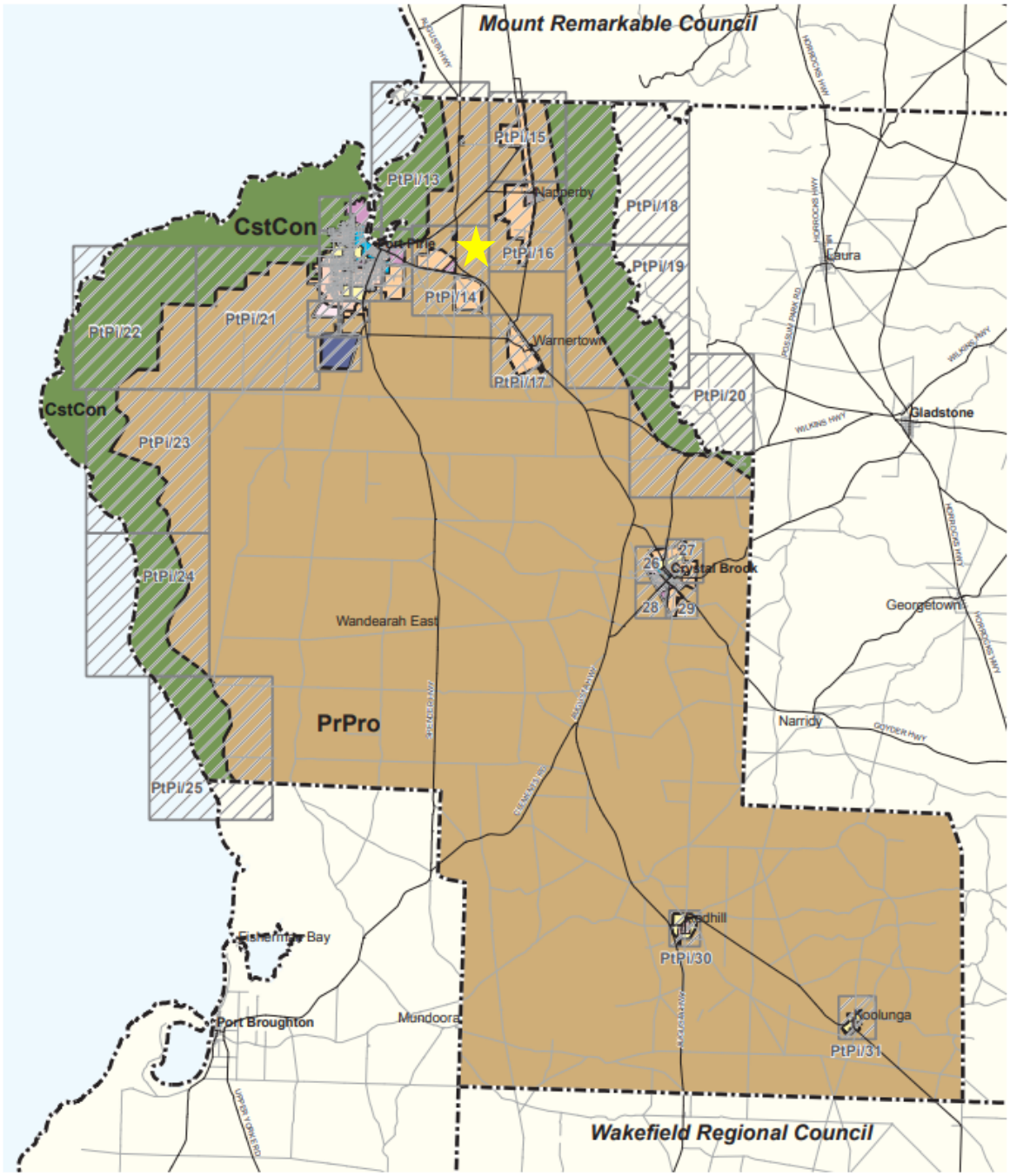
General policies of relevance to the assessment of this application include – Design and Appearance, Energy Efficiency, Hazards, Infrastructure, Interface between Land Uses, Landscaping, Fences and Walls, Natural Resources, Orderly and Sustainable Development, Renewable Energy Facilities, Short-term workers accommodation, siting and visibility, transportation and access, and waste.

8. PLANNING ASSESSMENT

8.1 Land Use

The establishment of renewable energy facilities are an envisaged form of development within the Primary Production Zone. Specific policies for windfarms were introduced into the Development Plan via a Ministerial Development Plan Amendment (DPA) in 2011/12, with the Port Pirie Council inserting '*solar and ancillary development*' as an envisaged land use on 31 October 2017 via its council initiated Better Development Plan Council Wide and Zone Amendments DPA.

The General section of the Development Plan also contains a suite of policies that encourages the development of renewable energy facilities that benefit the environment, the community and the State (Objective 1 of the Renewable Energy Facilities provisions). Furthermore, PDC 1 of the subject Primary Production Zone clearly confirms that solar related development is an envisaged use in the area and the Council Wide Renewable Energy Facilities Section clearly confirm what locations should be chosen that may, unfortunately, give rise to loss of what would otherwise be suitable primary production land.



See enlargement map for accurate representation.

N

0 10 km

Zones

CstCon Coastal Conservation

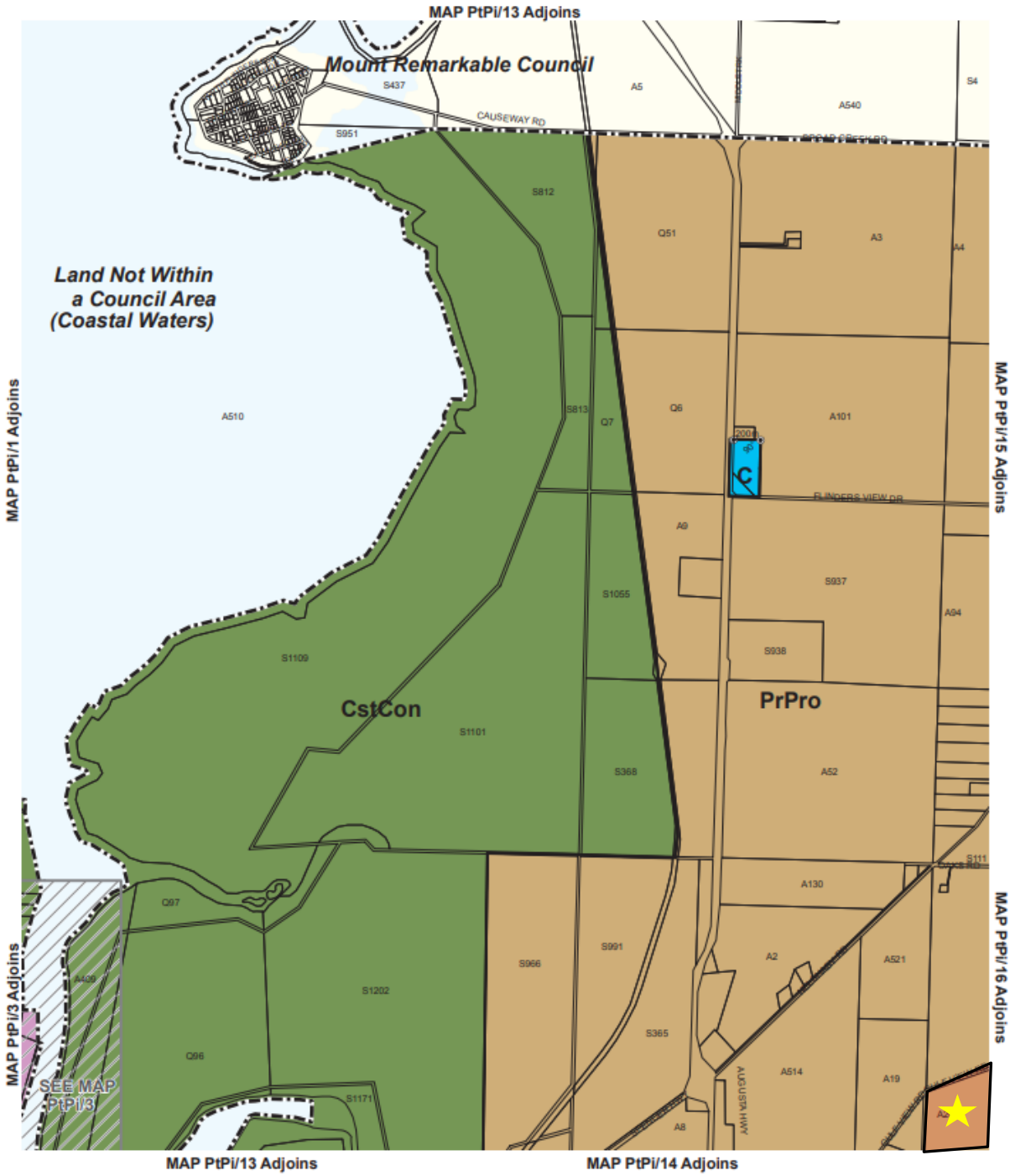
PrPro Primary Production

Zone Boundary

Development Plan Boundary

Zone Map PtPi/1

PORT PIRIE REGIONAL COUNCIL
Consolidated - 31 October 2017



See enlargement map for accurate representation.
Lamberts Conformal Conic Projection, GDA94

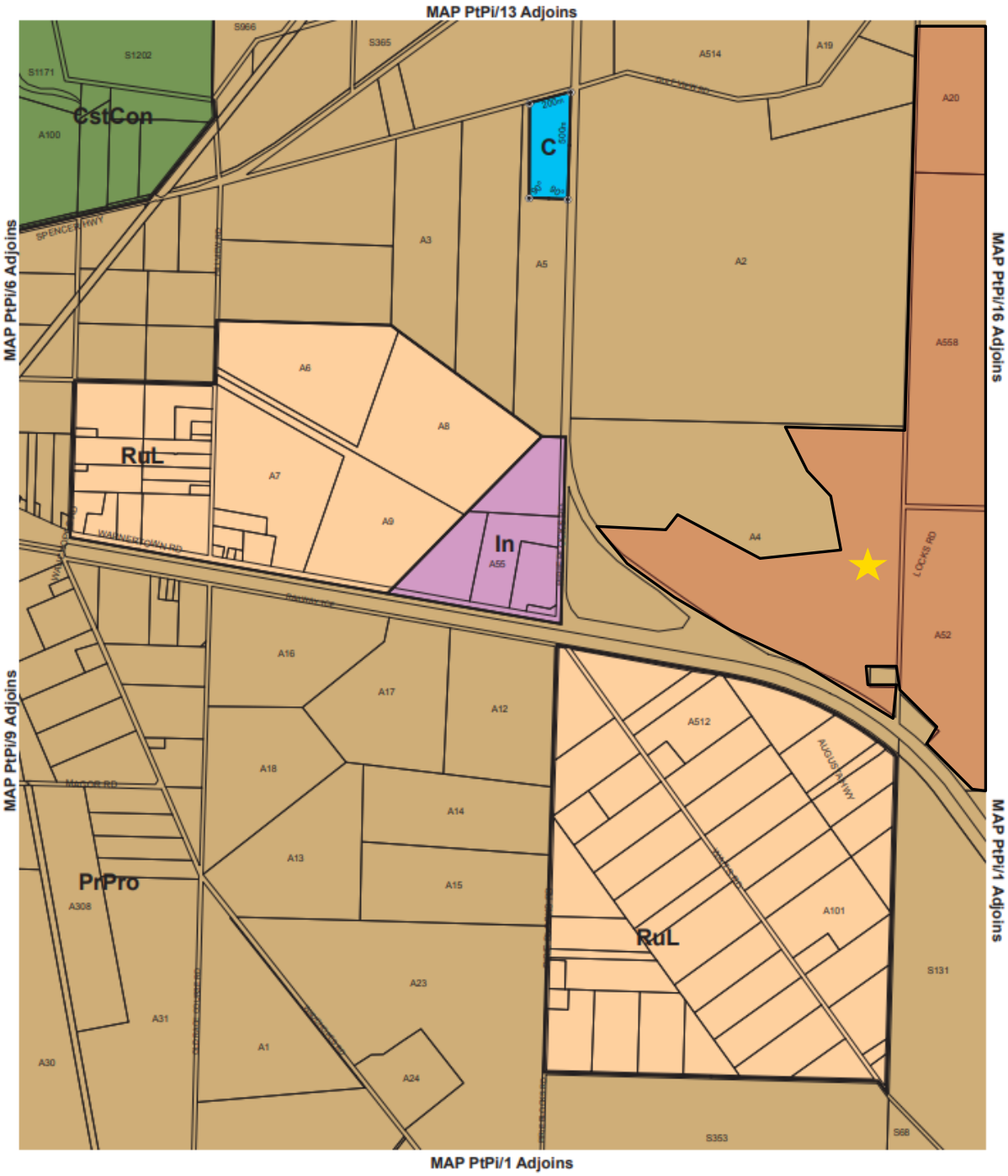
N

0 2,000m

Zones
- CstCon Coastal Conservation
- C Commercial
- PrPro Primary Production
- Zone Boundary
- Development Plan Boundary

Zone Map PtPi/13

PORT PIRIE REGIONAL COUNCIL
Consolidated - 31 October 2017



Lamberts Conformal Conic Projection, GDA94

N

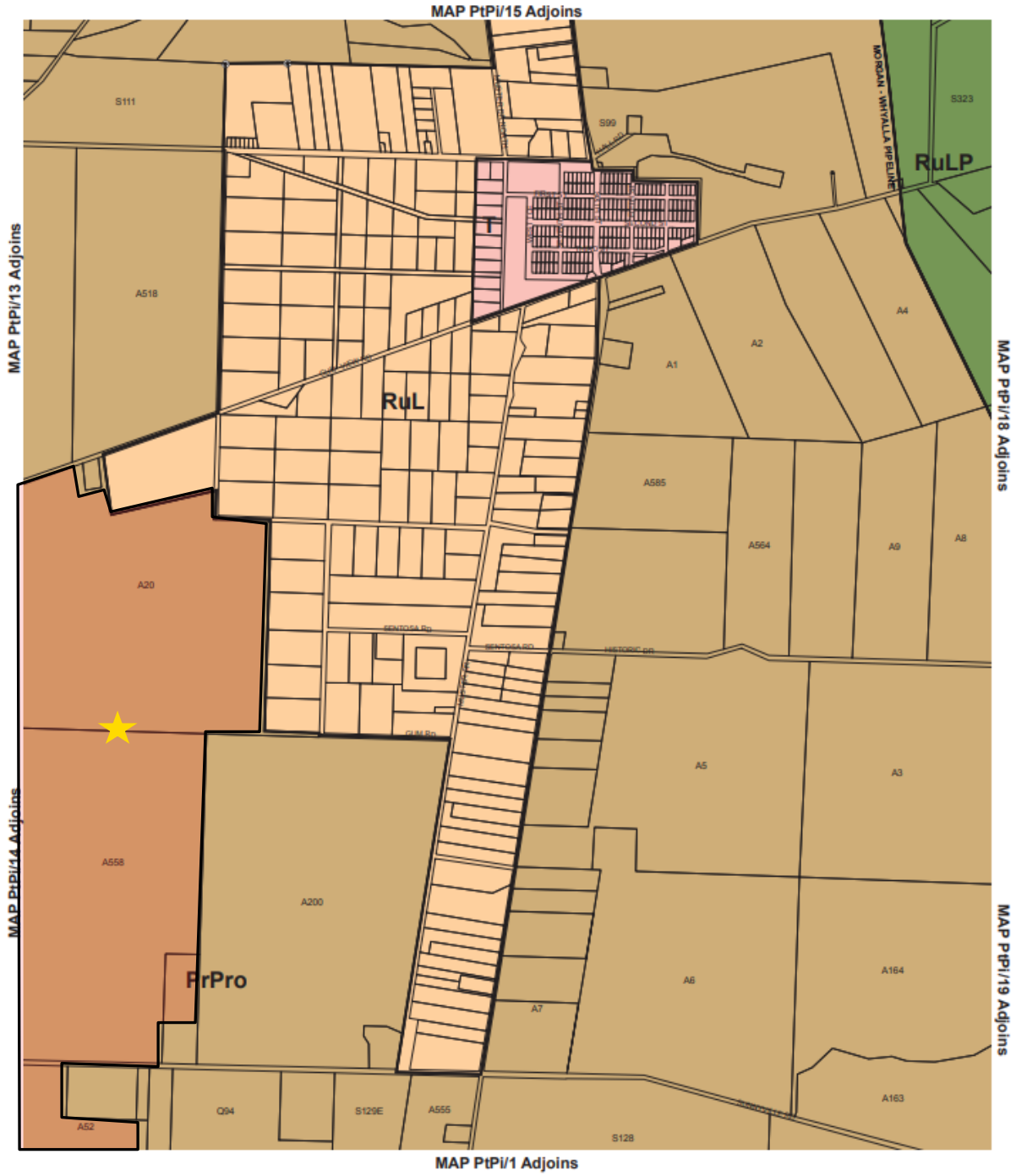
0 1,000m

Zones

CstCon	Coastal Conservation
C	Commercial
In	Industry
PrPro	Primary Production
RuL	Rural Living
	Zone Boundary

Zone Map PtPi/14

PORT PIRIE REGIONAL COUNCIL
Consolidated - 31 October 2017



Lamberts Conformal Conic Projection, GDA94

N

0 1,000m

NAPPERBY

Zone Map PtPi/16

Zones

- PrPro Primary Production
- RuLP Rural Landscape Protection
- RuL Rural Living
- T Township
- Zone Boundary

PORT PIRIE REGIONAL COUNCIL
Consolidated - 31 October 2017

Land Use

PDC 1 The following forms of development are envisaged in the zone:

- **Solar and ancillary development**

General Section: Renewable Energy

PDC 1 Renewable energy facilities, including wind farms and solar farms and ancillary development, should be:

(a) Located in areas that maximise efficient generation and supply of electricity
(b) Designed and sited so as not to impact on the safety of water or air transport and the operation of ports, airfields and designated landing strips

Although it is recognised that the primary intent of the Primary Production Zone is for the long term continuation of primary production and that the large area designated for the placement of solar panels removes a significant area of land from productivity, the construction and subsequent decommissioning would return the land to a state able to accommodate a broad range of rural activities. It is also proposed that during the lifespan of the proposed solar facility that the grazing of sheep could occur to maintain ground cover, thereby retaining a connection with primary production and satisfying the more 'traditional' intent of the Primary Production Zone i.e. Objective 1.

8.2 Design and Appearance

The Primary Production Zone and general provisions within the Development Plan contain a number of policies that encourage renewal energy facilities to be located, sited, designed and operated to minimise adverse impacts on the natural environment and other land uses (Obj 2- Renewal Energy Facilities). Buildings are also encouraged to be grouped together and setback from allotment boundaries to minimise impacts upon the landscape (Principle of Development Control – Primary Production Zone).

The solar PV modules have been designed in a consistent manner over the subject land to maximise its efficiency and minimise its visual impact. The overall maximum height of the solar modules will be in the order of 1.6 metres (5m row spacing) or 4.0 metres (10 metre row spacing) above natural ground level depending on the final design and layouts.

The office and maintenance sheds, switching yard and other similar structures are to be clustered together and have a maximum height of either 4-6 metres. The utility scale battery facility will be contained with structures up to 4 metres (containerised sheds) or 9 metres (small rural sized sheds). Landscaping is proposed around the perimeter of the built form to ensure that the visual impact from Augusta Highway and adjoining residents is minimised.

The applicants have prepared a Visual Impact Assessment to determine the impact of the proposed development on the locality and surrounding landowners. Considerable effort, including a comprehensive community engagement process, has sought to ensure that the design of the development is responsive to the communities needs.

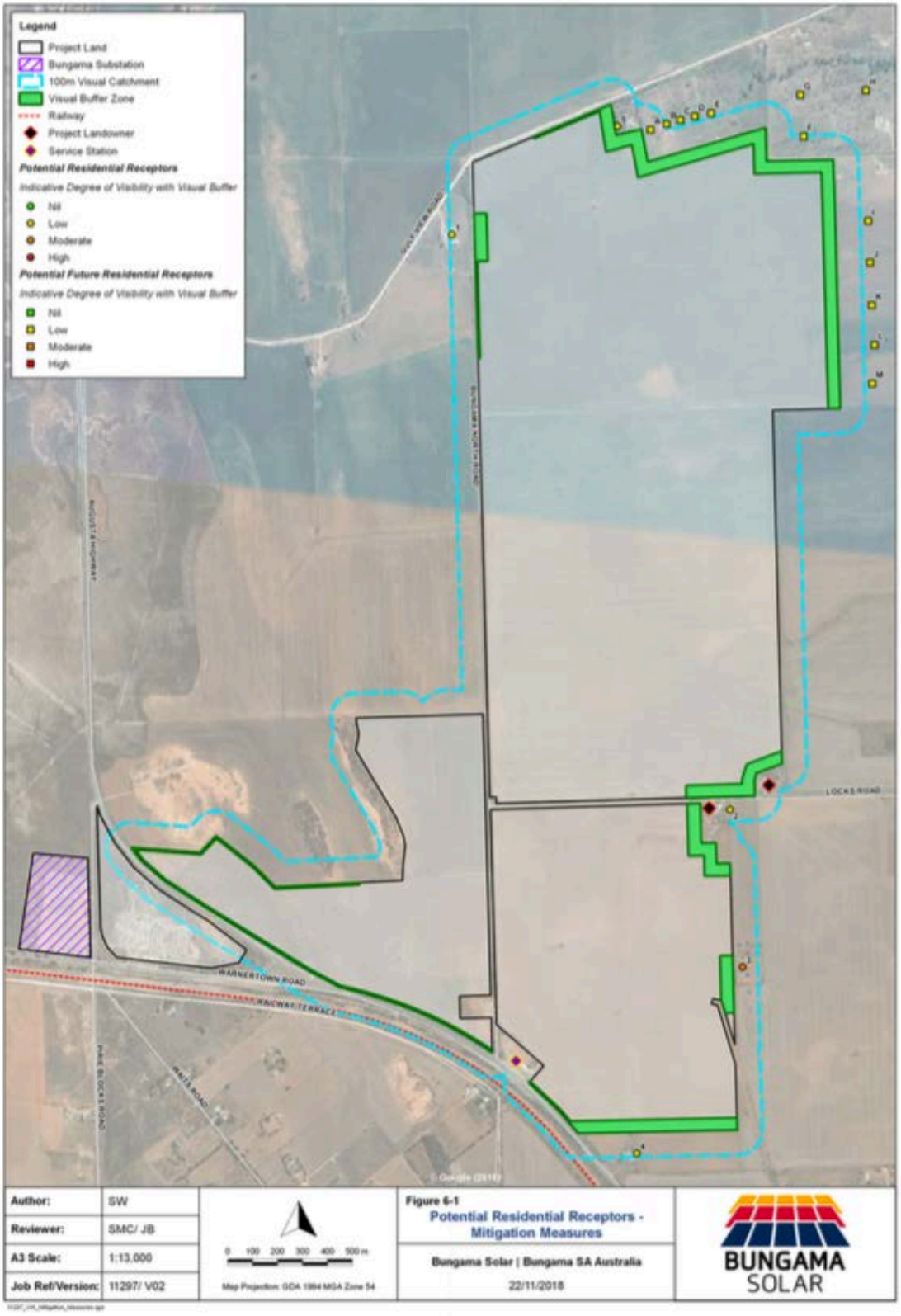


Figure 10 – Proposed 'Buffer Zone' (Source: EPS Energy, Nov 2018)

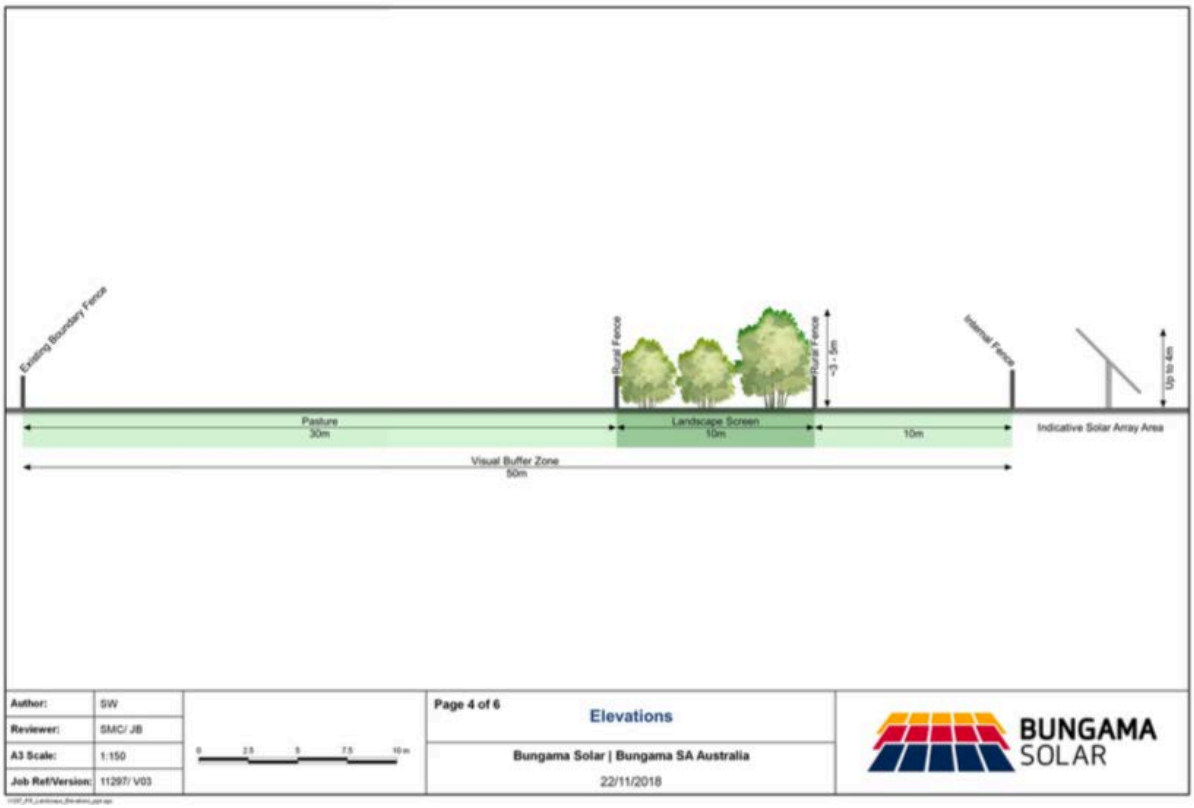


Figure 11 – Proposed 'Buffer Zone' elevation (Source: EPS Energy, Nov 2018)

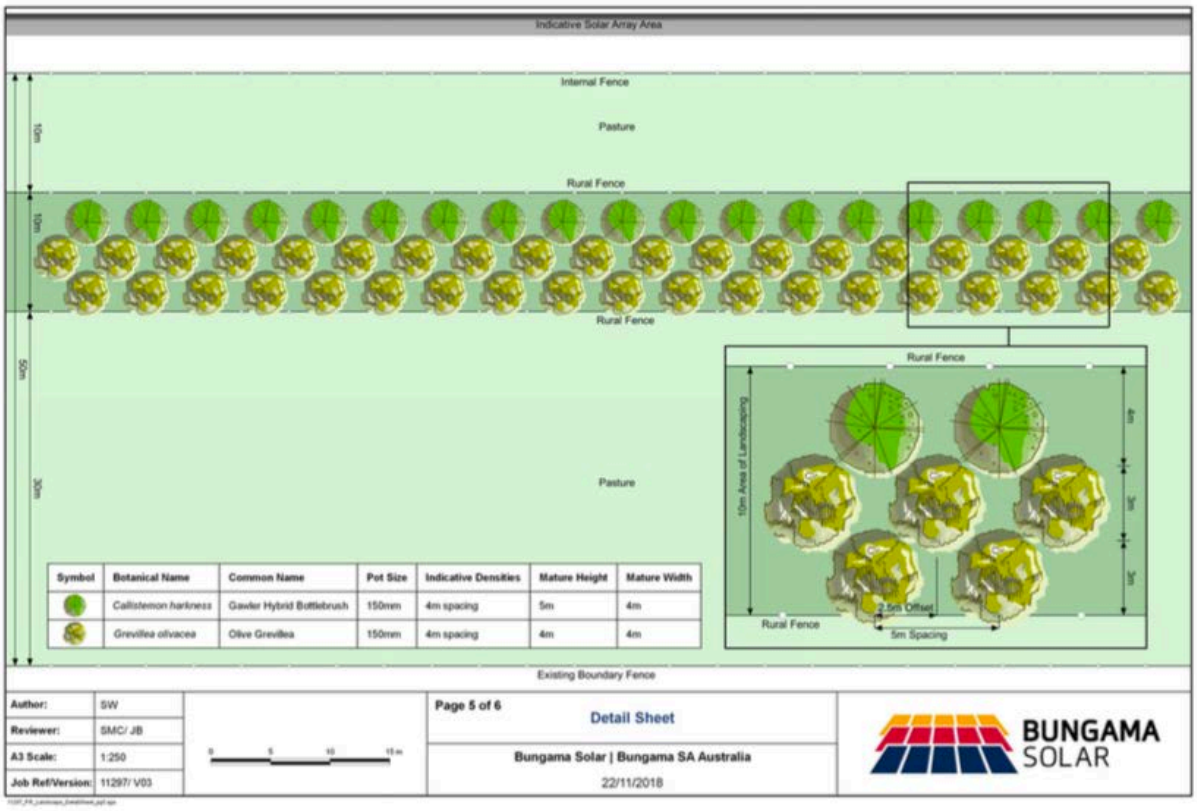


Figure 12 – Proposed 'Buffer Zone' (Source: EPS Energy, Nov 2018)

As a direct result of the formal public consultation period and community engagement process, a key mitigation measure to minimise the visual impact of the proposed development is the inclusion of more than 7kms of landscape screening to form a 'buffer zone' in targeted sections of the project area. The visual amenity buffer will:

- Setback the location of solar PV modules behind a 50-metre buffer zone from parts of the project boundary (where in proximity to a residential receptor or potential future receptor)
- Establish and maintain within the 50-metre buffer zone a 10-metre-wide landscape screen of vegetation approximately 3-5 metres in height, thereby helping to screen the proposed development
- reduces the land available for the placement of solar PV modules by approximately 24 hectares or 36,000 panels.

The Visual Impact Assessment acknowledges that the overall scale of solar farms makes it difficult to mitigate all visual impacts over a wide area. However, the location of the subject land, the emphasis placed on encouraging renewable energy facilities within the Primary Production Zone and the inclusion of both perimeter landscaping and buffer areas (to the closest sensitive receptors) assist to reduce the overall impact to a suitable level.

It is understood that the proposed buffer area was exhibited at the February 2019 public consultation event and received position feedback from the majority of attendees.

8.3 Interface between Land Uses

The Development Plan seeks to ensure that development is located and designed to minimise adverse impact and conflict between land uses and that development should not detrimentally affect the amenity of the locality (Obj 1-2, PDC 1-2 Interface Between Land Uses provisions).

8.3.1 Glint and Glare

The applicant has prepared a Glint and Glare analysis to determine the impacts of the solar PV modules on adjoining land owners, vehicular traffic and the Port Pirie airport located on the southern side of Port Pirie. The analysis determined that there would be no glint or glare for pilots operating at the airport or for drivers on the section of Augusta Highway adjacent to the subject land that are travelling at higher speeds than the local road network.

The analysis determined that dwellings sited in Napperby (the rural living areas to the east of the subject land) may experience up to 12 minutes per day in Autumn through to Spring (noting that this analysis was without considering existing vegetation). The analysis did however further confirm that both the existing vegetation and proposed buffer area ameliorates any glare from the proposed solar panels.

Dwellings sited to the north-east of the subject land (in the main area of the Napperby township) is not expected to experience any glare with dwellings sited to the north of the subject land may experience some glare, however this is also addressed by existing vegetation and the proposed buffer area.

The applicant has also advised that modern solar panels reflect only 2% (approximately) of incoming sunlight as they are designed to absorb sunlight, not reflect it – supporting the assumption that the proposal will have a low impact upon the locality.

8.3.2 Noise

The applicant has prepared a Noise Assessment analysis that indicates that noise emissions during both construction and operational phases will meet the Environment Protection (Noise) Policy 2017 and not cause any unreasonable impacts upon adjoining landowners.

The Noise Assessment indicates that a worst case scenario would result in noise levels less than 35dBA during the daytime and 38dBA during the night time. It is also recognised that noise at night will be less than stipulated as the invertors and panels do not operate at night.

The proposed buffer areas have also ensured that the proposed development will be setback a minimum 50 metres from many allotment boundaries, thereby further reducing the potential noise impacts.

8.3.3 Air Quality

Although it is recognised that solar PV modules do not produce any significant air quality concerns, internal access roads and specifically construction activities have the greatest potential for air pollution.

The applicant has advised that a Construction Environmental Management Plan (CEMP) will be prepared for the construction phase and an Operational Environmental Management Plan (OEMP) for the operation phase. The CEMP and OEMP will include specific management plans to manage dust along with a broad range of other matters, including noise, erosion and stormwater management, waste management, storage and handling of hazardous substances and other regulatory requirements.

8.3.4 Photovoltaic Heat Island Effect (PVHI)

A 'Photovoltaic Heat Island' effect (PVHI) has recently been the subject of further study with the rapid rise in large-scale solar installations around the world, mostly sited in more open agricultural areas and pasture lands.

Studies have shown that the PVHI effect may occur within the perimeter of solar arrays, but remains a localised phenomenon, with the affect dissipating within close proximity of the solar field. Consequently, use of appropriate setbacks from property boundaries should prevent any impacts on non-involved landholders (such as to more sensitive crops, horticultural activities or areas of environmental significance).

The potential extent and impact of PVHI from larger scale solar farms has recently been considered by the Victorian Civil and Administrative Tribunal (VCAT) in the matter of *ESCO Pacific Pty Ltd v Wangaratta RCC [2019] VCAT 219 (14 February 2019)*.

A 30m setback was recommended to ensure that any potential impacts from this affect are fully contained within a solar development site, although a lesser distance could be considered based on existing vegetation, roadways or similar buffer feature to neighboring land.

The proponent has indicated that a setback of 50 metres would be provided to provide a suitable screening buffer and setback from adjacent landowners and residences (particularly along the eastern perimeter of the project site). The setback distance is difficult to determine based on the scale and definition of applicant's conceptual layout, although the proposed vegetation buffers,

roadways and easements will generally meet a nominal 30m requirement. A condition requiring the submission of final plans and a minimum 30m boundary setback to solar infrastructure that would apply to all site boundaries is therefore recommended.

It is considered that the proposed development – subject to appropriate operational considerations and relevant conditions for construction management - satisfies the requirements of the Development Plan in relation to interface matters and will not prejudice the continuation of other existing primary production, impact upon drivers or pilots, or living conditions within nearby dwellings in the locality.

8.4 Traffic, Access and Car Parking

The Development Plan seeks to ensure direct, safe and convenient access is provided for development that avoids unreasonable interference with the flow of traffic on adjoining roads, provides appropriate separation distances from existing roads, and is sited and designed to minimise any adverse impacts on the occupants of and visitors to neighbouring properties (Obj 2, PDC 6, 23 Transportation and Access provisions).

A Traffic Impact Assessment prepared by GTA Consultants has been prepared as part of this application to determine the existing traffic conditions also with the proposed traffic generation and access arrangements required for the proposed development.

The assessment, confirmed that anticipated traffic volumes will be highest during the construction phase of the development with traffic volumes during the operation stage to be minimal.

It is anticipated that a 24-month construction period is required, with access proposed primarily from the Augusta Highway/Locks Road intersection and Locks Road. No access is proposed directly from Augusta Highway.

The Commissioner of Highways (DPTI) has expressed concerns with the proposed access from the Augusta Highway/Locks Road intersection as it is not considered possible to install a suitable right turn treatment at this junction. Alternative access should be considered from the Augusta Highway/Scenic Drive junction as this can be adequately upgraded to manage expected traffic volumes.

The applicant has agreed to preparing a Traffic Management Plan for the construction phase (prior to the commencement of construction) to ensure that this matter can be suitably resolved. The applicant has agreed that this can be undertaken in consultation with both DPTI and the Port Pirie Council. A condition of approval is recommended to finalise the final detailed designs.

A condition of approval is also recommended that a dilapidation report (or equivalent) be prepared prior to the commencement of construction and that the applicant will undertake this in consultation with the Port Pirie Council.

On-site car parking is proposed adjoining the control room and site office to accommodate staff and visitors. Although the Port Pirie Development Plan does not contain a minimum car parking requirement, it is considered that the subject land is more than capable of providing sufficient car parks on-site.

8.5 Stormwater and Water Quality

The majority of the subject land does not contain any built form with stormwater managed by natural infiltration. The proposed development will include approximately 75% of the subject land containing solar PV modules and the spacing's between these solar arrays will remain unsealed. This will ensure that the post development

scenario will be able to suitably manage stormwater disposal in a manner consistent with that currently occurring.

There will however be an increase in sealed/non-pervious areas that incorporate the built form proposed as part of the overall development. Drainage will be designed to ensure that there is no increase in stormwater into adjoining properties or road reserves than what is currently experienced.

A Construction Environmental Management Plan is proposed that will consider soil erosion and drainage management is suitable managed throughout the development lifespan.

8.6 Hazards

8.6.1 Bushfire

The subject land is located in the General Bushfire Risk Area as depicted on Bushfire Protection Area BPA Maps PtPi/1 and PtPi/3 of the Port Pirie Council Development Plan.

The Development Plan contains a suite of policies that seek to ensure that buildings and structures are located away from areas that pose an unacceptable risk of bushfires (Principle of Development Control 10 – Hazards provisions).

The SA Country Fire Service was provided the opportunity to comment via the formal referral process and did not object to the proposed development. The SA CFS did however request that a number of conditions be included in any approval to minimise bushfire hazard risk in relation to road construction and access, water supply and on-site availability, fire-fighting equipment and appropriate vegetation management and clearance.

The applicant also directly consulted the SA CFS in February 2019 with suggestions provided for improving access requirements (ie turning circles for fire control vehicles). The applicant has agreed to continue to liaise with the SA CFS as the project progresses. The applicant has also agreed to prepare a Bushfire Management and Emergency Response Plan in consultation with the SA CFS.

8.6.2 Site Contamination

The subject land has been predominantly cleared for broad acre farming and grazing of livestock. No previously contaminating land uses have been identified on the subject land with no sensitive land uses proposed as part of the development.

Preliminary geotechnical investigations in mid-2018 reviewed both site and subsurface soils were visually assessed for contamination. No fill materials were encountered and no contaminated soils discovered. Although not to be considered a comprehensive review of site contamination, the previous land uses and intended development are such that the subject land is considered suitable for its intended purposes.

8.7 Flora and Fauna

The large scale and extent of area used for solar developments can result in the removal of large areas of native vegetation, habitat loss and potential introduction of weed and pest animals.

As previously discussed, the subject land is predominantly cleared of vegetation as it is used for broad acre cropping and grazing of livestock. The applicant has estimated that 0.1% of the entire site is covered in native vegetation – with these areas primarily located along allotment boundaries.

An Ecological Assessment has been prepared by EBS Ecology that incorporates an ecological desktop assessment and a field survey of the subject land to ascertain the potential impacts of the proposed development. The desktop assessment concluded that the likelihood of habitat for threatened flora species being present was assessed as very low with the field analysis observing 4 bird and 1 mammal species.

Two (2) scattered trees (both River Red Gums) and 6 vegetation associations were located within the subject land. None of these species observed are listed as threatened under the *Environment Protection and Biodiversity Conservation Act 1999* or the *National Parks and Wildlife Act 1972*.

The proposed layout of solar arrays and associated infrastructure has sought to avoid the unnecessary clearance of native vegetation with priority given to areas already cleared of vegetation. As the vegetated areas are located along allotment boundaries, and up to a maximum width of 3 metres, the potential of reduced clearance is increased as solar PV modules are proposed to be setback from allotment boundaries.

However, should the final designs result in the need to remove some areas of native vegetation, an application will be submitted to the Native Vegetation Council prior to the completion of the final designs.

8.8 Heritage

A desktop Heritage and Cultural Heritage Assessment has been undertaken to determine the impact of the proposed development on both European and Aboriginal heritage.

No State Heritage Places or Local Heritage Places are located on either the subject land or adjoining land.

A search of the Register of Aboriginal Sites and Objects has undertaken with 1 recorded entry located on the boundary of the subject land. A further Preliminary field investigation surveyed a total of 4 Aboriginal sites (including 1 already registered), 20 isolated artefacts and 6 culturally sensitive landscapes were located.

The applicant has met with the Nukunu Peoples Council representative regarding the presence of Aboriginal archaeological value over the subject land. It is proposed that further cultural work with the Nukunu Peoples Council Inc. will assist in the design of the final layout plans.

It is recommended that a Cultural Heritage Management Plan be prepared prior to the commencement of construction to provide long term management of Aboriginal sites within the subject area.

8.9 Registered Easements

The subject land contains a number of easements that contain primarily an underground gas pipeline and above ground electricity transmission lines. The subject land also contains easements that are managed by Telstra and DPTI.

All relevant authorities have been consulted and engaged on the proposed development. The applicant has advised that ongoing correspondence with these stakeholders will continue throughout the progression of this development and will ensure that no encroachment onto these easements will occur.

8.10 Waste Management

The construction of a solar farm will generate significant waste streams from the surplus packaging of solar panels and various equipment and cabling products. A Waste Management Plan is recommended to ensure that these materials are appropriately collected, stored, secured and disposed of to minimise any off-site impacts and then recovered or recycled to achieve a high level of sustainable practice. The recent completion of Stage 1 of the Vena Solar development at Tailem Bend, demonstrates that a well-managed, vertically integrated approach to waste material recovery can be practically and efficiently implemented.

8.11 Social and Service impacts

The proposal includes the option of an on-site workers accommodation camp for up to 275 workers on the development site. An indicative camp location and layout plan has been provided with the documentation (see Appendix 4). It is recommended that the final design and location of the facility be conditioned for further assessment, to ensure that any interface traffic or amenity impacts (either through noise, light spill, traffic flows etc) are appropriately addressed.

Port Pirie is a major regional service centre, with a wide range of facilities, services and businesses that serves a city population of 14,000 and a district population of 17,300 persons. The social and economic impact of a worker's accommodation camp for up to 275 on-site workers within close proximity to this regional centre is unlikely to have a significant impact on critical care or emergency service facilities, whilst alternative accommodation and residential options (as noted by the local Council) are readily available within the city and district more generally.

The applicant has sought to engage the local community and work with the Council to ensure the social and economic impacts of the development are positive, both in the support of existing businesses and the development of new opportunities in the form of employment, contractual work and service provision that is locally beneficial.

9. CONCLUSION

The key assessment outcomes in considering the appropriateness of the development in the Primary Production Zone of the Port Pirie Council Development Plan are:

- Establishes renewable energy facilities in an appropriately zoned location as a designated envisaged land use located close to essential infrastructure (Bungama Substation).
- The development utilises predominately cleared land used for primary production purposes (cropping and grazing of livestock).
- The design of the development seeks to limits impacts to flora and fauna.
- The design incorporates 7kms of additional buffer area around the perimeter of the subject land that includes landscaping to improve the overall visual amenity and reduce external impacts.
- Safe access can be established to / from the project area.
- Creates locally based employment (especially during construction).
- Dust, erosion and stormwater would be suitably managed by construction environmental management plans.
- Does not impact on sites of heritage or conservation significance.
- Visual impacts are low and acceptable in the context of the site.

- Will have a negligible impact on existing or future adjoining land uses (and would not affect existing easements).
- No Council or State Government agency objection to the development.
- Would not cause a glare hazard to drivers along the Augusta Highway, flights from Port Pirie Airport or to adjoining dwellings.

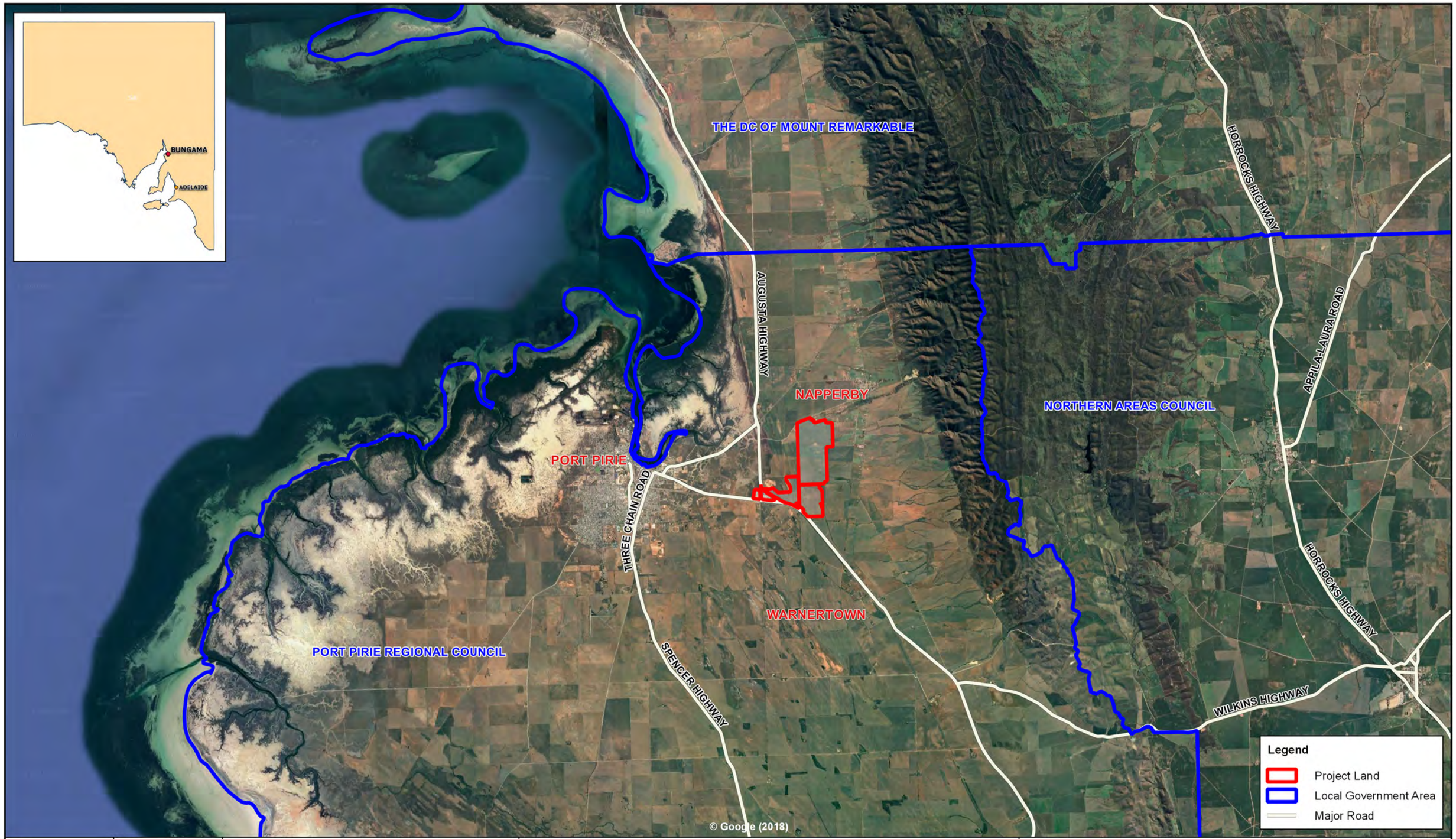
The applicant has sought to address the key concerns of representors and Government Departments / Agencies and will continue to engage with the Port Pirie Council and community though the staging of the proposal.

Pursuant to Section 49(8) of the *Development Act 1993,* and having undertaken an assessment of the application against the relevant Development Plan, the application is NOT seriously at variance with the provisions of that plan.

Overall, the development is in accordance with the key objectives and policies for the construction of renewable energy facilities encouraged by the relevant Development Plan. In addition, it is noted that there was no formal state agency or council objection to the development, whilst the Office of the Technical Regulator has assessed the project and granted a certificate to ensure that it meets network connection and stability guidelines.

If no further information is required, and all relevant assessment matters have been considered, this planning report can be endorsed by the State Commission Assessment Panel pursuant to Section 49 (7e) of the *Development Act 1993,* and a formal recommendation with appropriate conditions provided to the Minister for Planning for his further review and decision.

BEN GREEN
CONSULTANT PLANNER
PLANNING AND LAND USE SERVICES
DEPARTMENT OF PLANNING, TRANSPORT and INFRASTRUCTURE



Author:	MB
Reviewer:	SMC/ JB
A3 Scale:	1:150,000
Job Ref/Version:	11297/ V02

0 2.5 5 7.5 10 km

Map Projection: GDA 1994 MGA Zone 54

Figure 2-1

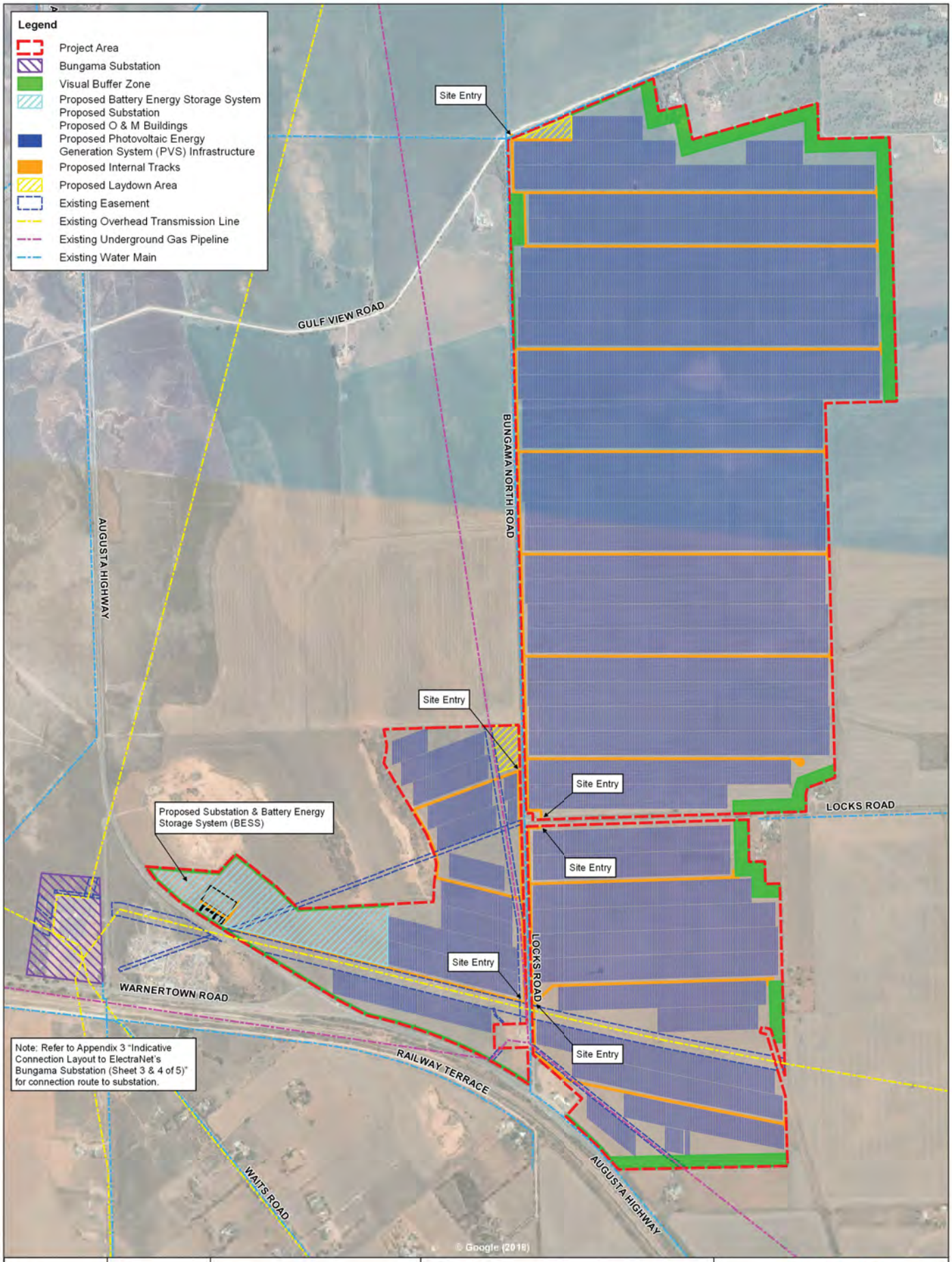
Location Plan

Bungama Solar | Bungama SA Australia

21/11/2018

BUNGAMA SOLAR

11297_PR_Location Plan.qgs



Author:	SW
Reviewer:	SMC/ JB
A3 Scale:	1:13,000
Job Ref/Version:	11297/ V05

0 100 200 300 400 500 m

Accuracy: location and scale of features is indicative only

Map Projection: GDA 1994 MGA Zone 54

Sheet 1 of 5

Indicative PVS Operations Layout

Bungama Solar | Bungama SA Australia

29/11/2018

BUNGAMA SOLAR

11297_PR_Preliminary Layout.qgs

Legend

- Project Land
- Bungama Substation
- Allotment Boundary

NELSHABY ROAD
SPENCER HIGHWAY
GULF VIEW ROAD
BUNGAMA NORTH ROAD
AUGUSTA HIGHWAY
LOCKS ROAD
WARNERTOWN ROAD
RAILWAY TERRACE
PIRIE BLOCKS ROAD
WAITS ROAD

CT 6037/29
Allotment 20
Deposited Plan 80628

CT 6127/5
Allotment 558
Filed Plan 188690

CT 5390/999
Allotment 559
Filed Plan 188691

CT 5360/334
Allotment 551
Filed Plan 188683

CT 5954/187
Allotment 52
Deposited Plan 25903

CT 5949/272
Allotment 4
Deposited Plan 24997

CT 5972/304
Allotment 1
Deposited Plan 24255

© Google (2018)

Author:	MB
Reviewer:	SMC/ JB
A3 Scale:	1:15,000
Job Ref/Version:	11297/ V04

0 100 200 300 400 500 m

Map Projection: GDA 1994 MGA Zone 54

Figure 2-2

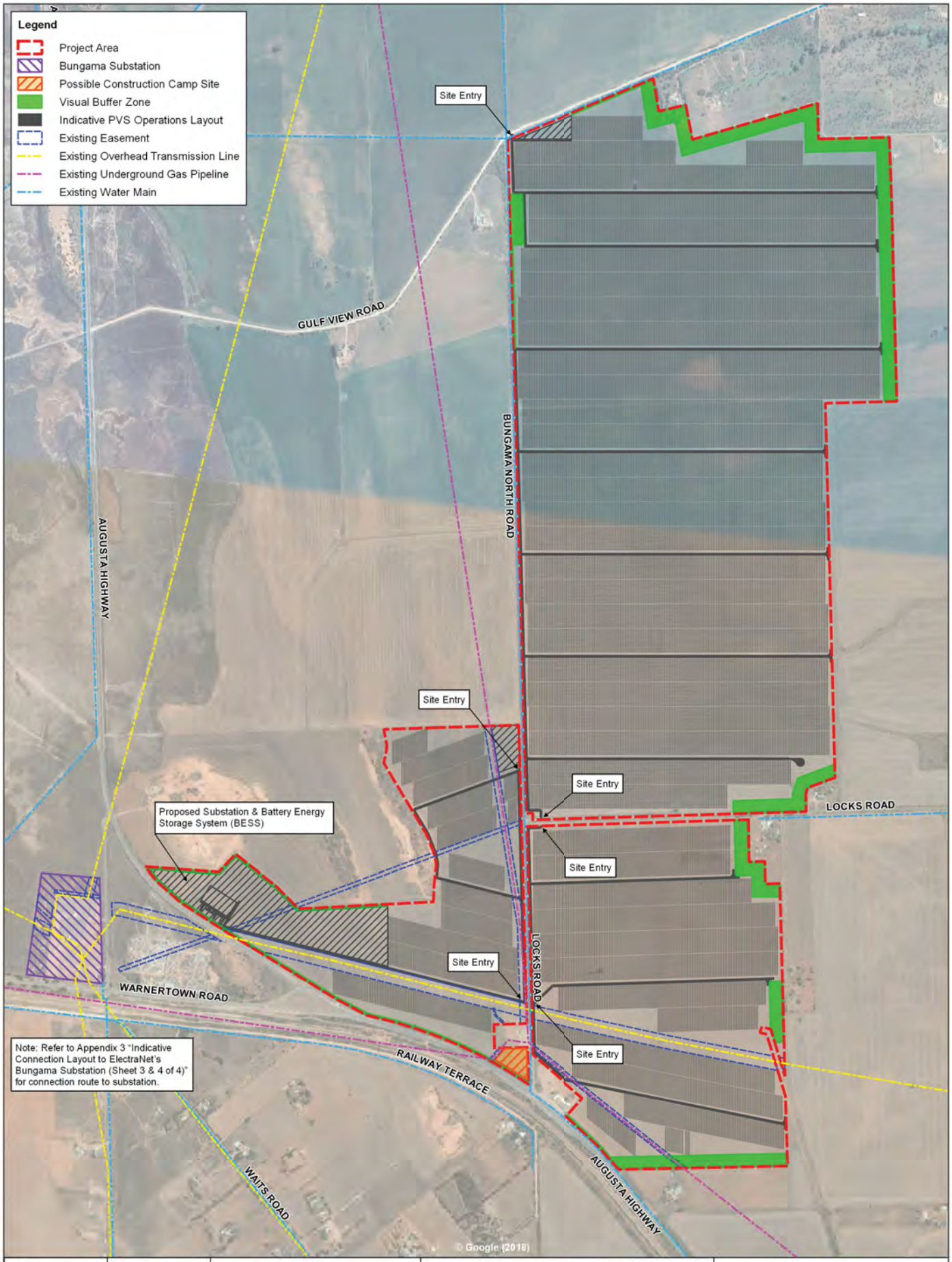
Project Land Plan

Bungama Solar | Bungama SA Australia

21/11/2018

BUNGAMA SOLAR

11297_PR_Project Land.qgs



Author:	SW
Reviewer:	SMC/ JB
A3 Scale:	1:13,000
Job Ref/Version:	11297/ V01

0 100 200 300 400 500 m

Accuracy: location and scale of features is indicative only

Map Projection: GDA 1994 MGA Zone 54

Sheet 1 of 2

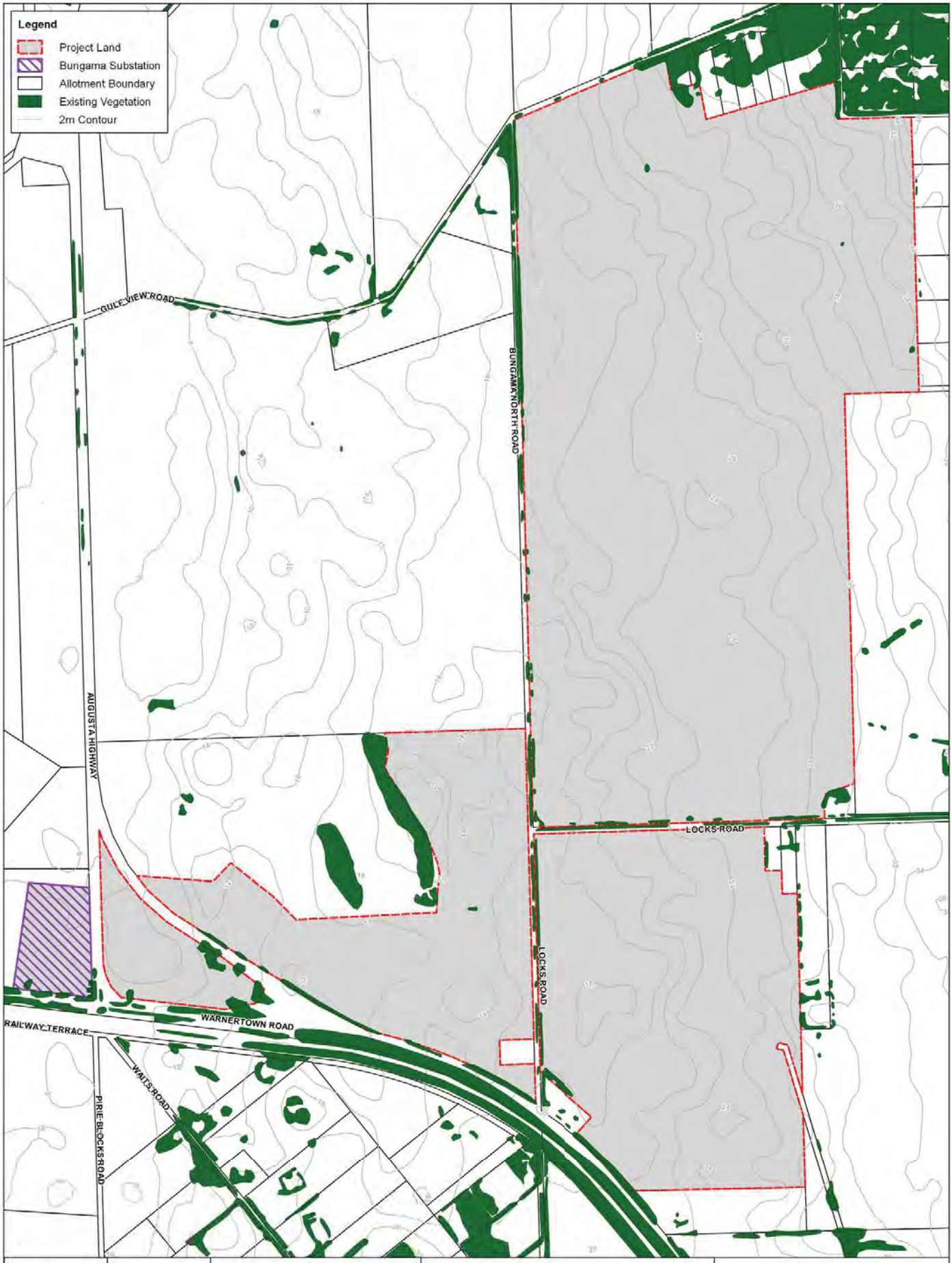
Possible Location of Construction Camp

Bungama Solar | Bungama SA Australia

23/11/2018

BUNGAMA SOLAR

11297_PR_Potential_Construction_Camps.qgs



Author:	SW
Reviewer:	SMC/ JB
A3 Scale:	1:12,500
Job Ref/Version:	11297/ V02

0 200 400 600 m

Map Projection: GDA 1994 MGA Zone 54

Page 2 of 6

Contours and Existing Vegetation Onsite or on Adjoining Roads

Bungama Solar | Bungama SA Australia

26/11/2018

BUNGAMA SOLAR

11297_PR_Landscape_ExistingVeg_pg2.ngm

Author:	SW
Reviewer:	SMC/ JB
A3 Scale:	1:12,500
Job Ref/Version:	11297/ V03

0 200 400 600 m

Map Projection: GDA 1994 MGA Zone 54

Page 3 of 6

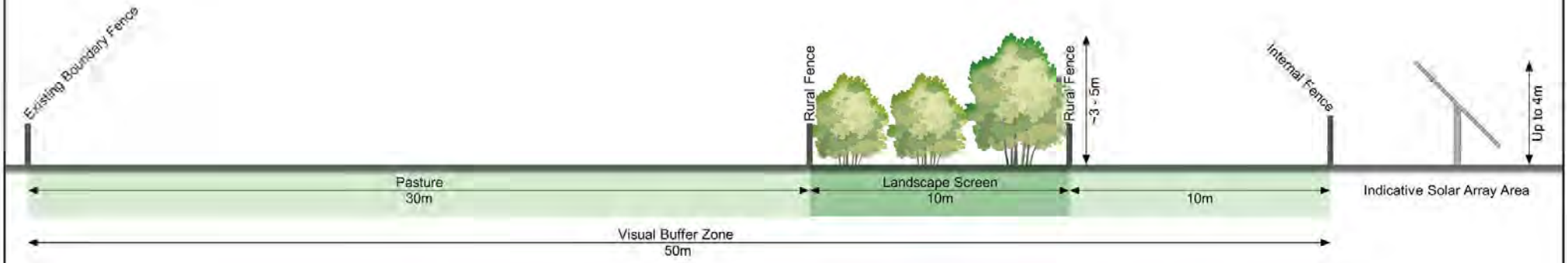
Landscape Masterplan

Bungama Solar | Bungama SA Australia

22/11/2018

BUNGAMA SOLAR

11297_BW_Landscape_Masterplan.pdf.qgs



Author:	SW
Reviewer:	SMC/ JB
A3 Scale:	1:150
Job Ref/Version:	11297/ V03

0 2.5 5 7.5 10 m

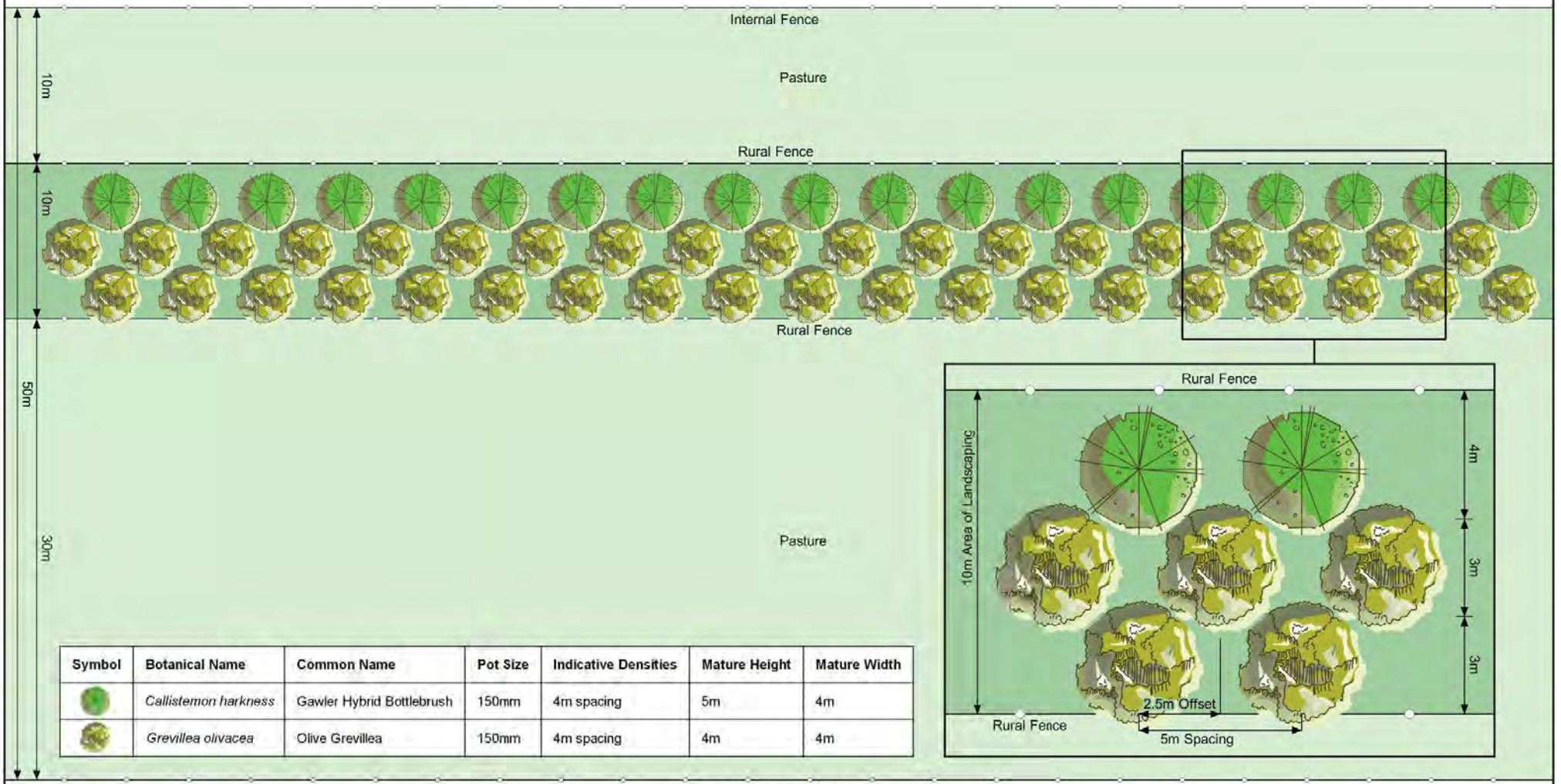
Elevations

Bungama Solar | Bungama SA Australia

22/11/2018

BUNGAMA SOLAR

Indicative Solar Array Area



Symbol	Botanical Name	Common Name	Pot Size	Indicative Densities	Mature Height	Mature Width
	Callistemon harkness	Gawler Hybrid Bottlebrush	150mm	4m spacing	5m	4m
	Grevillea olivacea	Olive Grevillea	150mm	4m spacing	4m	4m

Existing Boundary Fence

Author:	SW
Reviewer:	SMC/ JB
A3 Scale:	1:250
Job Ref/Version:	11297/ V03

0 5 10 15 m

Detail Sheet

Bungama Solar | Bungama SA Australia

22/11/2018

BUNGAMA SOLAR

GENERAL

All landscaping is to be supervised by a landscape contractor or suitably qualified person. Any sub-contractors are to be co-ordinated by the lead contractor.

DEEP RIPPING

To be undertaken where tree stock is to be planted with (i) a bulldozer, or (ii) rippers on a tractor in dry conditions only.
Rip in a grid pattern where possible.
Avoid bringing clay soils to the surface.

FENCING & RABBIT PROOF NETTING

Place tree guards around seedlings upon planting.
Rabbit proof netting may be placed around the landscape area to protect it from invasion following works.
Stock proof fencing placed around landscaping until trees are at mature height.

WEED CONTROL

A Weed Management Plan will be developed in accordance with the Environmental Management Strategy.

PLANT MATERIAL

Plants shall be of the species and size detailed within the landscaping drawings. Plants shall be vigorous, well established, hardened off and free from pests and diseases. Plants shall not be soft, forced or root bound. Potted plants should be bushy or well furnished.

PLANTING

Ensure planting hole is bigger than pot size. When planting do not damage root system. Hold plant within the planting hole, replace soil around plant and firm down.

WATERING

To eliminated transplanting shock, water with one litre of water per seedling upon planting.
Over drier periods (December, January, February, March) water plant once a month at most until established.

MULCHING

Mulch to be of organic material, laid up to 75mm thick, 1m around each plant.
Keep mulch away from plant stems.

GROUNDCOVER

Use pasture species that will be seeded under solar panels as groundcover.

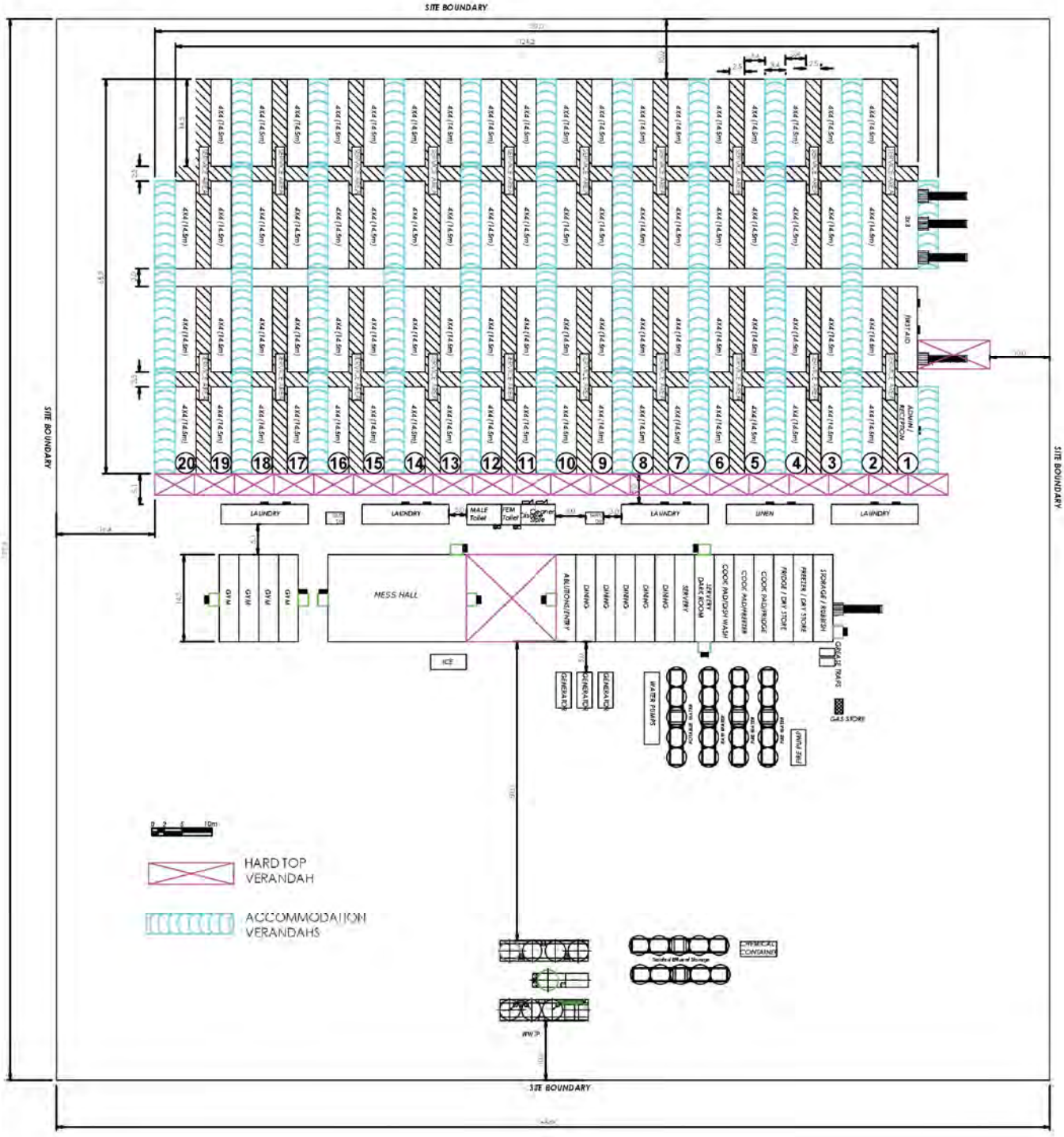
MAINTENANCE

For the first 52 weeks check plants for stress or failure and soil moisture.
Water as required.
Replace dead plants.

Olive Grevillea | *Grevillea olivacea*
Source: GardensOnLine

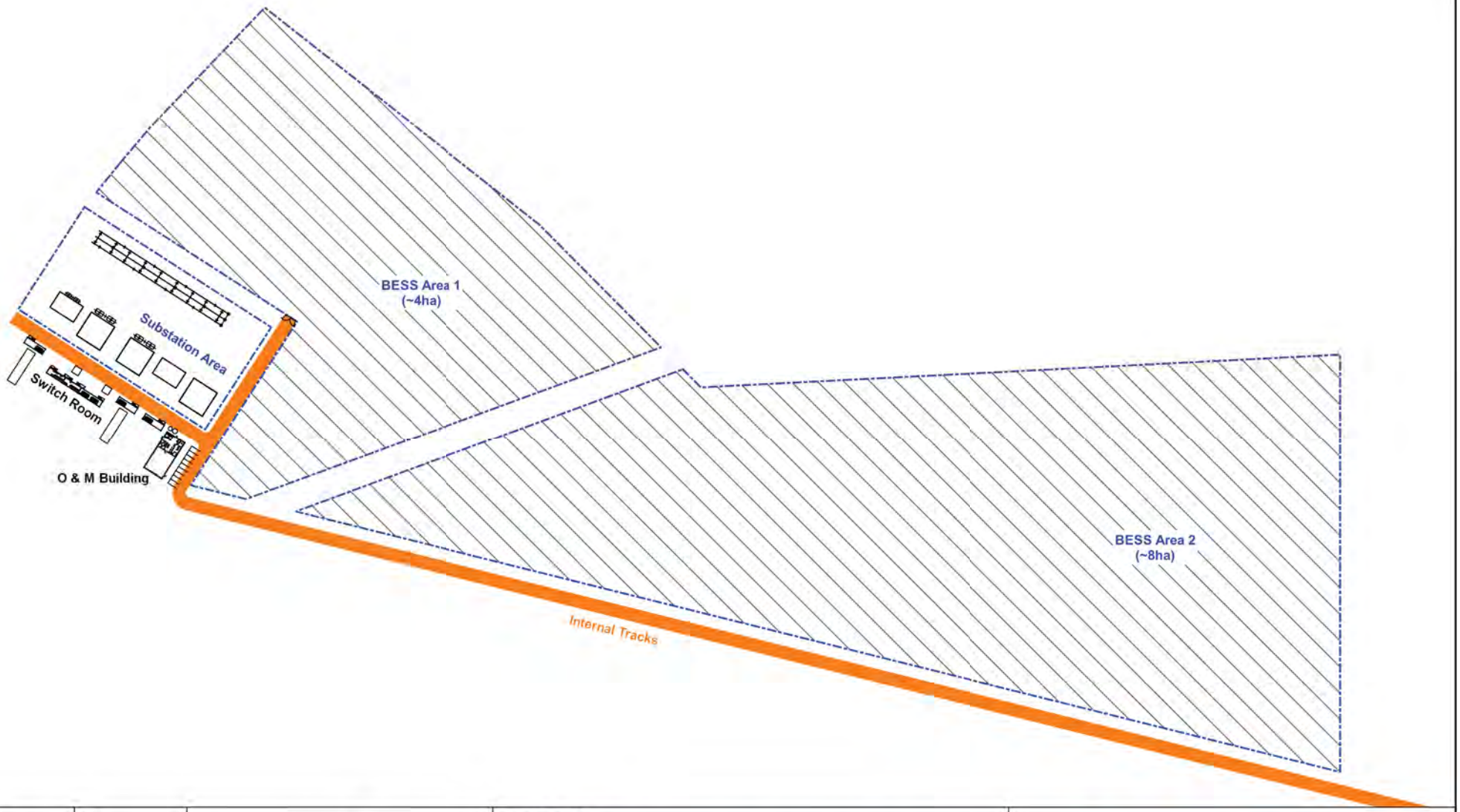
Gawler Hybrid Bottlebrush | *Callistemon harkness*
Source: davesgarden.com

Author:	SW		**Page 6 of 6**	BUNGAMA SOLAR
Reviewer:	SMC/ JB		**Specfic Details**	
A3 Scale:	N/A		**Bungama Solar | Bungama SA Australia**	
Job Ref/Version:	11297/ V03		22/11/2018	



Note: While the Project has a preference for local accommodation, if insufficient accommodation suitable to meet the requirements of the Project is not available, then a temporary construction workers camp on a suitable part of the Project area

Author:	SW		**Sheet 2 of 2**	BUNGAMA SOLAR
Reviewer:	SMC/ JB		**Indicative Construction Camp Layout Plan**	
A3 Scale:	N/A		**Bungama Solar | Bungama SA Australia**	
Job Ref/Version:	11297/ V01		23/11/2018	



Author:	SW
Reviewer:	SMC/ JB
A3 Scale:	1:2,000
Job Ref/Version:	11297/ V01

0 25 50 75 100 m

Sheet 2 of 5

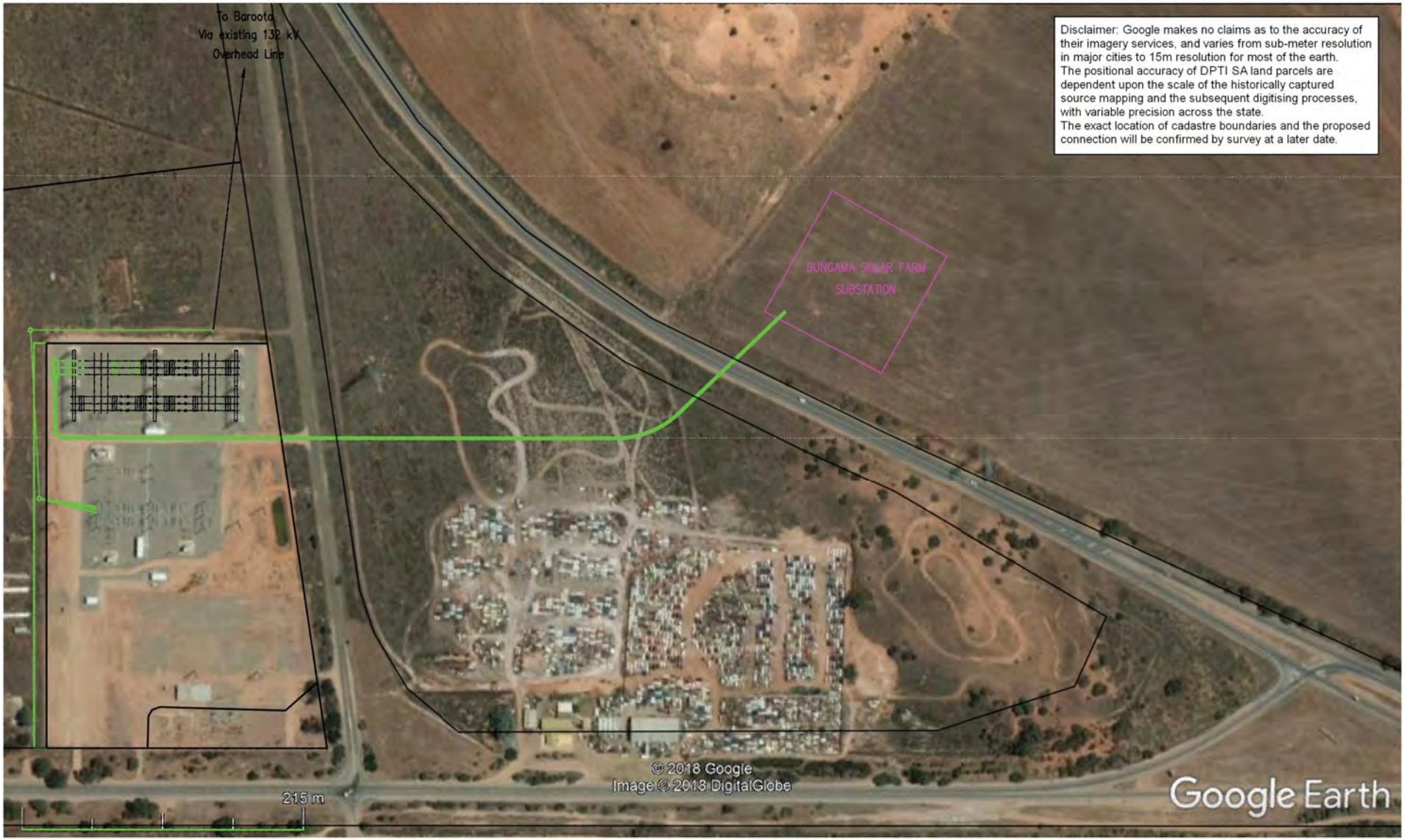
Indicative BESS Operations Layout, Project Substation Layout and Operations and Maintenance Layout

Bungama Solar | Bungama SA Australia

29/11/2018

BUNGAMA SOLAR

11297_PR_Indicative_BESS_Substation_OM.dgn



Author:	SW
Reviewer:	SMC/ JB
A3 Scale:	N/A
Job Ref/Version:	11297/ V02

Sheet 3 of 5

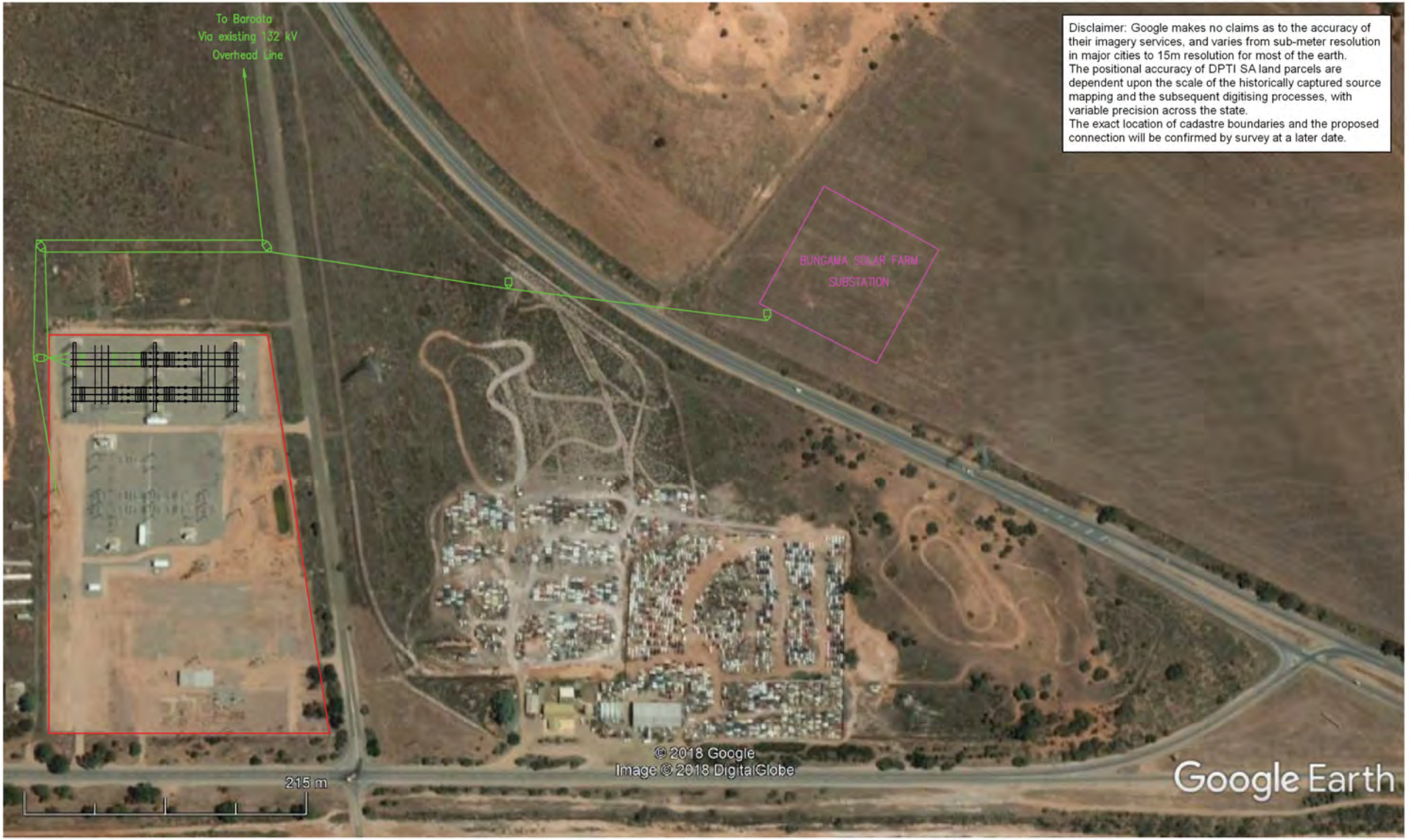
Indicative Connection Layout to ElectraNet's Bungama Substation (Underground Cable - Option 1)

Bungama Solar | Bungama SA Australia

29/11/2018

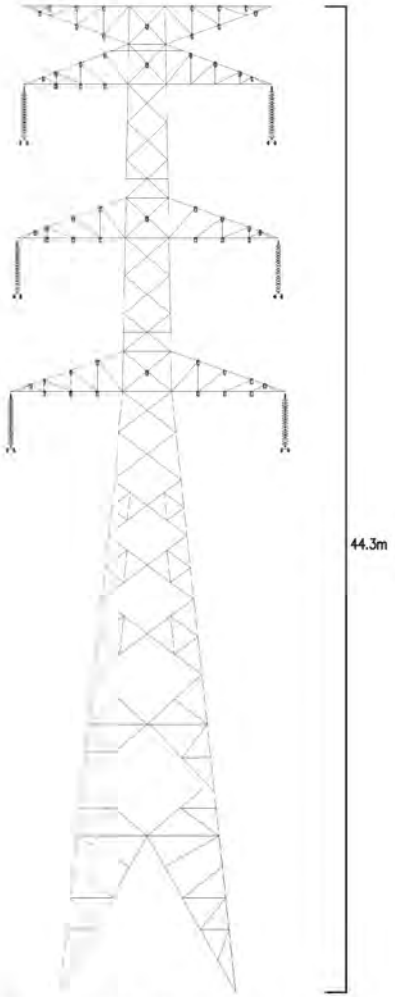
BUNGAMA SOLAR

11297_PR_Indicative_Connection_Layout1.qgs

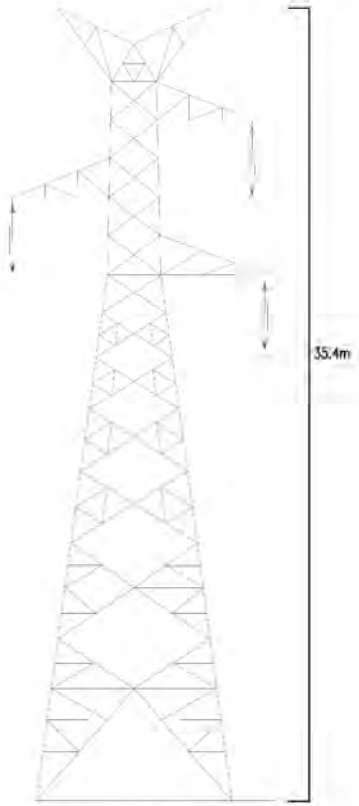


Author:	SW		**Sheet 4 of 5** **Indicative Connection Layout to ElectraNet's Bungama Substation (Overhead 275kV Transmission Line - Option 2)**	BUNGAMA SOLAR
Reviewer:	SMC/ JB			
A3 Scale:	N/A		**Bungama Solar | Bungama SA Australia**	
Job Ref/Version:	11297/ V01		29/11/2018	

11297_PR_Indicative_Connection_Layout2.qgs



Double Circuit 275kV Lattice Tower



Single Circuit 275kV Lattice

Author:	SW
Reviewer:	SMC/ JB
A3 Scale:	N/A
Job Ref/Version:	11297/ V01

Sheet 5 of 5

Typical Overhead Transmission Towers

Bungama Solar | Bungama SA Australia

29/11/2018

BUNGAMA SOLAR

SECTION 49 & 49A – CROWN DEVELOPMENT
DEVELOPMENT APPLICATION FORM

PLEASE USE BLOCK LETTERS

COUNCIL: PORT PIRIE REGIONAL COUNCIL

APPLICANT: SEE ANNEXURE A

ADDRESS: PO BOX 195, CHARLESTOWN, NSW, 2290

CROWN AGENCY: DEPARTMENT FOR ENERGY AND MINING

FOR OFFICE USE

DEVELOPMENT No: _____

PREVIOUS DEVELOPMENT No: _____

DATE RECEIVED: / /

CONTACT PERSON FOR FURTHER INFORMATION

Name: STEVE MCCALL

Telephone: 02 9258 1362 [work] 0418 462 769 [Ah]

Fax: _____ [work] _____ [Ah]

Email: stevemccall@epsenergy.com.au

☐ Complying	Decision: _____
☐ Merit	Type: _____
☐ Public Notification	Finalised: / /
☐ Referrals	

NOTE TO APPLICANTS:

(1) All sections of this form must be completed. The site of the development must be accurately identified and the nature of the proposal adequately described. If the expected development cost of this Section 49 or Section 49A application exceeds $100,000 (excl. fit-out) or the development involves the division of land (with the creation of additional allotments) it will be subject to those fees as outlined in Item 1 of Schedule 6 of the *Development Regulations 2008*. Proposals over $4 million (excl. fit-out) will be subject to public notification and advertising fees.
(2) Three copies of the application should also be provided.

	Decision required	Fees	Receipt No	Date
Planning:				
Land Division:				
Additional:				
Minister's Approval				

EXISTING USE: AGRICULTURE - CROPPING/GRAZING

DESCRIPTION OF PROPOSED DEVELOPMENT: SEE ANNEXURE A

LOCATION OF PROPOSED DEVELOPMENT: SEE ANNEXURE A

House No: _____ Lot No: ____ Street: _____ Town/Suburb: _____

Section No [full/part] _____ Hundred: _____ Volume: _____ Folio: _____

Section No [full/part] _____ Hundred: _____ Volume: _____ Folio: _____

LAND DIVISION:

Site Area [m^2] _____ Reserve Area [m^2] _____ No of existing allotments _____

Number of additional allotments [excluding road and reserve]: _____ Lease: YES ☐ NO ☐

DEVELOPMENT COST [do not include any fit-out costs]: $ 650 MILLION

POWERLINE SETBACKS: Pursuant to Schedule 5 (2a)(1) of the *Development Regulations 2008*, if this application is for a building it will be forwarded to the Office of the Technical Regulator for comment unless the applicant provides a declaration to confirm that the building meets the required setback distances from existing powerlines. The declaration form and further information on electricity infrastructure and clearance distances can be downloaded from the DPLG website (www.dac.sa.gov.au).

I acknowledge that copies of this application and supporting documentation may be provided to interested persons in accordance with the *Development Act 1993*.

SIGNATURE: _____ Dated: 30 / 11 / 2018

SECTION 49 & 49A – CROWN DEVELOPMENT DEVELOPMENT APPLICATION FORM: ANNEXURE A

APPLICANT: ENERGY PROJECTS SOLAR PTY LTD ACN: 609 935 588 ON BEHALF OF BUNGAMA SOLAR 1 PTY LTD ACN: 621 450 762 FOR THE PHOTOVOLTAIC ENERGY GENERATION SYSTEM (PVS) AND ASSOCIATED INFRASTRUCTURE AND ON BEHALF OF BUNGAMA SOLAR 2 PTY LTD ACN: 621 450 995 FOR THE BATTERY ENERGY STORAGE SYSTEM (BESS) AND ASSOCIATED INFRASTRUCTURE.

DESCRIPTION OF PROPOSED DEVELOPMENT: DEVELOPMENT OF AN INTEGRATED BUT SEPARATELY OPERATED GRID CONNECTED PHOTOVOLTAIC ENERGY GENERATION SYSTEM (PVS) AND ASSOCIATED INFRASTRUCTURE AND BATTERY ENERGY STORAGE SYSTEM (BESS) AND ASSOCIATED INFRASTRUCTURE INCLUDING BUT NOT LIMITED TO:

SOLAR MODULES, INVERTER STATIONS, TRANSFORMERS, SWITCHING SUBSTATION, UTILITY SCALE BATTERY FACILITY, ONE OR MORE SYNCHRONOUS CONDENSERS (SUBJECT TO REQUIREMENT), ASSOCIATED UNDERGROUND CABLES, UNDERGROUND AND/OR OVERHEAD TRANSMISSION LINES, ASSOCIATED CABLES, POLES, TO CONNECT THE PROJECT TO ELECTRANET'S ROBERTSTOWN SUBSTATION, ADMINISTRATION AND CONTROLS AREA, DRAINAGE WORKS, SECURITY MEASURES INCLUDING FENCING, CCTV AND LOW-LEVEL NIGHT TIME LIGHTING.

LOCATION OF THE PROPOSED DEVELOPMENT

TITLE	LOT/PLAN/SECTION	STREET/ROAD	AREA	HUNDRED
CT 5949/272	A4 DP24997	AUGUSTA HWY	BUNGAMA	PIRIE
CT 5954/187	A52 DP25903	LOCKS RD	WARNERTOWN	NAPPERBY
CT 6127/5	A558 FP188690	LOCKS RD	NAPPERBY	NAPPERBY
CT 6037/29	A20 DP80628	NORTH BUNGAMA RD	NAPPERBY	NAPPERBY
CT 5390/999	A559 FP188691	LOCKS RD	NAPPERBY	NAPPERBY
CT 5360/334	A551 FP188683	LOCKS RD	WARNERTOWN	NAPPERBY
CT 5972/304	A1 DP24255	WARNERTOWN RD	BUNGAMA	PIRIE
CT 5978/766	A55 DP71831	WARNERTOWN RD	BUNGAMA	PIRIE
CT 5776/531	A501 DP52803	WARNERTOWN RD	BUNGAMA	PIRIE
CT 5776/532	A502 DP52803	WARNERTOWN RD	BUNGAMA	PIRIE

Signature: _____ **Dated:** 30/ 11 /2018

DEVELOPMENT REGULATIONS 2008
Form of Declaration (Schedule 5 clause 2A)

Government of South Australia

To:

From:

Date of Application: 30 / 11 / 18

Location of Proposed Development: See below.

House No: _____ Lot No: _____ Street: _____

Town/Suburb: _____

Section No (full/part): _____ Hundred: _____

Volume: _____ Folio: _____

CT 5949/272 - A4 DP24997; CT 5954/187 - A52 DP25903; CT 6127/5 - A558 FP188690; CT 6037/29 - A20 DP80628; CT 5390/999 - A559 FP188691; CT 5360/334 - A551 FP188683; CT 5972/304 - A1 DP24255; CT 5978/766- A55 DP71831; CT 5776/531 - A501 DP52803; CT 5776/532 - A502 DP52803.

Nature of Proposed Development:

Development of an integrated but separately operated grid connected Photovoltaic Energy Generation system (PVS) and associated infrastructure and Battery Energy Storage System (BESS) and associated infrastructure including but not limited to:

Solar modules, inverter stations, transformers, switching substation, utility scale battery facility, one or more synchronous condensers (subject to requirement), associated underground cables, underground and/or overhead transmission lines, associated cables, poles, to connect the project to Electranet's Robertstown substation, administration and controls area, drainage works, security measures including fencing, CCTV and low-level night time lighting.

I STEPHEN McCALL **~~being the applicant~~/ a person acting on behalf of the applicant (delete the inapplicable statement) for the development described above declare that the proposed development will involve the construction of a building which would, if constructed in accordance with the plans submitted, not be contrary to the regulations prescribed for the purposes of section 86 of the Electricity Act 1996. I make this declaration under clause 2A(1) of Schedule 5 of the Development Regulations 2008.**

Signed: _____ **Date:** 30/11/2018

Government
of South Australia

Note 1

This declaration is only relevant to those development applications seeking authorisation for a form of development that involves the construction of a building (there is a definition of 'building' contained in section 4(1) of the Development Act 1993), other than where the development is limited to –

a) an internal alteration of a building; or
b) an alteration to the walls of a building but not so as to alter the shape of the building.

Note 2

The requirements of section 86 of the Electricity Act 1996 do not apply in relation to:

a) an aerial line and a fence, sign or notice that is less than 2.0 m in height and is not designed for a person to stand on; or
b) a service line installed specifically to supply electricity to the building or structure by the operator of the transmission or distribution network from which the electricity is being supplied.

Note 3

Section 86 of the Electricity Act 1996 refers to the erection of buildings in proximity to powerlines. The regulations under this Act prescribe minimum safe clearance distances that must be complied with.

Note 4

The majority of applications will not have any powerline issues, as normal residential setbacks often cause the building to comply with the prescribed powerline clearance distances. Buildings/renovations located far away from powerlines, for example towards the back of properties, will usually also comply.

Particular care needs to be taken where high voltage powerlines exist; or where the development:

- is on a major road;
- commercial/industrial in nature; or
- built to the property boundary.

Note 5

An information brochure: 'Building Safely Near Powerlines' has been prepared by the Technical Regulator to assist applicants and other interested persons.

This brochure is available from council and the Office of the Technical Regulator. The brochure and other relevant information can also be found at **sa.gov.au/energy/powerlinesafety**

Note 6

In cases where applicants have obtained a written approval from the Technical Regulator to build the development specified above in its current form within the prescribed clearance distances, the applicant is able to sign the form.

Government of South Australia

Department for Energy and Mining

DEMC18/00022

Mr Steve McCall
Director
Energy Projects Solar (EPS) Pty Ltd
3/153 Pacific Highway
CHARLESTOWN NSW 2290

Email: stevemccall@epsenergy.com.au

Dear Mr McCall

CROWN SPONSORSHIP BUNGAMA SOLAR PROJECT

Thank you for your letter of 7 September 2018 requesting Crown Sponsorship under section 49 of the *Development Act 1993* to assist with Energy Projects Solar (EPS) Pty Ltd's Bungama Solar Project (Project).

This Project has been considered within the South Australian Department for Energy and Mining (DEM) with input from the Department of Planning, Transport and Infrastructure, the Department of Environment and Water, the Environmental Protection Agency and the Technical Regulator. In principle, the Project is supported, recognising the possible environmental and community issues that will need to be addressed through the development assessment process.

On balance, the development of the Project has the potential to benefit South Australia and can be considered public infrastructure. Accordingly I, as the Chief Executive of the DEM, will support the development and specifically endorse the Development Application to construct the Project comprising up to 280 MW solar photovoltaic with up to 140MW capacity battery with up to 560MWh of storage as a development of public infrastructure as required by section 49 of the *Development Act 1993* (the Act).

It is the responsibility of EPS to prepare all documentation as required by section 49 of the Act. All costs in the preparation of the development application, lodgement and any other subsequent action in relation to this application are the responsibility of EPS.

Office of the Chief Executive
Level 12, 11 Waymouth Street, Adelaide SA 5000 | GPO Box 320 Adelaide SA 5001 | DX 452
Tel +61 8 8429 3216 | **Email** DEM.OCE@sa.gov.au | **ABN** 83 768 683 934

SOUTH AUSTRALIA

The DEM makes no representations or gives no warranties in relation to the outcome of the Development Application or time that it takes to secure a planning outcome. It is EPS's responsibility to obtain all other statutory approvals, licences, connection agreements and permits from relevant authorities, manage community expectations and to fund the project. The State Government makes no commitment to purchase any product or service related to the project.

A Development Application under this Crown sponsorship must be lodged with the State Planning Commission and is valid for 12 months from the date of this letter. If this is not achieved by that time, my support under Section 49(2)(c) of the *Development Act 1993* for EPS's Project will lapse.

If you have any questions regarding the preparation of the material to support this section 49 application, please contact Mr Adam Cook on (08) 8429 3496 or via email: adam.cook@sa.gov.au.

Yours sincerely

Paul Heithersay
CHIEF EXECUTIVE

18 / 10 / 2018

Government of South Australia
Department of the Premier and Cabinet

Energy and Technical Regulation

Office of the Technical Regulator

Level 8, 11 Waymouth Street
Adelaide SA 5000

GPO Box 320
Adelaide SA 5001

Telephone: 08 8226 5500
Facsimile: 08 8226 5866

www.sa.gov.au/otr

Ref: 2017/01873.01 D18089943

27 June 2018

Steve McCall
EPS Energy
PO Box 195
Charlestown NSW 2290
By email: stevemccall@epsenergy.com.au

Dear Steve,

RE: CERTIFICATE FOR DEVELOPMENT OF THE BUNGAMA SOLAR PROJECT

The development of the Bungama Solar Project has been assessed by the Office of the Technical Regulator (OTR) under Section 37 of the Development Act 1993.

Regulation 70 of the *Development Regulations 2008* prescribes if the proposed development is for the purposes of the provision of electricity generating plant with a generating capacity of more than 5 MW that is to be connected to the State's power system – a certificate from the Technical Regulator is required, certifying that the proposed development complies with the requirements of the Technical Regulator in relation to the security and stability of the State's power system.

In making a decision on your application, our office has taken the following information into account:

- An email from yourself 18 June 2018, which included the project application attached '20180618 Bungama Solar Statement to OTR.pdf';
- Revised project information emailed by John Thompson of John Thompson Inclusive Pty Ltd on 27 June 2018;

After assessing the information provided, I advise that approval is granted for the proposed project.

Should you have any questions regarding this matter, please do not hesitate to call David Bosnakis on (08) 8226 5521.

Yours sincerely

Rob Faunt
TECHNICAL REGULATOR

cc: Jeff Burns – EPS Energy
Simon Duffy – EPS Energy
John Thompson – John Thompson Inclusive

PLANNING REPORT

Prepared for Bungama Solar

BUNGAMA SOLAR

www.bungamasolar.com.au

EPS ENERGY

Reference No. 11297

November 18

QUALITY ASSURANCE AND DECLARATION

Quality Assurance and Version Control Table		
Project:	Bungama Solar	
Client:	Bungama Solar 1 Pty Ltd and Bungama Solar 2 Pty Ltd	
Rev:	**Date:**	**Reference:**
V01	29.11.2018	11297_Bungama Solar Planning Report

Checked By:	Steve McCall
Approved By:	Steve McCall
Declaration:	*The opinions and declarations in this document are ascribed to EPS Energy and are made in good faith and trust that such statements are neither false nor misleading.* *In preparing this document, EPS Energy has considered and relied upon information obtained from the public domain, supplemented by discussions between key EPS Energy staff, representatives from governing agencies and independents, including the client and specialist consultants.*
Applicant:	EPS Energy PO Box 195 Charlestown NSW 2290 (02) 9258 1362
Prepared By:	Alina Tipper and Simon Duffy
Project Land:	CT 6037/29 – A20 DP80628 CT 6127/5 – A558 FP188690 CT 5954/187 – A52 DP25903 CT 5949/272 – A4 DP24997 CT 5390/999 – A559 FP188691 CT 5360/334 – A551 FP188683 CT 5972/304 – A1 DP24255 CT 5776/531 – A501 DP52803 CT 5776/532 – A502 DP52803 CT 5978/766 – A55 DP71831

EXECUTIVE SUMMARY

At this stage Bungama Solar is proposed to be an integrated but separately operated grid connected Photovoltaic Energy Generation System (PVS) of approximately 280MW (AC) generation capacity and a 140MW capacity Battery Energy Storage System (BESS) with 560MWh of storage that will feed into the National Electricity Market via ElectraNet's Bungama Substation. The PVS element, the BESS element and associated infrastructure, together are "the Project".

This Planning Report (PR) has been prepared by Energy Projects Solar (EPS) Pty Ltd ACN: 609 935 588 for Bungama Solar 1 Pty Ltd ACN: 621 450 762 the special purpose vehicle for the (PVS) and Bungama Solar 2 Pty Ltd ACN: 621 450 995 the special purpose vehicle for the (BESS).

Bungama Solar 1 Pty Ltd, the special purpose vehicle for the PVS, has applied to the Australian Energy Market Operator (AEMO) to become a Registered Generator in the National Electricity Market (NEM). The PVS will connect to the Bungama Substation via its own dedicated connection allowing the PVS to export electricity into the national electricity grid.

Bungama Solar 2 Pty Ltd, the special purpose vehicle for the BESS, has applied to the Australian Energy Market Operator (AEMO) to become a Registered Generator in the National Electricity Market (NEM). The BESS will connect to the Bungama Substation via its own dedicated connection allowing the BESS to export and import electricity into and out of the national electricity grid.

PROJECT LAND LOCATION

The Project land comprises the Project area on which the PVS, BESS Project's substation, Operations and Maintenance buildings and associated infrastructure will be built and operated, and land required to connect the Project's elements to ElectraNet's Bungama Substation. The Project land is shown in Figure 2-2.

The Project area shown is approximately 530ha located in the suburbs of Bungama, Napperby and Warnertown in South Australia. The Project is situated approximately 6km east of Port Pirie, and 218km north of the State's capital, Adelaide. The Project is within the Local Government Area (LGA) of Port Pirie Regional Council.

Land within the immediate surrounding area of the Project area is used for agriculture, rural residential living and public services including electricity infrastructure.

PROJECT AREA SELECTION

On behalf of Bungama Solar, EPS Energy undertook an extensive solar site identification assessment across the Eastern Australian National Electricity Network examining potential project areas based on several criteria including:

- Proximity to electrical substations;
- Access to existing electrical substations and capacity of each substation to accept new generation;
- Marginal loss factors and future forecasts;
- Consideration of known solar projects proximate to a proposed project area and the potential for impact on capacity and connection;
- Irradiation levels;
- Agreements with landowners to host a project;
- Utilised land such as land used for agricultural land uses to reduce the likelihood of the solar development encountering significant areas of native vegetation, Aboriginal cultural heritage items or other environmental constraints;
- Environmental analysis of ecology, archaeology and potential environmental constraints including flooding;
- Favourable topography and geotechnical conditions for constructing and operating a solar development;
- Proximity to towns but equally enough distance between the site and urban populated areas;
- Suitable infrastructure surrounding the project area e.g. roads access for construction and operation of a solar development;
- NEM capacity, grid strength and the ever-increasing market demand for renewable energy;
- Favourable response from enquires with the Transmission Network Service Provider (ElectraNet); and
- Details on interstate connectors and relevant known transmission constraints.

The initial assessment of the 530ha (approximately) Project area found it met several key criteria including:

- The Project area is close to and can access the Bungama Substation;
- Bungama Substation has the capacity to accept new electricity generation;
- The area has a strong electrical transmission network;
- The landowners of the Project area were receptive to hosting a solar development;
- The Project area is used for agricultural land uses including cropping and grazing thereby reducing the likelihood of the Project encountering significant areas of native vegetation, Aboriginal cultural heritage items or other environmental constraints;
- Suitable infrastructure surrounding the Project area including good State and Local road access to the Project area for construction and operation of a solar development;
- Good irradiation levels; and

- Proximity to the City of Port Pirie but equally enough distance between the Project area and Port Pirie.

Based on the positive outcomes of the initial assessment and with strong landowner support the next phase of assessment was commenced including detailed grid connection studies, financial feasibility modelling, specific Project area investigations including preliminary field works to identify any unknown environmental and cultural constraints and preliminary Project design works. The assessment found:

- Power generated by the Project can be exported into the grid without any significant constraints;
- Colocation of the Project close to the Bungama Substation minimises the connection transmission line distance thereby reducing the need for transmission tower structures, electrical transmission losses and consequently improving the economics of the Project on the Project area;
- The Project will not be constrained by environmental constraints such as flooding, ecology or archelogy; and
- Favourable topography and geotechnical conditions for constructing and operating a solar and battery development.

Based on the findings the Project was considered feasible. Consideration then turned to the social aspect of the Project including ascertaining relevant stakeholder opinions on the Project in the Project area's locality.

On behalf of Bungama Solar, EPS Energy carried out pre-Development Application lodgement community and stakeholder engagement to understand the opinions of relevant stakeholders on the Project in the Project area's locality. Details of the consultation are set out in the following section Consultation.

CONSULTATION

The following stakeholders were identified as key to the Project:

- Landowners and occupiers of the properties forming the Project area and adjacent properties;
- Key government and agency members;
- The Nukunu Peoples Council Inc.;
- The wider Bungama/Napperby/Warnertown communities and established groups; and
- The relevant authorities who manage the registered easements across the Project area.

The response from the Pre-Development Application lodgement community and other stakeholder engagement has been largely positive and supportive of the Project.

An estimated 124 guests attended the information sessions over the two days (Thursday 31 May 2018 and Friday 01 June 2018)). This included 13 of the 27 identified adjacent landowners who attended the dedicated Neighbour Information Session. This also included a number of representatives from the Port Pirie Regional Council, Regional Development Australia and ElectraNet.

A number of key members of Council, State Government and other agencies attended the Community Information Sessions. The responses remained largely positive and supportive of the Project.

Most attendees of the Community Information Sessions were generally interested in learning more about the Project and looking for additional details around some of the information in the Information Brochure. Conversations with the attendees also identified anecdotal information about the area, including potential risks that may be useful to inform various aspects of the Project (e.g. the occurrence of strong winds, local resources).

The key themes that have arisen from correspondence with the general community to date include:

- Expressions of interest to participate in the Construction Phase by providing services and/or equipment;
- Interest in the locality for future projects;
- Economic benefit to the locality during construction;
- The potential adverse visual impacts of the Project;
- Clean energy production/ reduction in use of fossil fuels;
- Environmental benefits; and
- Lower power costs.

A total of 13 of the 27 identified adjacent landowners attended the Information Sessions. While supporting renewable energy in the form of solar energy, some landowners raised concerns about the Project being located near their land. Common concerns that were raised included:

- The potential adverse visual impact on their land;
- The potential adverse noise impacts on their land;
- The potential adverse impact on their livestock and horses on their land;
- The potential negative impacts on the value of their land; and
- The potential safety issues with construction traffic.

In direct response to adjacent landowner concerns, designs have been amended to reduce the potential for adverse impacts by:

- Including in excess of 7 km of visual buffering in the form of landscape screening at a direct Project cost estimated to exceed $750,000;
- Reducing the land area allocated to solar panels by approximately 24 hectares, equivalent to a reduction of 36,000 panels and equating to approximately $5,000,000 in relinquished income over the life of the Project; and
- Power Conditioning Units (inverters) near adjoining boundaries being relocated to reduce the potential for noise impact.

PROJECT DESCRIPTION

The PVS element of the Project will have a maximum output capacity of approximately 280MW (AC). The BESS element of the Project includes up to 140MW capacity battery with up to 560MWh of storage. The Project may also include one or more synchronous condensers to assist in providing inertia for managing power system strength. Further detailed assessments are underway to ascertain the option and appropriate sizing of any synchronous condensers.

The Project will include, but not be limited to, the following components:

- Solar Photovoltaic modules and ground mounted tracking racks;
- DC/AC containerised or skid mounted Inverter stations;
- Battery storage area;
- Synchronous condensers (subject to requirement);
- Transformers;
- Switching yard and electrical substation;
- Associated underground cables connecting groups of solar panels to inverter stations and inverter stations via overhead and/or underground transmission lines to a transformer in the substation;
- Ancillary infrastructure and buildings associated with the development including a site office, maintenance sheds, laydown area/compound access tracks and perimeter fencing; and
- Connection to Bungama Substation via overhead and/or underground transmission lines.

The Project will likely connect to Bungama Substation via a dedicated 275 kV circuit overhead and/or underground transmission lines having a route length of between 0.5-3km (approximately) dependant on the final design and location of the Project's transformers and switch gear. These network connection facilities will be designed, constructed and operated to ensure compliance with all statutory requirements.

Extensive technical assessments and National Electricity Market rules for connection to the high voltage transmission network require a separate approval process, coordinated with Australian Energy Market Operator (AEMO) and ElectraNet, for the PVS and BESS connection to the Bungama Substation.

In line with other utility scale solar developments the Project includes three broad phases, the development or construction phase, the operation phase and the decommissioning phase.

The development/construction phase of the Project with a maximum output capacity of approximately 280MW (AC) and a battery energy storage system with 560MWh capacity is multifaceted and consequently is likely to be constructed in a number of phases over a number of years.

STATUTORY PLANNING CONTEXT

The development application is submitted pursuant to Section 49 of the *Development Act 1993*.

ENVIRONMENTAL ASSESSMENT

Initial Project technical studies conclude there will be minimal impact to the surrounding environment. The studies underpin the key findings and recommendations outlined in this Planning Report.

The following is a summary of the key environmental considerations:

Visual Amenity

The Visual Impact Assessment (VIA) found that the overall visual impact rating to residential and viewpoint receptors is “Low” and “Moderate-Low” respectively.

Notwithstanding, the Community Consultation undertaken for the Project indicated that some residents living in close proximity to the Project were concerned about the visual impact of the Project, while others were impartial. These concerned residents include existing residents and those who own land adjacent to the Project but do not reside on the land as there is no dwelling.

In direct response to the concerns raised by some residents, the Project has implemented an additional key mitigation measure for further ameliorating Project visibility from not only the adjacent existing residences, but also the potential future residences. The additional key mitigation measure is to include a “visual buffer zone” in targeted sections of the Project area to further screen the Project.

Traffic and Transport

Anticipated traffic volumes will be highest during the Project's construction while operational traffic volumes are expected to be minimal.

A Transport Impact Assessment (TIA) assessed the potential impact of the Project's construction traffic movements on transport routes and other road users and assessed the potential impact of the Project's operational traffic movements on transport routes and other road users based on the Project being completely operational. The assessment reaches several conclusions including the traffic generated by the Project during the construction and operational phases is very low in comparison to existing traffic volumes on the State controlled roads and therefore is not expected to compromise the safety or function of the surrounding State road network and the traffic generated by the proposed Project area during the construction and operational phases is not expected to compromise the safety or function of the local roads that experience low volumes of traffic.

A Traffic Management Plan for the construction phase will be prepared before the commencement of construction in consultation with Department of Planning, Transport and Infrastructure (DPTI) and Port Pirie Regional Council. The Traffic Management Plan will address construction vehicle access arrangements and identify traffic management measures to address traffic safety and access issues inherent with using oversized vehicles and general construction traffic.

Biodiversity

The Project's area is predominately used for cropping and grazing livestock. Approximately 0.1% of the Project Area is covered in native vegetation.

Desktop and initial field survey assessment of the Project area's ecological values were completed to determine the presence of species of conservation significance (i.e. species protected under Commonwealth or State legislation).

The Project area is predominantly cleared agricultural land used for cropping with thin strips of vegetation along field boundaries. Avoiding these strips of native vegetation will be considered as part of the final Project design.

Two scattered trees where identified in the Project area. Initial fauna surveys opportunistically identified the presence of four (4) bird and one mammal species. None of these are listed as threatened under either the *Environment Protection and Biodiversity Conservation Act 1999* (Cth) or *National Parks and Wildlife Act 1972* (SA).

Further Flora and Fauna field survey work may be carried out to inform the Project's final layout plans.

Cultural Heritage

Desktop and initial archaeological survey assessment of the Project area were completed to understand the possible presence of Aboriginal and/or European archaeological value within the Project area.

The initial assessment identified four (4) Aboriginal sites (including one site which was already registered), 20 isolated artefacts along with six (6) culturally sensitive landscapes.

Discussions have commenced with the Nukunu Peoples Council Inc. regarding further archaeological survey assessment of the Project area to identify the presence of Aboriginal heritage within the Project area.

The Cultural heritage survey works and discussion with the Nukunu Peoples Council Inc. will inform the Project's final layout plans.

Land Use

The possible medium - term change of land use of approximately 5.3km² of agricultural land is a very minor (0.02%) change on the region's 3.2 million+ hectare agricultural production potential (Based on Australian Bureau of Agricultural and Resource Economics land use data 2011).

Investigations are being undertaken to assess if sheep grazing or other co-located limited agricultural activities under the panels is feasible during the operation phase.

After the Project's decommissioning the Project area will be available for agricultural production. Consequently, the Project will not have an adverse impact on the long-term agricultural use of the land.

Flooding

The Project will not have a demonstrable impact on local flooding.

Hydrology

The Project will not affect basic landholder water rights and harvestable rights.

Soils and Salinity

The Project will involve short - term construction, followed by decades of operation with either limited co-location agricultural land uses or no agricultural land uses. The Project will not contribute to an increase in the existing salinity levels or adversely impact the existing soil conditions.

Surface Water and Erosion

The majority of the Project area will be retained in its current condition allowing infiltration of rainfall. A small area of the Project area (approximately 13ha or 2.5% of the Project area) could potentially increase the runoff volumes and velocities however with appropriate management the potential for erosion and migration of sediment is considered unlikely.

During the construction and operational phases, the Project will implement measures to ensure peak runoff rates or long-term runoff yields are not increased or are minimal and the possibility of soil erosion is limited.

Groundwater

The risk of groundwater contamination is very low. Fuel, oils and lubricants required during construction and operation will be stored and managed in accordance with relevant standards.

Water Resource

Australia is one of the world's top 20 water-stressed nations.

A report by the World Resources Industry notes the following key points:

- It identified Australia as one country vulnerable to water stress where the potential for cheap renewable energy, solar and wind as opposed to fossil fuels, could reduce water consumption country-wide as these technologies use minimal water.
- Every megawatt hour of electricity generated by coal withdraws around 60,700 litres and consumes about 2,600 litres of water.
- In the 2017-2018 financial year, Australian's have consumed 147 terawatt hours of electricity, about 73 per cent of which comes from coal, which equates to around 455 billion litres of water.

The Project will contribute to reducing the amount of water required to generate electricity.

Climate

The Project will, deliver clean and renewable energy to the South Australian people in the face of climate change, assist in meeting renewable energy targets for the State and the nation, displace the annual equivalent of 497,000 tonnes of greenhouse gas emissions, comparable to planting 69,500 trees or removing 195,000 cars from the road and provide clean energy to power an equivalent of 86,000 homes for each year of the Project's 30 year life.

Noise

A Noise Assessment quantifies potential noise levels associated with the construction and operation of the Project.

The assessment found noise emissions during the construction and operation phase will be compliant with the Environment Protection (Noise) Policy 2007 and will not cause adverse impacts.

The Noise Assessment concluded there are no noise related issues which would prevent the approval of the Project.

Bushfire

The risk of initiating fire from the solar panels, inverters and other solar infrastructure is very low due to high quality of the components. Potential ground cover on the Project area does pose a potential risk of fire. Mitigation of this risk will include the internal access roads being maintained for access and where relevant as a firebreak.

Air Quality

Potential dust generated by construction traffic on internal access roads and unsealed public roads will be mitigated by standard management controls. The Project is not expected to generate measurable dust during operations.

Electric and Magnetic Fields

The Project design will adhere to the clearance distances from sensitive receivers for safety purposes and incorporate suitable buffers to limit exposures in accordance with several technical and legislative requirements.

Socio-Economic

The Project will:

- Deliver clean and renewable energy for Australia in the face of climate change;
- Assist in meeting renewable energy targets for the State and the Nation;

- For each year of its 30-year operational life, displace the equivalent of 497,000 tonnes of greenhouse gas emissions per annum, the equivalent of offsetting the impact of 195,000 cars or providing the equivalent benefit of 69,500 trees per annum;
- Provide clean energy to power an equivalent of 86,000 homes for each year of the Project's life;
- Create industry diversity for the Port Pirie region;
- Create substantial employment opportunities during Project construction phases;
- Be located in a suitable area with access to existing infrastructure;
- Provide a flexible, low-impact alternative to the existing agricultural land use;
- Generate an estimated economic benefit in the order of $292.5 million for the broader economy and approximately $164 million as direct domestic Project expenditure;
- Generate up to an estimated 275 equivalent full-time jobs during construction, and a further 410 indirect full-time equivalent jobs;
- Generate up to an estimated 8 equivalent full-time jobs during operations; and
- Provide a direct benefit to the community in the form of a community fund.

Glint and Glare

A Glint and Glare Analysis assessed the potential optical effects on drivers on certain parts of relevant roads, residence in some adjacent areas for housing, a section of the railway line as well as airplanes approaching the Port Pirie Airport from the PVS solar panels on a single axis tracking system during the Project's operational phase.

There are no Glint or Glare issues for pilots or for the section of the railway line near the Project area or for the section of the Augusta Highway adjacent to the Project area.

No harmful glint or glare will be experienced for sensitive receivers as a result of the Project, with the potential for a low level of glare experienced for some locations either very early morning or late evening in the Autumn and or Winter, if these areas are not impeded by existing vegetation.

A section of Warnertown Road experiences only 2 minutes of low level glare late evening on some Autumn and Winter days for a total cumulative less than one hour per annum. A section of Gulf View Road experiences low level glare for two minutes per year. The proposed visual screening will mitigate low-level glare.

Some areas of the adjacent Napperby rural living area may experience some low-level glare in early morning or late evening during Autumn and or Winter if views directly to the PVS solar panels were unimpeded. Proposed landscape screening will mitigate the potential for this low-level glare.

Environmental Management Framework

Environmental Management Plans for the Project's construction phase and operation phase will be prepared detailing the management measures for any potential environmental risk.

CONCLUSION

The Planning Report concludes the Project:

- Is consistent with the relevant statutory provisions;
- Will not result in significant environmental impacts;
- Is suitable at the proposed Project area; and
- Is in the public interest.

Therefore, it is respectively requested the Project be approved subject to final Project documents and plans being approved by relevant Government authorities prior to the commencement of construction and operation.

ABBREVIATIONS

Abbreviation	Description
AADT	Annual Average Daily Traffic
AC	Alternating Current
ACMA	The Australian Communications and Media Authority
AEMO	Australian Energy Market Operator
APZ	Asset Protection Zones
Asl	Above Sea Level
BESS	Battery Energy Storage System
CASA	Civil Aviation Safety Authority
CMP	Construction Management Plan
DC	Direct Current
DRP	Decommissioning and Rehabilitation Plan
DPTI	Department of Planning, Transport and Infrastructure
EMF	Electromagnetic Fields
EMP	Environmental Management Plan
EPA	Environment Protection Authority
ESCOSA	Essential Services Commission of South Australia
FTE	Full Time Equivalent
GHG	Greenhouse Gases
LGA	Local Government Area
MW	Megawatt
MWh	Megawatt hour
NEM	National Electricity Market
OMP	Operational Management Plan
OP	Observer locations
OTR	Office of the Technical Regulator
PBS	Performance Based Standards
PR	Planning Report
Project	Bungama Solar
PV	Photovoltaic
PVS	Photovoltaic Energy Generation System
RFI	Radio Frequency Interface
RO	Route locations
RET	Renewable Energy Target

The Act	Development Act 1993
TIA	Transport Impact Assessment
SA	South Australia
SARIG 2018	South Australian Resource Information Gateway
VIA	Visual Impact Assessment

CONTENTS

TABLE OF FIGURES

LIST OF TABLES

APPENDICES

1. INTRODUCTION

Bungama Solar ('the Project') is situated approximately 6km east of Port Pirie, and 218km north of the State's capital, Adelaide. The Project is within the Local Government Area (LGA) of Port Pirie Regional Council. The Project land comprises the Project area on which the PVS, BESS, Project's substation, Operations and Maintenance buildings and associated infrastructure will be built and operated, and land required to connect the Project's elements to ElectraNet's Bungama Substation. The Project area is approximately 530ha.

This Planning Report (PR) has been prepared to explain the environmental, social and economic matters associated with the Project. At this stage the Project is proposed to be an integrated but separately operated grid connected Photovoltaic Energy Generation System (PVS) of approximately 280MW (AC) generation capacity and a 140MW capacity Battery Energy Storage System (BESS) with 560MWh of storage. The PVS element, the BESS element and associated infrastructure, together "the Project", requires an estimated capital investment of AUD $650 million. The Project's detailed design will be completed prior to construction.

Attached as Appendix 1 is Department for Energy and Mining's endorsement of the Project for the purposes of section 49 of the *Development Act 1993* (SA). The Development Application is submitted for the approval of construction, operation and decommissioning of the Project including the Project's connection to the Bungama Substation.

1.1. APPROVALS SOUGHT

The Development Application seeks development approval for the following Project components and approach:

- Development approval for the construction, operation and decommissioning of the following components:
  - A Photovoltaic Energy Generation System (PVS) of approximately 280MW (AC) generation capacity and associated infrastructure;
  - A 140MW capacity Battery Energy Storage System (BESS) with 560MWh of storage and associated infrastructure;
  - Temporary construction components required to construct the Project's PVS element and BESS element including (but not limited to) access points, construction camp (if required), workshops, outbuildings, site office, amenities, laydown areas, waste storage areas, car parking areas, refuelling areas, clean-down facilities, roads, fences;

- Permanent operations components of the PVS element including (but not limited to) the series of mounted photovoltaic modules set out in arrays, inverter/ transformer stations, interconnector substations, switching station, all overhead transmission and/or underground cabling and operational, maintenance and control buildings;
- Permanent operations components of the BESS element including (but not limited to) the battery energy storage area, sheds (if required) and all overhead transmission and underground cabling;
- Connection of the Project's PVS element and BESS element to ElectraNet's Bungama Substation and required connection infrastructure including but not limited to overhead transmission and/or underground cabling and associated poles;
- Infrastructure upgrades to ElectraNet's Bungama Substation to allow to the Project's PVS element and BESS element to export and import electricity into and out of the national electricity grid;
- Any synchronous condensers if included in the Project;
- Permanent operations ancillary components of the Project including (but not limited to) all internal roads, car parking areas, fencing, and access points to the road network, and any other relevant matter; and
- Landscaping plan(s).

- An approval validity timeframe providing for four (4) years after the operative date of the development approval to substantially commence construction, and six (6) years after the operative date of the development approval to substantially complete construction;
- Temporary construction facilities to be dismantled post construction; and
- Staging of building rules consent and commencement of construction for different Project elements and/or components, as described in section 1.3 of this document.

1.2. TIMING

Construction, including the commissioning, of a 280MW(AC) PVS element with an integrated; but separately operated 140MW/560MWh BESS element is complex multifaceted and dependant on a number of factors including:

- Development of the required final detailed construction/engineering plans;
- Tender process for the PVS technology and BESS technology, the construction of the PVS technology and BESS technology and the operation of the PVS technology and BESS technology;
- Project financing, which is itself dependent on a number of factors including a feasible development consent, the economic and political environment at the time of construction, the time required for a financial organisation's diligence enquires for an estimated capital investment of AUD $650 million, the financial

arrangements/requirements for constructing the Project and possibly negotiating and entering into offtake agreements;

- Lead times for the delivery from overseas suppliers of the various components for the Project. The lead times are influenced by the selected technology which will not be known until the final design stage. Given the world's current interest in solar development, some components are anticipated to have delivery lead times of up to 2 years from order;
- Phased completion of construction;
- Efficiencies associated with both economies of scale and with reduced demobilisation and remobilisation costs, which influences the timing of the phases for construction; and
- The time required to comply with AEMO's commissioning tests and verification testing requirements prior to grid connection.

To adequately manage the factors influencing the construction of a 280MW(AC) PVS element with an integrated but separately operated 140MW/560MWh BESS element the development timeframes provided in Table 1-1 and Table 1-2 are proposed for the Project with the option of the relevant approval authority being permitted to extend these periods if required.

Table 1-1: Development Milestone Timeframes – PVS – Bungama Solar 1 Pty Ltd

Milestone	Timeframe Sought
Substantial Commencement	4 years from the Development Approval operative date
Substantial Completion	6 Years from the Development Approval operative date

Table 1-2: Development Milestone Timeframes – BESS – Bungama Solar 2 Pty Ltd

Milestone	Timeframe Sought
Substantial Commencement	4 years from the Development Approval operative date
Substantial Completion	6 Years from the Development Approval operative date

1.3. STAGING OF CONSTRUCTION WORKS AND BUILDING RULES CONSENT

A project's PVS element, of this size, would typically be constructed in 2 phases. The PVS phases would typically comprise the following works:

- PVS Phase 1: PVS up to approximately 140MW(AC) with associated infrastructure; and
- PVS Phase 2: PVS up to approximately 140MW(AC) with associated infrastructure.

The BESS construction would also typically be phased to meet incremental project maturity.

The BESS grid connection infrastructure is proposed to be constructed adjacent to the switchyard for the Project. The Project seeks development approval to incrementally add to the BESS up to and after substantial completion, up to a total capacity of 140MW.

The BESS physical grid connection works will be completed as part of substantial completion while the battery capacity and storage will be incrementally added over the life of the Project to allow flexibility in increasing the BESS as technology and commerciality of utility scale batteries matures.

On that basis, it is proposed that once development approval for the entire Project has been obtained, building rules consent will be obtained and construction will proceed in stages.

Works which do not require building rules consent will comprise a separate stage so that construction can commence as soon as practicable subject to compliance with development approval conditions and reserved matters (if any). This stage will encompass such things as site mobilisation activities, establishing temporary laydown areas and facilities, access roads formation or widening, underground cable works and other civil works.

For works that do require building rules consent, it is proposed that building rules consent may be obtained separately for each structure and for each stage of construction as exemplified but not limited to following list:

- PVS Phase 1: PVS up to approximately 140MW(AC) with associated infrastructure;
- PVS Phase 2: PVS up to approximately 140MW(AC) with associated infrastructure;
- BESS Phased storage area suitable for a BESS up to approximately 140MW(AC) and 560MW/hrs with associated infrastructure;
- Battery units (in incremental sub-stages) up to a total capacity of 140MW;
- Temporary construction components required to construct the Project's PVS element and BESS element including (but not limited to) access points, construction camp, workshops, outbuildings, site office, amenities, laydown areas, waste storage areas, car parking areas, refuelling areas, clean-down facilities, roads, fences;
- Permanent operations components of the PVS element including (but not limited to) the series of mounted photovoltaic modules set out in arrays, inverter/ transformer stations, interconnector substations, switching station, all overhead transmission and underground cabling and operational, maintenance and control buildings;
- Permanent operations components of the BESS element including (but not limited to) the battery energy storage area, sheds (if relevant) and all overhead transmission and underground cabling;

- Connection of the Project's PVS element and BESS element to ElectraNet's Bungama Substation and required connection infrastructure including but not limited to overhead transmission and/or underground cabling and associated poles;
- Infrastructure upgrades to ElectraNet's Bungama Substation to allow the Project's PVS element and BESS element to export and import electricity into and out of the national electricity grid;
- Any synchronous condensers if included in the Project; and
- Permanent operations ancillary and associated components of the Project including (but not limited to) all internal roads, car parking areas, fencing, and access points to the road network, landscaping plans and any other relevant matter.

The Office of the Technical Regulator (OTR) prescribes technical requirements that Generators must meet in order to lodge an application for Development Approval. In summary the technical conditions to be met include:

- The Generator shall provide either Real Inertia (real physical inertia provided by a synchronous system) or Fast Frequency Response;
- The Generator is connected to the network via a switched connection (breaker and half connection) or other connection approved by the OTR; and
- The Essential Services Commission of South Australia's (ESCOSA) current Generator Licencing conditions must be met.

The OTR has issued a certificate of approval for the Project which is provided in Appendix 1.

1.4. OBJECTIVES

The Project's objectives are:

- To provide a large-scale, grid connected solar power development that can contribute to SA's electricity supply;
- To provide dispatchable clean energy via energy storage in the form of a battery system;
- To contribute to Australia's competitive electricity market with a renewable energy resource;
- To contribute to Australia's growing solar industry;
- To encourage development in regional SA areas;
- To develop infrastructure and technical knowledge that will contribute to the Australian renewable energy industry;
- To assist in reducing electricity prices in South Australia; and
- To assist in South Australia's electricity network and increase resilience to operation of the network.

1.5. PROPONENT

Bungama Solar 1 Pty Ltd is the special purpose vehicle for the Photovoltaic Energy Generation System (PVS) and Bungama Solar 2 Pty Ltd is the special purpose vehicle for the Battery Energy Storage Systems (BESS). The PVS element, BESS element and associated infrastructure together are “the Project”.

Energy Projects Solar (EPS) Pty Ltd is the development consultant for the Project.

2. LAND DESCRIPTION

2.1. PROJECT AREA SELECTION

On behalf of Bungama Solar, EPS Energy undertook an extensive solar site identification assessment across the Eastern Australian National Electricity Network examining potential project areas based on several criteria including:

- Proximity to electrical substations;
- Access to existing electrical substations and capacity of each substation to accept new generation;
- Marginal loss factors and future forecasts;
- Consideration of known solar projects proximate to a proposed project area and the potential for impact on capacity and connection;
- Irradiation levels;
- Agreements with landowners to host a project;
- Utilised land such as land used for agricultural land uses to reduce the likelihood of the solar development encountering significant areas of native vegetation, Aboriginal cultural heritage items or other environmental constraints;
- Environmental analysis of ecology, archaeology and potential environmental constraints including flooding;
- Favourable topography and geotechnical conditions for constructing and operating a solar development;
- Proximity to towns but equally enough distance between the site and urban populated areas;
- Suitable infrastructure surrounding the project area e.g. roads access for construction and operation of a solar development;
- NEM capacity, grid strength and the ever-increasing market demand for renewable energy;
- Favourable response from enquires with the Transmission Network Service Provider (ElectraNet); and
- Details on interstate connectors and relevant known transmission constraints.

The initial assessment of the 530ha (approximately) Project area found it met several key criteria including:

- The Project area is close to and can access the Bungama Substation;
- Bungama Substation has the capacity to accept new electricity generation;
- The area has a strong electrical transmission network;
- The landowners of the Project area were receptive to hosting a solar development;

- The Project area is used for agricultural land uses including cropping and grazing thereby reducing the likelihood of the Project encountering significant areas of native vegetation, Aboriginal cultural heritage items or other environmental constraints;
- Suitable infrastructure surrounding the Project area including good State and Local road access to the Project area for construction and operation of a solar development;
- Good irradiation levels; and
- Proximity to the City of Port Pirie but equally enough distance between the Project area and Port Pirie.

Based on the positive outcomes of the initial assessment and with strong landowner support the next phase of assessment was commenced including detailed grid connection studies, further financial modelling, specific Project area investigations including preliminary field works to identify any unknown environmental and cultural constraints and preliminary Project design works. The assessment found:

- Power generated by the Project can be exported into the grid without any significant constraints;
- Colocation of the Project close to the Bungama Substation minimises the connection transmission line distance thereby reducing electrical transmission losses through long transmissions and consequently improving the economic rationalisation of the Project on the Project area;
- The Project will not be constrained by environmental constraints such as flooding, ecology or archelogy; and
- Favourable topography and geotechnical conditions for constructing and operating a solar development.

Based on the findings the Project on the Project area was considered feasible. Consideration then turned to the social aspect of the Project including ascertaining relevant stakeholder opinions on the Project in the Project area's locality.

On behalf of Bungama Solar, EPS Energy carried out pre-Development Application lodgement community and stakeholder engagement to understand the opinions of relevant stakeholders on the Project in the Project area's locality. Details of the consultation are set out in Section 6 Community and other Stakeholders.

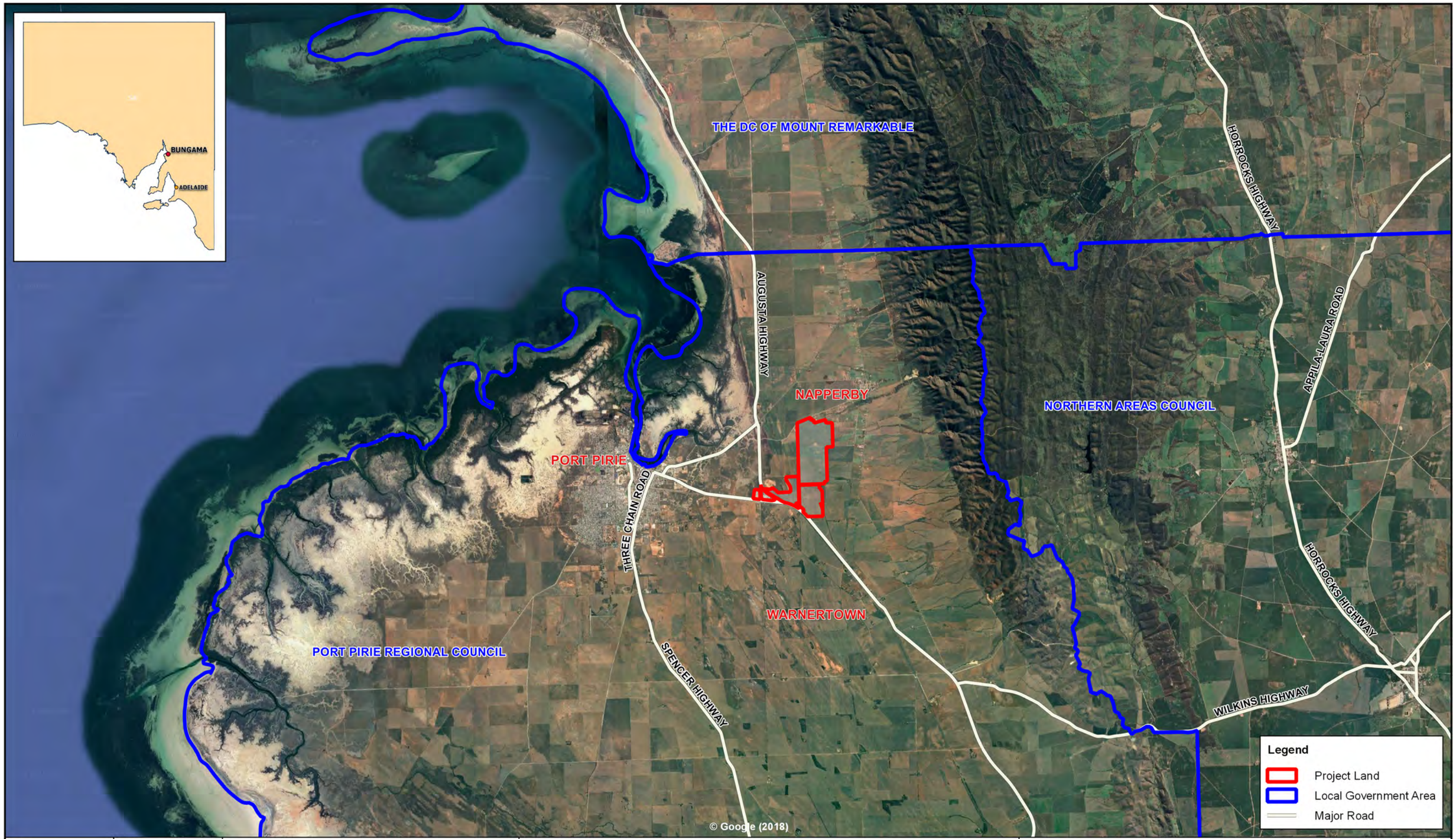
2.2. PROJECT AREA CONTEXT

The Project area is approximately 530ha (5.3km^2) located in the suburbs of Bungama, Napperby and Warnertown in South Australia. The Project is situated approximately 6km east of Port Pirie, and 218km north of the State's capital, Adelaide. The Project is within the Local Government Area (LGA) of Port Pirie Regional Council.

The Port Pirie Regional Council is in the Mid North region of South Australia situated on the upper reaches of the Spencer Gulf in the Southern Flinders Ranges of South Australia. It is a diverse region encompassing agricultural and industrial activities, with a history as a major manufacturing and export centre, where industry, century old buildings and attractive parks and gardens sit side by side.

The Port Pirie Regional Council area is approximately 1,761 km^2 a with a population of 17,364 (2016 census). The Port Pirie Regional Council area is located within the Mid North Region of South Australia which covers about 23,000km^2 with a population of 33,500 (2016 census).

Figure 2-1 shows the location of the Project land.



Author:	MB
Reviewer:	SMC/ JB
A3 Scale:	1:150,000
Job Ref/Version:	11297/ V02

0 2.5 5 7.5 10 km

Map Projection: GDA 1994 MGA Zone 54

Figure 2-1

Location Plan

Bungama Solar | Bungama SA Australia

21/11/2018

BUNGAMA SOLAR

11297_PR_Location Plan.qgs

2.3. PROJECT LAND

The Project land title particulars are:

Title	Lot/Plan/Section
CT 6037/29	A20 DP80628
CT 6127/5	A558 FP188690
CT 5954/187	A52 DP25903
CT 5949/272	A4 DP24997
CT 5390/999	A559 FP188691
CT 5360/334	A551 FP188683
CT 5972/304	A1 DP24255
CT 5776/531	A501 DP52803
CT 5776/532	A502 DP52803
CT 5978/766	A55 DP71831

The Project land comprises the Project area on which the PVS, BESS, Project's substation, Operations and Maintenance buildings and associated infrastructure will be built and operated, and land required to connect the Project's elements to ElectraNet's Bungama Substation.

A copy of the Project land Certificates of Titles are attached as Appendix 2.

Figure 2-2 shows the Project land.

Legend

- Project Land
- Bungama Substation
- Allotment Boundary

NELSHABY ROAD
SPENCER HIGHWAY
GULF VIEW ROAD
BUNGAMA NORTH ROAD
AUGUSTA HIGHWAY
LOCKS ROAD
WARNERTOWN ROAD
RAILWAY TERRACE
PIRIE BLOCKS ROAD
WAITS ROAD

CT 6037/29
Allotment 20
Deposited Plan 80628

CT 6127/5
Allotment 558
Filed Plan 188690

CT 5390/999
Allotment 559
Filed Plan 188691

CT 5360/334
Allotment 551
Filed Plan 188683

CT 5954/187
Allotment 52
Deposited Plan 25903

CT 5949/272
Allotment 4
Deposited Plan 24997

CT 5972/304
Allotment 1
Deposited Plan 24255

© Google (2018)

Author:	MB
Reviewer:	SMC/ JB
A3 Scale:	1:15,000
Job Ref/Version:	11297/ V04

0 100 200 300 400 500 m

Map Projection: GDA 1994 MGA Zone 54

Figure 2-2

Project Land Plan

Bungama Solar | Bungama SA Australia

21/11/2018

BUNGAMA SOLAR

11297_PR_Project Land.qgs

2.4. EXISTING LAND USE OPERATIONS

The Project area has been used for many years for cereal cropping and grazing. Land within the immediate area of the Project area is predominately used as agricultural land and rural residential living.

There is existing utility scale electricity infrastructure in the immediate area including the Bungama Substation.

Figure 2-3 shows key physical features of the Project land.

Legend

Project Land
Allotment Boundary

Infrastructure

Bungama Substation
Existing Caveat
Road
Existing Overhead Electricity Transmission Line
Existing Underground Gas Pipeline
Existing Water Main

Environment

Vegetation
Ephemeral Watercourse
(Department for Environment and Water SA)

Heritage

Registered Aboriginal Site (6531 2972)

GULF VIEW ROAD
BUNGAMA NORTH ROAD
AUGUSTA HIGHWAY
LOCKS ROAD
WARNERTOWN ROAD
RAILWAY TERRACE
PIRIE BLOCKS ROAD
WAITS ROAD
© Google (2018)

Author:	MB
Reviewer:	SMC/ JB
A3 Scale:	1:13,000
Job Ref/Version:	11297/ V02

0 100 200 300 400 500 m

Accuracy: location and scale of features is indicative only

Map Projection: GDA 1994 MGA Zone 54

Figure 2-3

Key Physical Features of the Project Land

Bungama Solar | Bungama SA Australia

23/11/2018

BUNGAMA SOLAR

11297_PR_Key Features of Project Land.qgs

3. PROJECT DESCRIPTION

3.1. PROJECT CAPACITY

3.1.1. Description of Development

The Project land comprises the Project area on which the PVS, BESS, Project's substation, Operations and Maintenance buildings and associated infrastructure will be built and operated, and land required to connect the Project's elements to ElectraNet's Bungama Substation.

The Project area is approximately 530ha and the Project development footprint is approximately 413ha (approximately 78% of the Project Area).

The predominance of the development footprint comprises the PVS which will have a maximum capacity of approximately 280MW (AC).

The BESS element of the Project will have a maximum energy storage capacity of 140MW/560MWh and depending on the final BESS technology could occupy a footprint of up to approximately 12ha being approximately 2.9% of the Project development footprint.

The PVS element & BESS element will be connected to the adjacent Bungama Substation via a dedicated 275 kV circuit over-head and poles or underground transmission lines having a route length of between 0.5-3km (approximately) dependant on the final design and location of the Project's transformers and switch gear.

<u>PVS description</u>

Solar photovoltaic (solar panel) technology uses manufactured semiconductor material to absorb and convert sunlight into electricity. Each solar panel contains a series of interconnected cells that convert sunlight directly into electricity. The solar panels produce energy in the form of direct current (DC), which is converted to alternating current (AC) via a solar inverter.

The solar panels will be mounted on single axis tracking racks. The panels will be installed in parallel rows with the spacing being between approximately 4m to 10m depending on the type of the single axis tracking racks selected as part of the final design.

Groups of solar panels are connected to each inverter by underground cabling and the inverters are linked together to collect the total energy being produced. Step-up transformers, that increase the voltage are housed in the inverter containers. Underground or overhead lines are run from each inverter station to the Project's on-site switching substation where the voltage is again stepped up via one or more transformers to match the voltage of the transmission network.

The PVS will connect to the Bungama Substation via the 275Kv transmission line to the Bungama Substation allowing the PVS to export a maximum capacity of approximately 280MW (AC) into the national electricity grid.

BESS description

A utility-scale BESS encompasses multiple battery units and associated infrastructure housed in a storage structure or structures.

The BESS will connect to the Bungama Substation via the 275Kv transmission line to the Bungama Substation allowing the BESS to export and import electricity into and out of the national electricity grid.

The BESS can support the South Australian electricity grid through a variety of services such as frequency control and short-term network security services and can assist in stabilising the South Australian electricity grid, facilitate integration of renewable energy in the State, provide arbitrage and assist in preventing load-shedding events.

3.2. PROJECT DESIGN AND LAYOUT

The Project's integrated but separately operated PVS and BESS elements together with supporting ancillary infrastructure includes (but is not limited to):

- Solar modules – mounted on single axis tracking racks;
- Module footings and racking for solar modules;
- Inverter stations;
- Transformers;
- Switching substation;
- One or more synchronous condensers (subject to requirement);
- Utility scale battery facility;
- Associated underground cables connecting groups of solar panels to inverter stations and underground and/or overhead transmission lines from inverter stations to the Project's switching substation;

- Associated cables, poles and to connect the Project to ElectraNet's Bungama Substation;
- Administration and controls area including:
    - Control room and site office with amenities;
    - Maintenance and spare parts building;
    - Other buildings;
    - Car parking sufficient for employees and contractors during operation;
    - Laydown/compound area and future battery storage area;
    - Internal access roads;
- Drainage works, including stormwater management systems;
- Areas not to be developed e.g. native vegetation areas, heritage areas;
- Security fencing and CCTV;
- Low-level night time lighting; and
- Lightning protection.

Indicative layout and preliminary PVS Operation design drawings are attached as Appendix 3. Illustrative examples of typical project componentry are included within the visual impact assessment at Appendix 7.

The following subsections examine the Project's proposed key elements identified in the indicative layout and preliminary PVS Operations design drawings. The Project's final key elements will be identified in the final design plans.

3.2.1. Single Axis Panel Solar Photovoltaic Modules

Further site layout assessments and detailed engineering will define the preferred configuration of panels to ensure:

- Maximum exposure to sun;
- Efficient layout of solar panels across the Project area;
- Efficient connection to the substation;
- Ease of construction;
- Efficient access for maintenance and long-term operation; and
- Technology advances can be incorporated.

The solar panels will be mounted on single axis tracking racks. Depending on the type of single axis panel solar photovoltaic modules selected for the final design and layout the height of the bottom of the solar modules could be in the range of 0.3 to 1.2m (approximately) above ground level while the height of modules could be approximately 2-4m above ground level.

Based on preliminary designs the Project's photovoltaic area including the spaces between the arrays and non-developed area will cover approximately 517ha or 98% of the 530ha Project area. The modules will generally be aligned on the tracking system in a north/south row and rotate in position from east to west.

Prior to the commencement of construction final layout and design drawings will be submitted to the authority specified in the development approval for endorsement.

3.2.2. Module Foundation Systems

Foundation systems for photovoltaic solar panel arrays typically comprise driven piles (most common), screw piles or mass concrete foundations that are sized to resist uplift and lateral loading during wind events.

The results of preliminary geotechnical investigations indicate driven piles is the likely foundation for the Project's geotechnical conditions. Additional investigations will be conducted prior to final design to confirm the Project's optimum foundation solution.

3.2.3. Inverter Stations

The solar panels produce energy in the form of direct current (DC), which is converted to alternating current (AC) via a power conversion unit (inverter), to allow the solar generated energy to be fed into the electricity grid. Utility-scale inverters harvest the maximum power from the solar photovoltaic array over a wide range of operating conditions (e.g. solar irradiation, temperature and shading). Typically, the inverter units will be approximately 3m in height.

The final type, design and therefore quantity of the inverter stations to be used for the Project are yet to be finalised. Final selection will be dependent on several factors including suitability for the Project area, relative cost, maintenance requirements, efficiency and reliability of units available on the market at the time of detailed design.

3.2.4. Solar Modules Connection to Inverter Stations

Groups of solar panels are connected to each inverter by underground cabling and the inverters are linked together to collect the total energy being produced. Step-up transformers, that increase the voltage, are housed in the inverter containers. Underground lines and or overhead transmission lines may be used due to the long distances across the Project area. These will run from each inverter station to the Project's switchyard/substation where the voltage is again stepped up via one or more transformers to match the voltage of the transmission network. The solar energy generated from the Project will be exported to the transmission network.

Existing SA Power Networks and ElectraNet's Bungama Substation is located near the Project's western boundary. The Project's network connection will be made to the ElectraNet substation via the Project's switchyard/substation. Formal connection enquiries with ElectraNet confirmed the feasibility of connecting to the electricity network at this location.

3.2.5. Project's Switchyard/Substation

275/33/33 kV transformers are likely to be installed to provide reliable supply reticulation to the solar farm. These network connection facilities will be designed, constructed and operated in accordance with all statutory requirements. The number and size of transformers will be a function of technical requirement and confirmed in the Project's final design.

3.2.6. Battery Energy Storage Systems (BESS)

The Project's BESS, to be integrated although operated independently from the PVS, will allow the Project to appropriately distribute power outside PVS generating periods. Utility-scale battery storage structures are typically constructed according to two design methodologies; modular systems and building-based systems. A number of technologies are being assessed to provide the optimum solution for the Project and integration in the South Australian transmission electricity network. The BESS footprint and storage structure is subject to the final technology decision.

At this stage storage of the battery energy storage system could include a combination of solid structures representative either of typical agricultural style storage buildings e.g. intensive animal keeping sheds used in the Primary Production Zone or Tesla style battery units or 40-foot shipping containers. The specific height of storage structures within the battery storage area is yet to be determined.

The indicative layout and preliminary BESS Operations design drawings are attached as Appendix 3. The BESS storage area will be located near the Project substation (refer to Appendix 3). The battery storage structures to be implemented will be a function of technical requirement coupled with economic viability and confirmed in the Project's final detailed design.

3.2.7. Synchronous Condensers

Fundamentally, a synchronous condenser is simply a large generator similar to those found in thermal power plants, with the difference being that rather than being powered from an external source such as a gas or steam turbine, the generator can be operated as an electric motor. In this way, the synchronous condenser stores rotational energy (inertia). The synchronous condenser can therefore instantaneously absorb/deliver both real and reactive power from/to the grid to maintain grid stability.

The Project may include one or more synchronous condensers to assist in providing inertia for managing power system strength requirements. The synchronous condensers, if required, will most likely be located within the switchyard or substation.

At this stage the storage/housing of a synchronous condenser could be outdoors and/or could include a combination of solid structures representative of typical agricultural style storage buildings e.g. intensive animal keeping sheds used in the Primary Production Zone. The specific height of structures is yet to be determined.

Further detailed assessments are underway to ascertain the option and appropriate sizing of any synchronous condensers. Final design and synchronous condenser inclusion will be a function of technical requirement and confirmed in the final Project design.

3.2.8. Administration and Controls Area

The administration and control area will incorporate several buildings including a single ancillary office building and control room, together with a maintenance and spare parts building. These structures have been located in the western section of the Project with access from Locks Road and sited to allow for ease of access of the workforce and to maximise the area available for solar panels. Amenities and car parking will also be provided in the administration and controls area. This area may also be used as a laydown and storage area during the construction phase.

3.2.9. Control Room and Site Office / Maintenance and Spare Parts Buildings

The proposed buildings will likely be single storey structures with heights of approximately 6m. The control room will be the centralised control area for managing operations associated with the Project. The site office will be the administrative centre for the Project and will house permanent operational staff associated with the facility.

3.2.10. Car Parking

Car parking will be in the vicinity of the control room and site office to accommodate staff, visitors and temporary contractor parking (note that following sign-in to the site, contractors/tradespeople required to access the solar fields will drive their vehicle directly to the site of work and will not require a formal car parking area).

3.2.11. Amenities

Depending on availability and approval the administration and control area may be connected to mains water and electricity supply where available at Locks Road to provide water and electricity services for the buildings. A suitably sized sewage treatment system will be installed to manage wastewater from the amenities.

3.2.12. Laydown/Compound Area

An indicative layout of the operations administration/controls and laydown/compound area are illustrated in Appendix 3.

3.2.13. Site Access and Internal Access Roads

Site access is proposed from the existing road network surrounding the Project Area. Access will be via existing site access points and possibly additional access points. An indicative internal access road layout and design is provided in Appendix 3. The internal access roads will be designed and constructed to allow for vehicle manoeuvring including large vehicle deliveries.

3.2.14. Drainage works, including stormwater management system

The Project's final design will determine the drainage and stormwater management design.

3.2.15. Fencing and Security

Security fencing will be installed around the perimeter of the Project. Signage will be clearly displayed identifying hazards present within the Project area. Perimeter fencing will likely be approximately 1.8m chain wire mesh fencing with three strand barb-wire top. Fencing of this nature is required for security, insurance and to minimise wildlife interaction with the Project.

CCTV with infrared capability will be used to manage security on the Project area.

3.2.16. Lighting

Low-level night time lighting will be installed in the administration area for safety and security purposes.

3.2.17. Lightning Protection

Lightning protection will be incorporated into the Project. Lightening protection masts will likely be established for every third or fourth inverter station, with the final numbers and siting to be determined during detailed design. The lightning protection masts are thin, tubular structures, approximately 8 m high with a concrete base and earthing.

3.2.18. Landscaping

Given the scale and extent of the proposed development and the low level of visual impact, providing landscaping which is adequate to screen the entire Project area's 19km perimeter is not considered practical. In response to neighbouring landowner feedback, targeted landscaping to provide in excess of 7 kilometres of screening of the solar arrays and the BESS for adjoining landowners and viewpoints is proposed and shown in the preliminary landscape plan attached in Appendix 14.

Native species will be used for their habitat value; however, the landscaping is not intended to be revegetation. The landscaping will be removed in the decommissioning phase of the Project, so the land has the capacity to return to its former agricultural use.

3.2.19. Connection to ElectraNet's Bungama Substation

To enable the Project's PVS element and BESS element to export and import electricity into and out of the national electricity grid the following works including (but not limited to) will be required:

- Connection of the Project's PVS element and BESS element to ElectraNet's Bungama Substation and required connection infrastructure including but not limited to overhead transmission and/or underground cabling and associated poles.
- Infrastructure upgrades to ElectraNet's Bungama Substation to allow the Project's PVS element and BESS element.

The indicative connection layout to ElectraNet's Bungama Substation is attached as Appendix 3.

3.2.20. Final Project Layout

The indicative PVS Operations layout (Appendix 3) and indicative BESS Operations layout (Appendix 3) depict the Project's development footprint. The PVS final footprint and BESS final footprint will be determined following the completion of detailed design, and influenced by:

- Final selection of panels and other Project components: the physical and operational requirements of the various components required by the Project (e.g. solar panels, inverters and Battery storage system) will influence the final layout, spacing between panels and the number of ancillary components required (inverters, lightning protection etc.).
- Detailed geotechnical investigation: an investigation to determine the geotechnical characteristics of the Project area will influence the final footing selection and may result in alterations to the Project layout.
- Outcomes of a final network constraints and opportunity analysis to determine export constraints, network constraints and sizing and staging of the Project elements.

As a result, the following information will be submitted to the relevant authority prior to the commencement of construction for each Phase of the Project:

- The final design, specification and layout of all temporary construction components required to construct the Project's PVS element and BESS element including (but not limited to) access points, workshops, outbuildings, site office, amenities, laydown areas, waste storage areas, car parking areas, refuelling areas, clean-down facilities.
- The final design, specification and layout of all permanent operations components of the PVS element including (but not limited to) the series of mounted photovoltaic modules set out in arrays, inverter/ transformer stations, interconnector substations, switching station, all overhead transmission and underground cabling and operational, maintenance and control buildings.

- The final design, specification and layout of any synchronous condensers if included in the Project.
- The final design specification and layout of all permanent operations components of the BESS element including (but not limited to) the battery energy storage area, sheds (if relevant), transformers, ancillary connection components and all overhead transmission and underground cabling.
- The final design, specification and layout of all permanent operations ancillary and associated components of the Project including (but not limited to) all internal roads, car parking areas, fencing, and access points to the road network, and any other relevant matter.
- The final landscaping plans.
- The final design for the connection of the Project's PVS element and BESS element to ElectraNet's Bungama Substation and required connection infrastructure including but not limited to overhead transmission and/or underground cabling and associated poles.
- The final design infrastructure upgrades to ElectraNet's Bungama Substation to allow the Project's PVS element and BESS element.

3.3. PROJECT PHASES

3.3.1. Construction Phase

The PVS development timeframes are explained in Section 1 "Introduction" provided in Table 1-1.

The BESS development timeframes are explained in Section 1 "Introduction" provided in Table 1-2.

The majority of construction works is associated with the PVS element with relevant BESS phases most likely constructed concurrently.

3.3.2. Construction Works

The key construction works required to complete the construction phase include (but are not limited to):

- Construction of internal access tracks and laydown areas;
- Installation of site office, maintenance sheds and other buildings;
- Site preparation earthworks for installation of panel supports;
- Installation of panel supports;

- Solar panel erection;
- Installation of the battery system/technology and battery storage structures;
- Electrical substations and connection between solar panels and central inverters, substations and battery storage;
- Provision of other utility services (electricity, communications, etc.) as required;
- Overhead or underground electrical connections to the Bungama substation;
- Bungama Substation infrastructure works;
- Installation of the remaining system components (including synchronous condensers if included);
- Landscaping (if required), fencing and signage; and
- Commissioning.

3.3.3. Construction Workforce

Direct employment generation during the construction period is up to approximately 275 full time equivalent (FTE) jobs. An estimated additional 410 FTE roles are indirectly anticipated to be generated by the Project. Additional support to local employment is also anticipated during the construction period with a preference for local goods, accommodation and skills if available and practicable and spending in local retail and services by construction employees if available and practicable.

3.3.4. Temporary Construction Facilities

Temporary facilities will be established during construction to provide basic amenities for construction workers and temporary laydown and storage areas for construction materials. The requirements for temporary facilities will be determined by the construction contractor, however are anticipated to include (but not limited to):

- Site office;
- Temporary toilet facilities;
- Multiple Laydown areas; and
- Temporary car parking (informal).

Lay-down areas will be required for the delivery and management of construction material. The construction contractor will determine the lay-down requirements within the Project area.

Other temporary construction facilities will most likely be accommodated within the Project area.

3.3.5. Temporary Construction Camp

While the Project has a preference for local accommodation, if insufficient accommodation suitable to meet the requirements of the Project is not available, then a temporary construction workers camp on a suitable part of the Project area will likely be the most efficient/effective way to manage the construction workforce during the construction phase.

The Project seeks approval for a temporary construction camp to ensure that if the camp is required due to other accommodation alternatives being unsuitable, then construction will not be delayed by requiring a further development approval at a later stage.

The construction workers camp would be designed to accommodate up to an estimated 275 equivalent full-time workers during construction.

Approximately 3ha – 5ha may be required for the construction workers camp. An example of a typical construction workers camp layout is attached as Appendix 4.

If a construction workers camp is required, adequate arrangements will need to be made for the provision of essential services including, the supply of water, the supply of electricity, the disposal and management of sewage/waste water, stormwater drainage, and general waste management.

Therefore, if the temporary construction camp is required, then the final design, specification and layout of the temporary construction workers camp, including essential services, within the Project area will be submitted to the relevant authority for approval prior to the commencement of construction.

3.3.6. Utilities

The construction contractor will be responsible for providing power and water required to support construction activities. It is anticipated the first priority will be establishment of a permanent auxiliary power supply, so it can be used to supply power during the construction period. It is anticipated construction water requirements will be trucked in.

3.3.7. Vehicle Movements

Construction/commissioning vehicle movements are linked to the phases explained in Section 1 “Introduction”.

Based on the estimated level of light and heavy vehicle construction/commissioning vehicles movements on the highways are not expected to greatly alter existing highway traffic movements and are within the design criteria of the roads.

Available traffic data is limited for Locks Road but based on discussions with some of the local landowners the roads have relatively minor vehicle flows, except during harvest. The estimated level of light and heavy vehicle construction/commissioning vehicles movements on Locks Road is not expected to greatly alter the existing Locks Road traffic movements and are within the design criteria of the road.

A Traffic Management Plan for the construction phase will be prepared before the commencement of construction in consultation with DPTI and Port Pirie Regional Council. The Traffic Management Plan will address construction vehicle access arrangements and identify traffic management measures to address traffic safety and access issues inherent with using oversized vehicles and general construction traffic.

3.3.8. Waste Management

Waste products will be generated during construction. Construction waste management procedures will be implemented via a Construction Management Plan (CMP). Suitable management measures typically include:

- Construction waste will be separated into different streams to facilitate recycling with waste removed from the Project area by a licensed contractor as appropriate.
- Liquid waste (including hydrocarbons, paints and solvents) will be stored in sealed drums or containers in a bunded area before removal from the Project area by an EPA licensed contractor for recycling, where possible, or disposal to a licensed facility.
- Temporary ablution facilities will be serviced by pump-out tanker trucks, used with offsite disposal by a licensed contractor.

3.3.9. Stormwater Management

The Project's construction has the potential to cause erosion, sedimentation, and pollution of water courses running through the Project area. Suitable key principles that could be incorporated into the Project's detailed design to appropriately manage stormwater runoff include:

- Surface water runoff will be discharged to match existing drainage patterns (if any) as much as possible.

- All drainage works will be designed and constructed to prevent scour and erosion. Additional protection measures will be included as required at locations particularly susceptible to scour/erosion.
- If practicable all drainage works will be formed to provide a consistent fall along drainage lines and to avoid flat spots, where water may be subject to collection adjacent to the Project's infrastructure.

A soil erosion and drainage management plan will be prepared as part of the CMP.

3.4. OPERATIONAL PHASE

The Project's PVS element and BESS element are expected to operate for approximately 30 years. It is expected up to approximately 8 permanent full-time staff will be required to run the Project during operations. Some of the permanent staff will operate out of the site office while others will operate generally across the Project area. Specialist contractors will be on-call to assist with maintenance activities that will include (but not be limited to):

- Solar panel washing;
- General PVS and BESS equipment maintenance;
- Fence and landscape maintenance; and
- Land management.

Equipment updates and replacements will be required from time to time as equipment fails or is rendered obsolete by improvements in technology.

3.4.1. Utilities

Depending on availability and approval the Project area will be connected to electricity and water at Lower Bright Road.

Requirements for disposal of sewerage during operations are considered small as there will be minimal staff on site at any one time. Sewerage management will likely comprise either:

- Installation of a small on-site sewerage treatment system such as a BioCycle; or
- Installing holding tanks to be pumped out and disposed of at a suitably licenced facility.

3.4.2. Vehicle Movements

Operational vehicle movements are expected to be minimal, and not have any significant impact on the State or local road network. During the operational phase staff attendance on site will be up to approximately 8 personnel employed on a full-time basis. Additional staff are expected to be employed on part-time and contract basis, for specialist electrical skills, module cleaning and other maintenance requirements associated with the Project. Operational vehicle movements are not expected to significantly impact on other road users and the local road network.

3.4.3. Waste Management

A limited amount of waste products will be generated during Operations. Operational waste management procedures will be implemented via an Operational Management Plan (OMP). Suitable management measures typically include:

- Operation waste will be separated into different streams to facilitate recycling with waste removed from the site by a licensed contractor as appropriate.
- Liquid waste (including hydrocarbons, paints and solvents) will be stored in sealed drums or containers in a bunded area before removal from the site by an EPA licensed contractor for recycling, where possible, or disposal to a licensed facility.
- Management of ablution facilities.

3.4.4. Stormwater Management

Approximately 401ha or approximately 76% of the Project area will be covered by the PVS solar array and spacing between the arrays. The areas underneath and surrounding the solar modules will not be impervious and therefore most of the Project area will be retained substantially in the current infiltration condition. Consequently, the runoff from most of the Project area, is likely to remain at the same pre-development levels and allow infiltration of rainfall.

Runoff from areas such as the administration and control area, laydown and compound area, inverters stations, battery storage structures and switchyard/substation area may increase compared with current levels but this is not anticipated to be significant because the areas will comprise less than approximately 14ha or approximately 3.2% of the Project's development footprint.

Drainage will be designed for all Project-disturbed areas to ensure there is no or minimal increase in developed flow intensity/frequency beyond the Project area boundaries. Suitable key principles that could be incorporated into the Project's detailed design to appropriately manage stormwater runoff include:

- Surface water runoff will be discharged to match existing drainage patterns (if any) as much as possible.
- All drainage works will be designed and constructed to prevent scour and erosion. Additional protection measures will be included as required at locations particularly susceptible to scour/erosion.
- If practicable all drainage works will be formed to provide a consistent fall along drainage lines and to avoid flat spots, where water may be subject to collection adjacent to the Project's infrastructure.

3.5. DECOMMISSIONING PHASE

The Project would likely be decommissioned at the end of its operational lifespan. In consultation with the landowners, all Project related infrastructure would be removed from the Project area, and the land returned for agricultural use.

Prior to the commencement of Project's operation phase a Decommissioning and Rehabilitation Plan (DRP) that outlines end-of-project decommissioning works (describing the extent of reinstatement and restoration activities upon the removal of the renewable energy infrastructure and associated facilities) will be provided to the relevant authority for approval.

The plan will include, but is not limited to;

a) identification of structures, including but not limited to all solar panels, the control and facility building and electrical infrastructure, including underground infrastructure to be removed, except where such facilities are to be transferred to or in the control of the local network operator, and how they will be removed;
b) measures to reduce impacts of the development on the environment and surrounding land uses; and
c) details of how the land will be rehabilitated back to its predevelopment condition, including slope and soil profile.

The alternate to decommissioning is to extend the life of the Project however currently it is not possible to determine if extending the life of the Project is a viable option.

4. STRATEGIC CONTEXT

4.1. ALIGNMENT WITH NATIONAL POLICY OBJECTIVES

The Project will assist fulfil Australia's commitment to reducing greenhouse gas emissions as a signatory to the Paris Agreement.

The Project will complement and increase the generation of renewable energy within South Australia and the broader National Electricity Market. Australia's Renewable Energy Target (RET) emphasises the need to reduce greenhouse gases, specifically in the electricity generation sector through the encouragement of additional sustainable and renewable sources. The RET targets both large-scale and small-scale renewable generation. The RET envisages that by 2020, renewable sources will provide 20 percent of Australia's electricity supply. The Project supports the achievement of the RET through generation of additional renewable energy.

Federal Government is considering replacing the RET with a number of options that aim to:

- Put downward pressure on household and business power bills and reduces spot price volatility—more investment and therefore more supply of electricity puts downward pressure on prices;
- Encourage the right investment in the right place at the right time—to meet the obligation, retailers will need to secure power from a variety of sources ensuring an ongoing place for coal, gas, wind, solar, batteries and hydro in the Nation's energy mix;
- Improve reliability—increasing investment in new and existing dispatchable supply;
- Reduce emissions at lowest cost—emissions targets can be met using a range of technology, including existing resources; and
- Is not a subsidy or a tax—allows the lowest cost range of technologies to meet overall targets.

The Project's 280MW(AC) PVS element with an integrated; but separately operated 140MW/560MWh BESS element supports the aims of the Federal Government.

4.2. ALIGNMENT WITH STATE POLICY OBJECTIVES

The South Australian Government is reviewing a number of the previous Government's long - standing State renewable energy strategic policies. The Project's alignment with current key Government State policy objectives is summarised in Table 4-1.

Table 4-1 State Policy Objectives

Objective/Target	Project Alignment
South Australia's greenhouse gas emissions	
South Australia's *Climate Change and Greenhouse Emissions Reduction Act 2007* provides renewable energy and emissions reduction targets. Under the Act, South Australia has a target to 'reduce by 31 December 2050 greenhouse gas emissions within the State by at least 60% to an amount that is equal to or less than 40% of 1990 levels as part of a national and international response to climate change. The Australian Government Department of the Environment reports South Australia's net greenhouse gas emissions were 26.3 million tonnes of carbon dioxide equivalent in 2015/16.	The Project is a renewable energy development with a maximum output capacity of approximately 280MW(AC) from the PVS and storage capacity of 140MW/560MWh from the BESS. The Project will annually displace the equivalent of… 497,000 tonnes of greenhouse gas emissions, comparable to planting 69,500 trees or removing 195,000 cars from the road each year of it's operational life. The Project contributes to South Australia's emissions reduction targets.
South Australia's Virtual Power Plant	
The South Australian government is embarking on the largest expansion of home battery storage in the world and has reconfirmed its support for Tesla's virtual power plant of solar and Powerwall home batteries. Analysis by Frontier Economics shows the new 250MW power plant is expected to lower energy bills for participating households by around 30 per cent. Additionally, all South Australians will benefit, with lower energy prices and increased energy stability.	The Project is a utility scale solar Photovoltaic Energy Generation System (PVS) and Battery Energy Storage System (BESS) with a maximum output capacity of approximately 280MW (AC) from the PVS and storage capacity of 140MW/560MWh from the BESS to feed into the National Electricity Market via ElectraNet's Bungama Substation. The Project supports the Government aim to lower SA energy bills through increasing supply and competition and increase energy stability.

4.3. ALIGNMENT WITH MID NORTH REGION PLAN

The State Government's broad vision for sustainable land use and the built development of the State is outlined in the Planning Strategy. The relevant volume of the Planning Strategy for the Port Pirie Council Development Plan is the Mid North Region Plan (May 2011).

The Mid North Region Plan provides a link between broad, state wide planning aims and local, council-specific planning needs, and they work in tandem with key state policies, leading to a consistent approach to land use and development across the state.

The Mid North Region Plan includes the following vision, Principle and Policies for renewable and clean energy:

- *In addition, state and local governments continue to investigate ways to organise land use such that it supports renewable and clean energy technologies. These opportunities will give South Australia a competitive advantage in a carbon-constrained economy. Investment in infrastructure will be critical to realise such opportunities. These initiatives will extend the life and reliability of our water and energy supplies and allow the population and the economy to grow without placing unsustainable demands on our natural resources (P8).*
- *Expanding local electricity generation through renewable energy sources, such as wind farms and gas-fired peak demand plants, which will provide greater capacity for economic activity. This will require expansion of the transmission infrastructure to service this growth (P12).*
- *Enhance development of renewable energy (P14).*
- *Energy supply is limited in many parts of the region. Building design and innovative local solutions (for example, solar, wind and co-generation) can make the best use of energy supplies. There are opportunities to further develop wind farms in several locations across the central and southern parts of the region, which would facilitate the achievement of SASP targets related to renewable energy development (P30).*
- *Provide for the development of alternative and innovative energy generation (for example, wind, solar, marine, biomass and geothermal technologies) and water supply facilities, as well as guidance on environmental assessment requirements (P30).*
- *South Australia has the potential to be a 'green' energy hub and to help other states achieve the Federal Government's target of 20 per cent renewable energy by 2020 (P32).*
- *Identify land suitable to accommodate renewable energy development, such as wind farms (P36).*
- *Support the development of wind farms in appropriate locations, including the collocation of wind farms and existing agricultural land (P38).*
- *increasing renewable and low emission energy generation (for example, wind farms) (P62).*

The Project's 280MW(AC) PVS element with an integrated; but separately operated 140MW/560MWh BESS element supports the aims of the Federal Government, State Government and supports the Mid North Region Plan's vision, Principle and Policies for renewable and clean energy.

4.4. ALIGNMENT WITH PORT PIRIE REGIONAL COUNCIL STRATEGY

The alignment of the Project with Port Pirie Regional Council's Community Plan 2016-2025 relevant strategies is summarised in Table 4-2.

Table 4-2 Port Pirie Regional Council Community Plan

Strategy/Outcome/Action	Project Alignment
Community Wellbeing	
Built Environment Goal CW7 - *A community that values and promotes its rich cultural and built heritage and provides pleasant, well designed environments (living, working, shopping and civic) that are enduring and sustainable.*	
Strategy: 8. Encourage development that enhances and complements existing characters, aspirations and the natural environment.	The existing character of the Project area is a rural setting with established electrical infrastructure, including the Bungama Substation and electricity transmission lines. The Project is in line with the existing character of the Project area, featuring existing electrical infrastructure, whilst also embodying Council aspirations for the development of beneficial renewable energy in the Region.
Place Goal CW8 - *Create a strong sense of place within the City and each rural township in the region.*	
Strategy: 1. Engage with the community to build on and harness the strong sense of community pride.	Anecdotal evidence collected during community consultation for the Project, indicates the local community is supportive of renewable energy and have expressed interest to participate in the Project's construction and operation. The Project will contribute to the growing number of renewable energy developments in region. This Project will allow the Port Pirie community to establish a sense of community pride as being and area in the region involved in the delivery renewable energy.
Economic Prosperity	
Economic Diversity Goal EP1 - *Grow the regional economy by supporting existing businesses and attracting new businesses and industry sectors*	
Strategy: 1. Promote local economic growth and development.	The Project is expected to generate a total estimated economic benefit in the order of $292.5 million for the broader economy and approximately $164 million as direct domestic Project expenditure. The Project will provide a direct benefit to the community in the form of a community fund. The Project will deliver local economic growth and development through to the locality during construction and operations.

Strategy/Outcome/Action	Project Alignment
Strategy: 5. Encourage developers of large infrastructure and projects to offer training and development opportunities.	The Project will promote local economic growth and development through the creation of an estimated 275 equivalent full-time jobs during construction, and a further 410 indirect full-time equivalent jobs. During operations an estimated 8 equivalent full-time jobs during operations. The Project potentially will offer training and development opportunities for workers to upskill and provide exposure to the renewable energy industry.
Sustainability	
Energy Goal S2 - *Increase reliance on renewable energy sources and clean fuels in the region and Council's operations.*	
Strategy 1. Ensure regulatory processes positively discriminate towards renewable energy.	The Project offers a sustainable alternative to traditional fuel sources, delivering clean and renewable energy to the Australian people in the face of climate change. The Project is able to provide clean energy to power an equivalent of 86,000 homes for each year of the Project's 30 year life. The Project offers a source of renewable energy in the Port Pirie Region.
Climate Change Goal S5 - *Adapt to climate change and ensure community resilience.*	
Strategy 1. Identify methods of adapting actions and processes to ensure climate impacts are minimised and resilience to change is maximised.	The Project provides a flexible, low-impact alternative to existing agriculture land use. The Project is capable of displacing the equivalent of 497,000 tonnes of greenhouse gas emissions, comparable to planting 69,500 trees or removing 195,000 cars from the road each year for 30 years. The Project creates industry diversity for the Port Pirie Region, offering an adaption to climate change and better resilience for the future.

The Port Pirie Regional Council Strategic Plan 2010-2019 has been prepared to achieve a shared vision for the community. The alignment of the Project with the Port Pirie Regional Council Strategic Plan is summarised in Table 4-3.

Table 4-3 Port Pirie Regional Council Strategic Plan 2010-2019

Policy Recommendations	Project Alignment
Goal 2 – Economic Prosperity	
Outcome 2.1 Economic Development *To grow the regional economy by attracting new businesses and employment opportunities through a diverse business base. (SAP Targets: T1.1 Economic Growth; T1.5 Business Investment; T1.10 Jobs; T1.11 Unemployment; T1.12 Employment Participation).*	
Target 2.1.2 Actively promote, support, attract and encourage sustainable economic development, investment and the business opportunities available in the city and region.	The Project encourages sustainable economic development through the provision of a project lifespan of 30 years. The Project is a renewable energy project which will create employment opportunities both during the construction and operational phases of the Project. The Project offers a new business opportunity to the Port Pirie Region with potential to promote, support, attract and encourage renewable energy business opportunities.
Target 2.1.5 Maximise the employment opportunities that arise from business growth.	The Project aims to provide a wide range of employment opportunities, with the creation of an estimated 275 equivalent full-time jobs during construction, and an estimated 8 equivalent full-time jobs during operations. The Project will support local business growth indirectly through the creation of a further 410 indirect full-time equivalent jobs.
Outcome 2.2 Tourism and Promotion *Develop and support tourism and promotional initiatives and programs that will enhance the Port Pirie Region's reputation as a must for tourists and visitors. (SAP Targets: T1.15 Tourism Industry).*	
Target 2.2.3 Develop a positive image of Port Pirie and the region	Port Pirie has a strong history as a major Port in South Australia, which contributes significantly to the sense of place. The smelting of metals and the operation of grain silos are key industries for Port Pirie and create a sense of identity for the Region. The introduction of renewable energy to an area can generate media attention and may offer opportunities for eco-philosophy tourism. The development of the Project in the Region has the potential to positively contribute to the style the image of Port Pirie.

Policy Recommendations	Project Alignment
Goal 4 – Environmental Sustainability	
Outcome 4.3 Healthy Environment *Support a clean, green and healthy environment. (SAP Targets: T2.4 Healthy South Australians; T3.4 Green House Gas Emission Reduction; T3.7 Ecological Footprint)*	
Target 4.3.9 Encourage the establishment of renewable energy in the region	The Project will establish an approximate 280MW (AC) utility-scale solar development in the Port Pirie Region.
Target 4.3.11 Provide community leadership in environmental management and sustainability.	The Project is a sustainable development, able to deliver clean and renewable energy to the Australian people in the face of climate change. The Project will produce electricity for the needs of the present generation without compromising the ability of future generations to meet their future economic, social and environmental needs. The Project's development shows leadership in the Port Pirie Region community in the promotion of environmental sustainability.
Target 4.3.13 Assess the likely impacts of climate change and seek to implement the appropriate responsive action to the issues identified.	Australia faces significant environmental and economic impacts from climate change across a number of sectors. Decisions made today will undoubtable impact upon the future. The Project will assist in meeting renewable energy targets for the state and the nation. The Project implements an appropriate responsive action to the issue of climate change.

5. STATUTORY CONTEXT

The following section outlines the key legislation and planning instruments relevant to the proposed development.

5.1. DEVELOPMENT APPROVAL

The development application is submitted pursuant to Section 49 of the *Development Act 1993* (the Act).

The Department of Energy and Mining's endorsement of the Project is provided in Appendix 1.

5.1.1. Public Notification

The proposed development has an estimated cost of AUD $650 million. Accordingly, public notification pursuant to subsection 49(7(d)) of the Act is required.

5.1.2. Statutory Referrals

In accordance with Section 49 of the Act, and Schedule 8 of the *Development Regulations 2008* (the Regulations), statutory referrals are required including:

- Commissioner of Highways; and
- Port Pirie Regional Council.

5.2. ADDITIONAL APPROVALS

Additional statutory approvals may be required prior to the construction and operation of the Project including:

- Approval for the clearance of native vegetation.
- Authorisation of a planned activity to damage, disturb or interfere with an Aboriginal site or object.
- Network Connection agreement to connect the Project to the adjacent substation in accordance with the National Electricity Rules.
- Electricity Generation Licence for connection to the National Electricity Market in accordance with the requirements of the *Electricity Act 1996*.

- Authorisation to place infrastructure and access tracks across road reserves under the *Local Government Act 1999* and possibly the *Roads (Opening and Closing) Act 1991*.
- Approval for on-site sewage handling or treatment systems under the *South Australian Public Health (Wastewater) Regulations 2013*.

5.3. DEVELOPMENT PLAN ASSESSMENT

The Port Pirie Regional Council Development Plan (Consolidated – 31 October 2017) (Development Plan) is a statutory policy document guiding the type of development that can occur within the council area.

Assessment of the Project against the relevant provisions of the applicable Development Plan provisions is provided in Appendix 5.

The assessment of the Project against the relevant provisions of the Development Plan determined:

- The Project is a type of Renewable Energy Facility contemplated for the Port Pirie Regional Council area. Specifically, 'solar farms' are contemplated for the Port Pirie Regional Council area.
- The Project is located on land Primary Production Zone. The Development Plan expressly seeks 'solar and ancillary development' within the Primary Production Zone.
- The Development Plan acknowledges that given the size of utility scale renewable energy facilities it is difficult to mitigate all impacts.
- Subject to implementation of management techniques set out by the general/Council wide policy regarding renewable energy facilities a level of impacts including visual impacts are to be accepted in pursuit of benefits derived from increased generation of renewable energy.
- The general / Council wide policy comprises general provisions that contain Objectives and Principles of Development Control that establish the development standards or management techniques that apply to renewable energy facilities and provide the yardstick against which the suitability of the Project is measured.
- The key findings of the assessment of the Project against the applicable Development Plan controls include:
    - Primary Production Zone - The Project is sufficiently in compliance with the relevant Objectives and Principles of Development Controls for the Project.
    - Renewable Energy Facilities - The Project is sufficiently in compliance with the relevant Objectives and Principles of Development Controls for the Project.

- Orderly and Economic Development - The Project is sufficiently in compliance with the relevant Objectives and Principles of Development Control of General Provisions - “Infrastructure”, “Interface between Land Uses”, “Orderly and Sustainable Development” and “Renewable Energy Facilities”.
- Visual Amenity – The Project is sufficiently in compliance with the relevant Objectives and Principles of Development Control of General Provisions - “Design and Appearance”, “Infrastructure”, “Interface between Land Uses”, “Landscaping, Fences and Walls”, “Renewable Energy Facilities” and “Siting and Visibility”, “Landscape Protection Policy Area 11” and “Landscape Protection Policy Area 12”.
- Noise - The Project is sufficiently in compliance with the relevant Objectives and Principles of Development Control of General Provision - “Interface between Land Uses”.
- Health and Amenity - The Project is sufficiently in compliance with the relevant Objectives and Principles of Development Control of General Provisions - “Interface between Land Uses” and “Waste”.
- Flora and Fauna - The Project is sufficiently in compliance with the relevant Objectives and Principles of Development Control of General Provision - “Natural Resources”.
- Traffic and Transport - The Project is sufficiently in compliance with the relevant Objectives and Principles of Development Control of General Provision - “Transportation and Access”.
- Heritage - The Project is sufficiently in compliance with the relevant Objectives and Principles of Development Control of General Provisions - “Historic Conservation Area” and “Heritage Places”.
- Hazards - The Project is sufficiently in compliance with the relevant Objectives and Principles of Development Control of General Provision - “Hazards”.

Conducted on behalf of Bungama Solar, EPS Energy’s assessment of the Project against the relevant provisions of the Development Plan concludes the Project is sufficiently in compliance with the relevant provisions of the Development Plan to warrant development approval.

6. COMMUNITY AND OTHER STAKEHOLDERS

A Community & Stakeholder Engagement Plan was prepared at the Project Preparation Phase to ensure that the engagement for the Project was undertaken in a comprehensive and constructive manner. The Plan is founded on a Statement of Intent and subsequent Aims and Objectives to promote effective community and other stakeholder engagement. The Plan was used as a tool to assist with the planning and management of engagement activities proposed to be undertaken at various stages of the Project including the Pre-development application engagement stage.

Subsequently, a Community & Stakeholder Engagement Report has been prepared with the purpose of communicating the outcomes of the Pre-development application engagement that has taken place. The full report is provided at Appendix 6 and is summarised in the following sections.

6.1. KEY STAKEHOLDERS

On behalf of Bungama Solar, EPS Energy conducted an audience analysis during the Project Preparation Phase to identify parties known to be potentially impacted by the Project, and those who may have an interest in the Project, vested or otherwise. The following stakeholders have been identified as key to the Project;

- Landowners and occupiers of the:
  - Properties forming the proposed Project area;
  - Adjacent properties;
- Key government and agency members:
  - Low Carbon Economy Unit within the Department for Energy and Mining;
  - ElectraNet;
  - Regional Development Australia;
  - Federal Member for Grey;
  - State Member for Frome; and
  - CEO, Mayor and relevant Development Officers of the Port Pirie Regional Council;
- The Nukunu Peoples Council Inc.;
- The wider Bungama/Napperby/Warnertown communities and established groups including:
  - Upper Spencer Common Purpose Group;
  - Napperby Tennis Club and Community Centre;
  - Napperby Memorial Hall;
  - Port Pirie CommUNiTY;
  - HOPE Partnership;

    - Rotary Club of Port Pirie;
    - Uniting Care Wesley Country SA; and
    - Soroptimist International of Port Pirie Incorporated;
- The relevant authorities who manage the registered easements across the Project area:
    - ElectraNet;
    - SA Power Networks;
    - Epic Energy;
    - Telstra; and
    - The Minister for Transport, Infrastructure and Local Government.

Additional stakeholders may be identified as the Project progresses over time. Bungama Solar will continue to review the above list as stakeholders gain or lose interest in participating in the engagement process over the Project's life.

Further, the initial release of Project information was staged with the purpose of directly informing the local community and ensuring the parties considered likely to have the highest level of impact and/or interest in the Project were notified earliest. Details of the staging are outlined in the attached report at Appendix 6.

6.2. ENGAGEMENT PROGRAMME

The Engagement Programme has five key phases which provide effective consultation from Project preparatory phase through to inception, construction, operation and decommissioning stages. This programme aimed to ensure that all relevant environmental, social and economic issues raised by the community and other stakeholders were considered and addressed within the Planning Report.

The Engagement Programme Phases are provided at Appendix 6.

6.3. COMMUNITY AND STAKEHOLDER RESPONSE

The response from the Pre-Development Application lodgement community and other stakeholder engagement has been largely positive and supportive of the Project.

An estimated 124 guests attended the information sessions over the two days (Thursday 31 May 2018 and Friday 01 June 2018)). This included 13 of the 27 identified adjacent landowners who attended the dedicated Neighbour Information Session. This also included a number of representatives from the Port Pirie Regional Council, Regional Development Australia and ElectraNet.

A number of key members of Council, State Government and other agencies attended the Community Information Sessions. The responses remained largely positive and supportive of the Project.

Most attendees of the Community Information Sessions were generally interested in learning more about the Project and looking for additional details around some of the information in the Information Brochure. Conversations with the attendees also identified anecdotal information about the area, including potential risks that may be useful to inform various aspects of the Project (e.g. the occurrence of strong winds, local resources).

The key themes that have arisen from correspondence with the general community to date include:

- Expressions of interest to participate in the Construction Phase by providing services and/or equipment;
- Interest in the locality for future projects;
- Economic benefit to the locality during construction;
- The potential adverse visual impacts of the Project;
- Clean energy production/ reduction in use of fossil fuels;
- Environmental benefits; and
- Lower power costs.

A total of 13 of the 27 identified adjacent landowners attended the Information Sessions. While supporting renewable energy in the form of solar energy, some landowners raised concerns about the Project being located near their land. Common concerns that were raised included:

- The potential adverse visual impact on their land;
- The potential adverse noise impacts on their land;
- The potential adverse impact on their livestock and horses on their land;
- The potential negative impacts on the value of their land; and
- The potential safety issues with construction traffic.

In direct response to adjacent landowner concerns, designs have been amended to reduce the potential for adverse impacts by;

- Including in excess of 7 km of visual buffering in the form of landscape screening at a direct Project cost estimated to exceed $750,000;
- Reducing the land area allocated to solar panels by approximately 24 hectares, equivalent to a reduction of 36,000 panels and equating to approximately $5,000,000 in relinquished income over the life of the Project; and
- Power Conditioning Units (inverters) near adjoining boundaries being relocated to reduce the potential for noise impact.

7. KEY ENVIRONMENTAL ISSUES

At this stage, the Project is proposed to be an integrated but separately operated grid connected Photovoltaic Energy Generation System (PVS) of up to approximately 280MW (AC) generation capacity, and up to a 140MW capacity Battery Energy Storage System (BESS) with 560MWh of storage. The PVS element, the BESS element and associated infrastructure, together are "the Project".

The following sections summarise the outcomes of investigations undertaken to identify, predict and analyse the potential impacts of the Project on the physical environment as well as social, cultural and health impacts and if necessary, identify mitigation measures to reduce the potential impact of the Project.

7.1. VISUAL IMPACT AND LANDSCAPE

A Visual Impact Assessment (VIA) has been completed and is attached as Appendix 7. The VIA assesses the existing landscape within the Project Area, as well as the surrounding area, to determine the potential visual impact of the Project to the landscape and visual receptors during the operational phase.

7.1.1. Existing Environment

The landscape within and surrounding the Project area can be described as predominantly rural, typified by flat terrain with scattered vegetation, and the land is primarily utilised for agricultural purposes.

There are potentially 231 residential receptors within a 2km Visual Catchment of the Project area, three (3) of which are owned by Project landowners, and potential viewpoint receptors who may view part of the Project area from other areas e.g. from the roads, within a 2km Visual Catchment of the Project area.

7.1.2. Potential Impact

The VIA found that the overall visual impact rating to residential and viewpoint receptors is "Low" and "Moderate-Low" respectively. Further, that renewable energy facilities were contemplated by the local Development Plan in the rural landscape.

Notwithstanding, the Community Consultation undertaken for the Project indicated that some residents living in close proximity to the Project were concerned about the visual impact of the Project, while others were impartial. These concerned residents include existing residents and those who own land adjacent to the Project but do not reside on the land as there is no dwelling.

7.1.3. Mitigation Measures

In direct response to the concerns raised by some residents, the Project has implemented an additional key mitigation measure for further ameliorating Project visibility from not only the adjacent existing residences, but also the potential future residences. The additional key mitigation measure is to include in excess of 7 kilometres of landscape screening to form a "visual buffer zone" in targeted sections of the Project area to further screen the Project as shown in the preliminary landscape plan attached in Appendix 14. The visual buffer zone will:

- Setback the PVS behind a 50m visual buffer zone from parts of the Project boundary for existing residential receptors, including the potential future residences, and consequently, reduce the physical size/scale of Project, which also reduces the renewable energy production of the Project;
- Establish and maintain within the 50m visual buffer zone a 10m wide landscape screen of vegetation approximately 3-5m in height, further reducing views of the Project; and
- As a result, ameliorate the degrees of visibility of the Project from other receptors located further away from the Project.

The following standard mitigation measures are also proposed to be implemented during the construction and operation phases, where practicable:

- Stakeholder engagement activities will continue to be undertaken to understand relevant landowner and community relationships with visual aspects of the Project;
- The development will occur on land previously cleared of vegetation and which is disturbed;
- Utility buildings or structures will be sited together, away from residences and constructed of materials that are muted in colour;
- Any landscaping that is completed as part of the Project will be selected and designed so that it is complementary to the landscape and visual receptors;
- Any signage will be designed and located so it is sensitive to the landscape and visual receptors;
- Fencing will be sited and designed appropriately to blend with the facility; and
- Construction equipment and waste will be removed from the site in a timely manner.

7.2. LAND USE

7.2.1. Existing Environment

The Project area and surrounding properties are used for agricultural land uses including cropping and grazing and rural residential land uses. Crops change over time according to market prices, changing demand and water availability.

7.2.2. Potential Impact

The medium-term change of land-use of approximately 530ha (5.3km^2). The medium-term change of agricultural land, 0.35% of the Port Pirie Regional Council area and 0.02% of the Mid North Region of South Australia, is considered very minor relative to the region's agricultural production potential (Based on Australian Bureau of Agricultural and Resource Economics land use data 2011).

The consistent income from the solar lease arrangements will assist each of the Project landowner's agricultural enterprises.

Investigations are being undertaken to assess agricultural co-location opportunities. Sheep grazing or cropping under or between the panels may be feasible during the operation phase.

Internationally examples of co-location in comparable climatic conditions include oilseed, Aloe Vera and Agave plantations in the US, India and Mexico.

On decommissioning the Project, the land will be available for agricultural activities, consequently the Project will not have an adverse impact on the long-term agricultural use of the Project area.

7.2.3. Mitigation Measures

Following the Project's decommissioning the land will be available for agricultural uses.

7.3. BIODIVERSITY

7.3.1. Existing Environment

An assessment of ecological values of the Project area was undertaken to determine the presence of species of conservation significance (i.e. species protected under Commonwealth or State legislation) and to identify any potential impacts on biodiversity.

It is highlighted that only approximately 0.6ha or approximately 0.1% of the 5.3km² Project area contains native vegetation.

The desktop ecological assessment, attached as Appendix 8, and preliminary field flora assessment undertaken in May 2018 determined the dominant landform in the Project area is "*a plain, which has been extensively cleared for agriculture*" (EBS, 2018). As such, the likelihood of suitable habitat for threatened flora species being present was assessed as very low.

The preliminary field flora assessment conducted in May 2018 was performed in accordance with the Scattered Tree Assessment Method and Bushland Assessment Method derived by the Native Vegetation Council. The field fauna assessment included recording of opportunistic fauna sightings, signs of fauna (e.g. scats, burrows, nests and skeletons) and potential fauna habitat (e.g. hollows).

No targeted fauna searches were conducted as part of the field investigations. However, four (4) bird and one (1) mammal species were opportunistically observed during the flora assessment. None of these species are listed as threatened under the *Environment Protection and Biodiversity Conservation Act 1999* (Cth) or the *National Parks and Wildlife Act 1972* (SA).

Six (6) vegetation associations and two (2) scattered trees were assessed within the Project area.

No species listed under *Environment Protection and Biodiversity Conservation Act 1999* and *National Parks and Wildlife Act 1972* were observed during the surveys.

The current land use in the Project area is agricultural cropping with thin strips of vegetation occurring only along field boundaries which are up to approximately 3m in width. Avoiding these strips of native vegetation will be considered as part of the final Project design.

7.3.2. Potential Impact

The Project area was selected due to its high-level of disturbance and associated historical vegetation clearance.

To assist with the construction of the PVS and BESS elements and the Project's effective operation, two (2) scattered trees (both *Eucalyptus camaldulensis var. camaldulensis*) and the six (6) vegetation associations may need to be removed. The six (6) vegetation associations of which all or part may need to be removed are:

- *Acacia spp. +/- Senna artemisioides spp. petiolaris over Maireana brevifolia+/- Atriplex spp.* Low Shrubland;
- *Acacia salicina* Tall Shrubland over *Maireana brevifolia*;
- *Alectryon oleifolius* over *Enchylaena tomentose*;
- *Typha domingensis* Small Wetland;
- *Atriplex vesicaria / Maireana brevifolia* Low Shrubland; and
- *Enneapogon nigricans* Grassland.

Any adverse impact on native vegetation or ecosystems that cannot be avoided will be submitted to the Native Vegetation Council for approval as required.

Perimeter fencing is proposed for not only security, but for safety of fauna. Fencing will minimise opportunities for wildlife to interact with the solar infrastructure area and the potential for fauna to be harmed, or damage infrastructure.

Based on the preliminary biodiversity investigations the Project's potential to adversely impact the existing biodiversity environment is low.

7.3.3. Mitigation Measures

The biodiversity investigations along with several other investigations have informed the Project's preliminary layout and design.

A key criterion for selecting the Project area was most of the area used for cropping (approximately 99% of the Project's area) is cleared of native vegetation to allow efficient cropping practices. An aim of the Project's layout and design is to position as much of the Project's development footprint, as is technically possible, on the cropped land thereby avoiding the need to remove native vegetation.

Where scattered native trees and/or thin strips of native vegetation will adversely impact the construction of the PVS element and/or BESS element and/or the Project's effective operation the native vegetation will need removal.

The Project's preliminary layout and design has endeavoured to avoid the unnecessary clearance of native vegetation for the Project's construction and operation.

Suitable mitigation measures for this potentially low impact typically include:

- Prioritise use of cleared, agricultural land, and avoid unnecessary clearance of thin strips of vegetation along allotment boundaries and native scattered trees;
- Removal of native vegetation be avoided and minimised, as far as practicable, as part of the final design;
- Weed and pathogen hygiene measures will be employed as part of the removal process to ensure that no new weeds or other pathogens are introduced to existing native vegetation; and
- An Application for approval to clear native vegetation under Division 5 of the *Native Vegetation Regulations 2017* be submitted to Native Vegetation Council based on the Project's final design.

7.4. SOILS AND SALINITY

7.4.1. Existing Environment

Preliminary geotechnical investigations indicate that the Project area is predominantly located within flat plains with some gentle slopes, with a sandy surface, underlain by two main geological units. The subsurface conditions can be generally described as Holocene sand and silty/ sandy clay.

The South Australian Resource Information Gateway (SARIG 2018) Salinity non-watertable (soil salinity) mapping layer identifies the Project area as having low to moderate salinity. The SARIG 2018 Salinity watertable induced (soil salinity) mapping layer identifies the Project area as having moderately high to very high or extreme salinity.

The South Australian Environment Protection Authority (EPA) holds a record of a Section 83 notification relating to a diesel spill at the nearby service station (Allotment 549 FP 188681). No works are proposed on Allotment 549 FP 188681.

7.4.2. Potential Impact

The potential for the Project to exacerbate soil erosion is considered in Section 7.5, while this section addresses the potential impacts of the Project on soil physical and chemical attributes.

Agricultural soils are commonly detrimentally affected by compaction, acidification, structural decline, loss of organic matter and fertility, and salinity. These can be due to a combination of factors such as removal of native vegetation, cultivation, the type of crop or pasture grown, irrigation and specific farming practices.

The Project area soils are understood not to be adversely impacted by the listed impacts. Nonetheless, it is likely that when compared to native soils in their pre-farming condition, there have been changes due to cultivation.

The Project will involve short-term construction, followed by possibly decades of the land being inactive. The limited or no cropping and consequently limited use of farm machinery on the Project area will be beneficial for the soils. While constructing the Project will require removal of a very small amount of vegetation and the Project's operations will require water to clean the PVS panels from time to time, these activities will not lead to an increase in the Project area's typical groundwater levels and/or the leaching of salts, and consequently the Project will not contribute to an increase in salinity levels.

7.4.3. Mitigation Measures

No specific mitigation measures are required because the Project is not expected to adversely impact the existing soil and salinity environments.

7.5. SURFACE WATER AND EROSION

7.5.1. Existing Environment

The Project's area is predominantly flat, ranging between 7-50m above sea level (asl), comprising cleared land historically used for cropping. Rainfall on the Project area predominately infiltrates and during high rainfall some of the rain from the southern Flinders Ranges is captured by drainage lines and flows down into the Project area.

The Project is located outside both the Murray Darling Basin Water Management Area and Rangelands Natural Resource Management District. Rainfall and temperature data indicate that the area experiences a Mediterranean climate, with cool wet winters and hot dry summers. Changes of weather are generally associated with frontal systems from southwest in the Spencer Gulf. These frontal systems are most active in winter and spring and bring reliable and frequent light to moderate rainfall. Annual average rainfall is approximately 474mm. The majority of the rainfall occurs during winter with the highest falls in June and July.

The major waterway in the area is the Port Pirie River, and its associated estuary, which is west of the Project area. The Port Pirie River is a tide dominated tidal flat / creek. It is not a freshwater source. The Project area is not located within the Port Pirie River or its associated estuary.

The second most important waterway is the Broughton River and the Broughton catchment area. The Broughton catchment is the major drainage system in the district. The Project is not located within the Broughton catchment.

Figure 2-3 shows the ephemeral drainage lines running down from the southern Flinders Ranges into the Project area. These drainage lines are not defined drainage channels, do not hold permeant water, and are currently used for cropping.

The Project area has minor water erosion caused from the flow of water during high rainfall and minor wind erosion. The potential for water or wind erosion is partly reduced by existing cropping practices and pasture management, which is dependent on rainfall frequency.

7.5.2. Potential Impacts

The largest component of the Project's operation is the PVS solar array layout including the spacing between the arrays anticipated to occupy approximately 97% of the Project development footprint. The areas underneath and surrounding the solar modules will not be impervious but will be retained substantially in the current condition and allow infiltration of rainfall. Even though the site is predominantly flat, earthmoving activities required for the PVS solar array layout are expected to grade areas suitable for the single axis tracking system. These activities will remove vegetation, if existing, exposing soils to erosive forces (e.g. wind and rain).

Erosion control measures to be adopted during construction will be further detailed and implemented as part of the Environmental Management Plan suite to be prepared as indicated at Section 7.5.3 and Section 9 of this report.

Construction of the Project will require earthmoving activities (topsoil stripping and contouring) for the internal access roads, parts of the PVS area, hardstands, BESS storage area, laydown and site infrastructure (inverters, demountable buildings, etc.). These activities will remove vegetation, if existing, exposing soils to erosive forces (e.g. wind and rain). The earthmoving activities can result in erosion and sediment release, deterioration of water quality, changes to surface runoff volume and overland flow paths.

Erosion control measures to be adopted during construction will be further detailed and implemented as part of the Environmental Management Plan suite to be prepared as indicated at Section 7.5.3 and Section 9 of this report.

The use and storage of fuels and chemicals for light vehicles, plant and construction equipment may potentially result in surface water or groundwater contamination through spills, leaks or other uncontrolled releases.

Surface water and Ground water pollution control measures to be adopted during construction will be further detailed and implemented as part of the Environmental Management Plan suite to be prepared as indicated at Section 7.5.3 and Section 9 of this report.

Approximately 13ha or approximately 3.2% of the Project development footprint could be occupied by the administration and laydown compound area, substation, invertors, BESS storage area and internal access roads. These areas could potentially increase the runoff volumes and velocities and consequently erosion and migration of sediment, though given the small size of this part of the development footprint any adverse impact is considered low.

Surface water, erosion and sediment management control measures to be adopted during construction and operation will be further detailed and implemented as part of the Environmental Management Plan suite to be prepared as indicated at Section 7.5.3 and Section 9 of this report.

The Project will include a wastewater treatment system for workforce. Discharge of treated sewage from the ablution block has the potential to decrease groundwater quality (e.g. through increased biological oxygen demands) if the sewage is not adequately treated or if the lining has not been appropriately designed the evapotranspiration bed could seep into the surrounding area.

Wastewater control measures to be adopted during construction and operation will be further detailed and implemented as part of the Environmental Management Plan suite to be prepared as indicated at Section 7.5.3 and Section 9 of this report.

The Project's potential to adversely impact the existing surface water and erosion environments is low.

7.5.3. Mitigation Measures

Suitable mitigation measures for this potentially low impact typically include:

- During construction, main access tracks will be permanently gravelled where required;
- Rows of PV panels rotate and will be separated from the next row, so providing an infiltration area and sunlight to potential co-located agricultural activities or pasture;
- If practicable, the ground under and adjacent the PV panels will be used for co-located agricultural activities and may be sown with a permanent pasture mix;
- If practicable, the Project area will include co-located agricultural activities such as pasture managed by controlled grazing (most likely with sheep) to maintain ground cover density and manage the sward length;
- During the construction and operation phases an erosion and sediment control plan for each phase will be developed detailing the control measures to be implemented;
- Sewage treatment and disposal to be conducted in accordance with relevant Australian Standards and local regulations/approval; and
- During the construction and operation phases a storage and handling of chemical and hazardous materials management plan for each phase will be developed detailing the control measures to be implemented.

7.6. FLOODING

7.6.1. Existing Environment

The Project area is not mapped as subject to inundation, is not located in the Murray Floodplain or within the River Murray protected area, is not within Broughton catchment or any local catchment area identified as being liable to inundation.

7.6.2. Potential Impacts

The Project will not have a demonstrable impact on local flooding.

7.6.3. Mitigation Measures

No specific mitigation measures are required because the Project is not expected to adversely impact the existing flooding environment.

7.7. GROUNDWATER

7.7.1. Existing Environment

The 1:100,000 Pirie sheet of SARIG 2018 shows the area to be underlain by a number of geological units. The following units are expected on the Project area:

- Qhe2/Qpe1 – Holocene Sand Capping in Dune Fields
- Qhe3/Qa – Holocene Sand Spread
- Qa – Undifferentiated Quaternary Alluvial/Fluvial Sediments

Preliminary geotechnical investigations in May 2018 of some of the Project area noted;

"The Holocene sand was not encountered in 5 out of the 12 boreholes drilled. Based on the regional geology maps, this unit was anticipated to be present at all boreholes (except BH08). Given the loose nature of the deposit (which will impact on pile embedment depth), further investigation of these areas is recommended to delineate the loose Holocene sand."

The SARIG 2018 groundwater mapping layer indicates the Shallow Standing Water Level is 0-10m Below Ground Level (BGL). The Shallow Standing Water Level represents the depth to standing water of the shallowest aquifer only. Other aquifers may well give rise to standing water at significantly different depths.

Groundwater was not encountered during site investigations. The July 2018 preliminary geotechnical investigation report states:

"*Groundwater was not encountered during the investigation. Portions of the site are expected to be underlain by shallow groundwater based on regional groundwater maps.*

Information provided by SARIG (2018) suggests the project area is expected to have shallow groundwater (up to 2m BGL) in the western portion of the site (Lot 4 DP24997). The rest of the project area is expected to have groundwater between 2 to 5 mBGL and 5 to 10m BGL".

7.7.2. Potential Impacts

Construction works will involve earthworks and limited vegetation clearing for the erection of the PVS solar panels, substation, BESS storage area, buildings, internal access roads and other infrastructure. During operation, the primary land management activities will likely relate to erosion and sediment control.

Potential geology, topography and soil impacts on the environment due to site activities include:

- Increased risk of erosion and sediment mobilisation due to alterations to drainage patterns and stormwater flows during high rainfall events. Erosion risk is higher where Project works encroach on drainage lines.
- Exposure of soil to erosive forces (wind and rain) causing soil erosion and sediment transport that can result in:
    - Deterioration of the receiving environments water quality during ephemeral flows;
    - Sedimentation of vegetated areas resulting in reduced vegetation growth/health; and
    - Reduced air quality (dust impacts) of neighbouring agricultural operations.
- Loss of topsoil integrity from improper removal or storage;
- Entrainment of soils off-site by construction vehicles and machinery leading to sedimentation external to the Project area;
- Physical degradation of soil as a result of the use of heavy construction machinery; and
- Soil contamination as a result of hazardous and other chemicals spills.

While the Project is not expected to directly interfere with groundwater, activities have the potential to impact groundwater quality through the accidental release of contaminants to the environment. These water affecting activities associated with the Project may include:

- Construction activities (e.g. operation of heavy machinery);
- Waste storage;
- Ablutions;
- Sewerage systems;
- Operation of the substation and inverters;
- Operation of heavy vehicles; and
- Storage of oils, hydraulic fluids, greases, coolants and other maintenance items including minor amounts of cleaning solvents, paints and thinners.

Contaminants, if released, have the potential to reach the water table via infiltration and recharge from the point of release or via stormwater mobilisation and subsequent infiltration.

The Project's potential to adversely impact the existing groundwater environment is low.

7.7.3. Mitigation Measures

Suitable mitigation measures for this potentially low impact typically include:

- Erosion and sediment control devices will be installed where necessary and monitored to assess efficacy of erosion and sediment control measures;
- No unnecessary clearing or earthworks;
- Measures implemented to control flow velocities in such a manner that prevents soil erosion along drainage paths;
- Ensure the use of appropriately designed laydown areas for vehicles and machinery and storage areas for chemicals, oils and fuels;
- Make available spill kit(s) within the operational and maintenance area;
- Ensure all staff to be made aware of spill response procedures and the requirement to report any spills or leaks;
- Ensure regular maintenance and checks of heavy vehicles, machinery and equipment to identify potential leaks; and
- All chemical storage vessels are to be bunded and/or constructed on impermeable surfaces in compliance with relevant Australian Standards.

7.8. CLIMATE

7.8.1. Existing Environment

South Australia's *Climate Change and Greenhouse Emissions Reduction Act 2007* provides emissions reduction targets to be achieved by 2050.

7.8.2. Potential Impacts

The Project will deliver clean and renewable energy to the South Australian people in the face of climate change, assist in meeting South Australia's renewable energy targets, displace the annual equivalent of 497,000 tonnes of greenhouse gas emissions, comparable to planting 69,500 trees or removing 195,000 cars from the road and provide clean energy to power an equivalent of 86,000 homes per annum for the Project's life.

The Project will make a significant contribution to achieving the State emission reduction targets.

7.8.3. Mitigation Measures

The Project is a mitigation measure, contributing to lower GHG and consequently climate change. Other measurable GHG mitigation measures could include where practicable:

- Efficient PV components and Project design to maximise electricity production;
- Components updated as they become obsolete or superseded by more efficient technologies, as required; and
- Panels will be maintained to maximise solar collection.

7.9. NOISE

7.9.1. Existing Environment

The Project area is located within an area typified by rural-residential and agricultural land, which generally has a low to moderate levels of existing background noise. Agricultural noise emissions primarily occur when farm machinery is used to prepare the land for cropping, sow crops, harvest crops and move stock. Rural-residential noise emissions primarily occur as a result of people, animals and transportation.

The Bungama Substation and associated transmission lines owned and operated by ElectraNet running through the southern part of the Project area emit a crackling or buzzing noise named 'Corona', which is the leakage of electricity into the air (which is a natural insulator). Often hard to hear, damp weather increases its audibility.

7.9.2. Potential Impacts

The Project's noise emissions will be generated primarily during some of the construction phase from construction vehicles and machinery.

The Project's construction noise emissions have the potential to impact receptors some of the time during the construction phase.

The Noise Assessment found noise emissions during the construction phase are expected to be less than 45dBA at existing and identified potential future receptors and therefore will be compliant with the Environment Protection (Noise) Policy 2007 and not cause adverse impacts.

The Project's components such as inverters, synchronous condensers and the BESS will generate noise during the operational phase. Using a 'worst-case' operational scenario, the results of the assessment calculated noise levels to be less than 35dBA during the daytime and 38dBA during the night time at all existing and identified potential future receptor locations. As such, relevant noise criteria will be satisfied at all receptors.

7.9.3. Mitigation Measures

In specific response to operational noise concerns raised by neighbouring land owners during the Project's community consultation, the Project design was altered to ensure no invertors are located within 200m of an existing residence and also some possible future residence locations. A Nosie Assessment has been undertaken to demonstrate that the Project should comply with relevant noise criteria and will not result in noise impacts for the neighbouring existing residences and for future possible residences adjoining the Project boundary.

Additional suitable mitigation measures for construction noise typically include compliance with the Environment Protection (Noise) Policy 2007 i.e.:

- Work on-site will occur within the standard work hours of 7.00a.m. and 7.00p.m. Monday to Saturday;
- Particularly noisy activities will be commenced after 9.00am where the noise exceeds industry guidelines;
- Noisy equipment and processes will be located so that their impact on neighbouring properties is minimised whether by maximising the distance to the premises, using structures or elevations to create barriers or otherwise;
- Equipment will be shut down or throttled down whenever it is not in use;
- Equipment will be equipped with feasible noise control (e.g. mufflers, silenced exhausts, acoustic enclosures);
- Equipment will be properly maintained so as to eliminate or reduce noise as far as practicable;
- Equipment shall be handled so as to minimise impact of noise;
- As far as practicable, off-site or alternative processes that eliminate or lessen noise will be utilised; and
- A complaints hotline will be established and advertised for the receipt of feedback on the Project, including any complaints regarding noise nuisance.

Subject to approval from the relevant authority, circumstances, such as extreme summer heat, may warrant construction activity to be permitted outside of the hours of 7.00am and 7.00pm Monday to Saturday or on a Sunday or Public Holiday.

The following recommendations were provided in the Noise Assessment for consideration during construction activities, where practicable, to reduce emissions to the surrounding community:

- Scheduling of construction activities to minimise the number of work fronts and simultaneous activities occurring along the boundaries of the Project area (within 200m) to minimise noise levels;
- Development of a construction noise management protocol to minimise noise emissions, manage out of hours (minor) works to be inaudible, and to respond to potential concerns from the community;
- Where possible, use localised mobile screens or construction hoarding around plant to act as barriers between construction works and receptors, particularly where equipment is near the site boundary and/or a residential receptor including areas in constant or regular use (e.g. unloading and laydown areas);
- Operating plant in a conservative manner (no over-revving), be shut down when not in use, and be parked/started at farthest point from relevant assessment locations;
- Selection of the quietest suitable machinery available for each activity;
- Avoidance of noisy plant/machinery working simultaneously where practicable;
- Minimise impact noise wherever possible;
- Utilise a broadband reverse alarm in lieu of the traditional high frequency type reverse alarm;
- Provide toolbox meetings, training and education to drivers and contractors visiting the site during construction so they are aware of the location of noise sensitive receptors and to be cognisant of any noise generating activities;
- Signage is to be placed at the front entrance advising truck drivers of their requirement to minimise noise both on and off-site; and
- Utilise Project related community consultation forums to notify residences within close proximity of the site with Project progress, proposed/upcoming potentially noise generating works, its duration, nature and complaint procedure.

Further, the following recommendations were provided in the Noise Assessment to actively minimise potential noise emissions during the operations phase:

- Complete a one-off noise validation monitoring assessment to quantify emissions from site and to confirm emissions meet relevant criteria; and
- Prepare an operational noise management protocol to minimise noise emissions and to respond to potential concerns from the community regarding Project noise emissions.

7.10. ARCHAEOLOGY

7.10.1. Existing Environment

An archaeological assessment of the Project was completed to determine the presence of Aboriginal and/or European heritage value within the Project area.

The desktop archaeological assessment is attached as Appendix 9. Preliminary field investigations in May 2018 entailed systematic inspection using pedestrian survey approach, looking for areas of interest for archaeological sites and object. Survey visibility was high as the majority of the Project area is heavily disturbed by cropping and animal grazing.

Aboriginal

As part of the assessment, a search of the National Native Title register was completed. The Search returned one Native Tile claim applicable to the Project area: Nukunu Native Title (SC1996/005). The contact for this claim is the Nukunu Peoples Council Inc.

A search of the Department of Premier and Cabinet Aboriginal Affairs and Reconciliation, Register of Aboriginal Sites and Objects, and the SA Museum Database was completed. The searches returned one recorded Aboriginal site located on the boundary of the Project area. The boundaries of this Aboriginal site require confirmation.

During the preliminary field investigations survey a total of four (4) Aboriginal sites (including one (1) Aboriginal site already registered), 20 isolated artefacts and six (6) culturally sensitive landscapes were located.

European

There are no State Heritage Places or Local Heritage Places registered in the Project area. The preliminary field investigations survey did not identify any potential sites.

7.10.2. Potential Impacts

The Project, especially during the construction phase, could result in damaging significant Aboriginal and/or European heritage sites and/or artefacts within the Project area.

The Project's potential to adversely impact the existing archaeological environment during the construction phase is moderate.

7.10.3. Mitigation Measures

The archaeological investigations along with several other investigations have informed the Project's preliminary layout and design.

A key criterion for selecting the Project area was most of the area used for cropping (approximately 99% of the Project's area) is cleared of native vegetation to allow efficient cropping practices. An aim of the Project's layout and design is to position as much of the Project's development footprint, as is technically possible, on the cropped land thereby ameliorating the possibility of disturbing Aboriginal and/or European cultural heritage items.

Where Aboriginal archaeological value may adversely impact the construction of the PVS element and/or BESS element and/or the Project's effective operation the relevant provisions of the *Aboriginal Heritage Act 1988* will be considered.

Discussions have commenced with the Nukunu Peoples Council Inc. regarding the presence of Aboriginal archaeological value within the Project area.

The preliminary cultural heritage works plus further cultural heritage work with the Nukunu Peoples Council Inc. will inform the final layout plans.

The Project's preliminary layout and design has endeavoured to avoid the disturbance of Aboriginal sites.

Suitable mitigation measures for this potentially moderate impact typically include:

- Further cultural heritage works with the Nukunu Peoples Council Inc. will inform the final detailed Project layout plans;
- Any Aboriginal sites and artefacts will be taken into consideration for the final detailed Project layout plans;
- Compliance with the relevant provisions of the *Aboriginal Heritage Act 1988*;
- Construction personnel will receive a heritage induction prior to work on-site;
- A stop work/site discovery procedure for both Aboriginal and European heritage will be developed prior to the commencement of construction to manage the event of an unexpected find; and
- The Construction Management Plan will include information on recorded heritage items.

7.11. BUSHFIRE

7.11.1. Existing Environment

The Project area is located within the General Bushfire Risk area shown on the Bushfire Protection Area (Location SA Map Viewer, 2018).

The Project area contains dry pastures and crop stubble, with thin strips of vegetation up to approximately 3m in width only occurring along field boundaries.

Potential ignition that exists in and around the Project area include: stubble burning, littered cigarettes, short circuiting electrical equipment, and lightning strikes.

7.11.2. Potential Impacts

Fires that might spread to the Project area would cause significant damage to wiring, panels and other components. Conversely, fires ignited on Project area could spread to neighbouring land and infrastructure.

To prevent the invasion of stubble or grass fires onto the Project area, the design will incorporate an appropriate Asset Protection Zones (APZ). Ongoing, long-term liaison with adjacent landholders should ensure that the Project area is staffed in the event of neighbouring stubble burns.

The risk of initiating fire from commercial solar panels and inverters is very low due to their high quality and remote sensing/operating systems.

The Project's potential to adversely impact the existing bushfire environment is low.

7.11.3. Mitigation Measures

Suitable mitigation measures for this potentially low impact typically include:

- Installation of only Standard compliant components;
- Ongoing monitoring and review of the solar system performance;
- Installation of thermal overload protection on inverters;
- Controlled grazing or machinery maintenance of pastures under panel arrays; and
- Maintenance of firebreaks.

7.12. TRAFFIC AND TRANSPORT

A Transport Impact Assessment (TIA) has been completed and is attached as Appendix 10. The TIA assesses the potential impact of the Project's construction traffic movements on transport routes and other road users based on an indicative construction scenario.

7.12.1. Existing Environment

Anticipated traffic volumes will be highest during the Project's construction while operational traffic volumes are expected to be minimal.

A Transport Impact Assessment (TIA) attached as Appendix 10 included assessing the potential impact of the Project's construction traffic movements on transport routes and other road users and assessed the potential impact on transport routes and other road users based on the Project being completely operational.

The TIA defined the existing environment as the component delivery route to the Project area. Consequently, the environment includes other road users and the road infrastructure.

While the component delivery route will be finalised as part of the Traffic Management Plan preliminary analysis indicates the feasible trucking option is components are shipped to Flinders Port Adelaide and trucked direct to the Project area via National Highway A9 (Port River Expressway, Salisbury Highway) and National Highway A1 (Port Wakefield Road, Port Wakefield Highway, Augusta Highway) and Locks Road.

The National Highway A9 (Port River Expressway, Salisbury Highway) and National Highway A1 (Port Wakefield Road, Port Wakefield Highway, Augusta Highway) are under the care and control of the Department of Planning Transport and Infrastructure (DPTI).

Locks Road is under the care and control of the Port Pirie Regional Council.

The existing DPTI approved restricted access vehicle routes detailed on the DPTI RAVnet website and reproduced as Figure 4.1 and Figure 4.2 in the TIA shows the existing 26m B-Double approved route for the Port Adelaide to Port Wakefield section of the indicative heavy vehicle route and the existing 26m B-Double approved route for the Port Wakefield to the Project area section of the indicative heavy vehicle route.

Locks Road is currently gazetted for 26m B-Double (PBS Level 2) access.

7.12.2. Potential Impacts

The majority of construction works are associated with the PVS element. The TIA is based on a construction scenario of approximately 24 months.

Other road users and key stakeholders including the DPTI and Port Pirie Regional Council are considered the potential sensitive receivers for the purposes of construction traffic.

Operational vehicle movements are expected to be minimal, and not have any significant impact on the local road network. During the operational phase staff attendance on site will be up to approximately 8 personnel employed on a full time, on site basis. Additional staff are expected to be employed on part-time and contract basis, for specialist electrical skills, module cleaning and other maintenance requirements associated with the Project. Operational vehicle movements are not expected to significantly impact other road users and the local road network.

Anticipated traffic volumes will be highest during the construction phase. The types of vehicles anticipated to be used during the construction phase include buses to transport workers to and from the Project area, if a temporary construction workers camp on the Project area is not used, light vehicles, heavy construction vehicles and oversized vehicles. A summary of the estimated number of construction vehicle traffic two-way movements estimated to take place during the indicative construction phase is presented in Table 7-1.

Table 7-1 Estimated Construction Traffic

Construction Phase	Light Vehicles	Heavy Vehicles	OD Heavy Vehicles	Total
Months 1-2	10	9	N/A	19
Months 3-4	15	11	N/A	26
Months 5-6	23	13	N/A	36
Months 7-8	34	18	N/A	52
Months 9-10	32	12	N/A	44
Months 11-12	27	24	2	43
Months 13-14	30	14	N/A	44
Months 15-16	32	12	N/A	44
Months 17-18	26	13	N/A	39
Months 19-20	18	11	N/A	29
Months 21-22	15	0	N/A	15
Months 23-24	9	0	N/A	9

It is important to note both Project phasing and the construction company's construction methodology, based on the Project's final design, may vary these predicted Project traffic volume estimates.

Based on the TIA findings the traffic generated by the proposed Project area during the construction and operational phases is very low in comparison to existing traffic volumes for the National Highway A9 (Port River Expressway, Salisbury Highway) and National Highway A1 (Port Wakefield Road, Port Wakefield Highway, Augusta Highway) section of the indicative heavy vehicle route under the care and control of DPTI and therefore is not expected to compromise the safety or function of this road network.

Locks Road is under the care and control of the Port Pirie Regional Council. While the TIA was unable to source traffic volume data for Locks Road, the existing traffic volumes are expected to be low. Based on the TIA findings the traffic generated by the proposed Project area during the construction and operational phases is very low and therefore is not expected to compromise the safety or function of Locks road that experiences low volumes of traffic.

The other potential impact is the potential deterioration of local road conditions from construction traffic. Although the construction traffic will be for a short time it will possibly contribute to the wear and tear on the approved local road access routes.

The Project's potential to adversely impact the existing State road traffic and transport environment during the construction phase is low. The Project's potential to adversely impact the existing local road traffic and transport environments during some of the construction phase is low-moderate.

7.12.3. Mitigation Measures

Suitable mitigation measures for the potentially low-moderate impacts will be addressed in the following documents:

- A Traffic Management Plan prepared prior to commencement of construction works in consultation with DPTI and Port Pirie Regional Council; and
- A dilapidation report or equivalent report, of the road conditions along the nominated Local access roads, prepared prior to commencement of construction in consultation with the Port Pirie Regional Council.

7.13. AIR QUALITY

7.13.1. Existing Environment

The Environmental Protection Authority (EPA) conducts long-term ambient air quality monitoring around the state of South Australia. The air quality rating is based on a comparison between pollutant concentrations and the relevant National Environment Protection Measures standards. The nearest air quality monitoring site is in Oliver Street, Port Pirie, which is approximately 4.8km west of the Project area. At the time of this report (November 2018), the air quality for the site was rated Good (with a station index of 39). A rating of Good means that the air quality is rated between 34 to 66, for particles and sulphur dioxide.

7.13.2. Potential Impacts

Installation of the Project will involve trenching, plant and vehicular movements over soil and local unsealed roads and general movement of construction vehicles. This limited activity is not expected to generate more dust than the regular cultivation and crop stripping that currently occurs on the Project area and adjacent paddocks.

The Project is not expected to generate measurable dust during operations and natural ground cover or sown pasture (if practicable) on what is now a series of cropping paddocks will reduce the dust generation potential of the Project area.

During operations the Project will contribute towards improving air-quality by reducing Australia's reliance on fossil fuels for electricity generation. The Project equates to the equivalent to the displacement of 487,000 tonnes of greenhouse gas emissions per annum (14.6 million tonnes over it's 30 year lifetime).

The Project's potential to adversely impact the existing air quality environment is low.

7.13.3. Mitigation Measures

Suitable mitigation measures for this potentially low impact typically include:

- Dust management measures will be included in the Construction Management Plan;
- During construction, dust raised on site will be monitored and, if dust is creating a nuisance, a water cart will be used to manage problem areas;
- Dust generation from construction traffic will be monitored and dust suppression activities will be undertaken to minimise dust emissions, if required;

- Wind speed and direction will be monitored, and dust generating activities will be adapted to the wind conditions; and
- Properly maintained equipment will be used to minimise emissions.

7.14. ELECTRIC AND MAGNETIC FIELDS, AND RADIO FREQUENCY INTERFERENCE

7.14.1. Existing Environment

A brief discussion of electrical terminology is useful to aid an understanding of electric and magnetic fields (EMF) and the separate question of radio frequency interference (RFI).

EMF are produced by all electrical equipment, from high voltage power lines to hair dryers, with fields increasing with voltage and current respectively. Both fields drop away rapidly with distance from the source, or due to shielding by insulation or earth (in the case of buried installations). For comparative purposes, in unshielded overhead high voltage transmission wiring, both electrical and magnetic fields would drop to approximately zero within 60 metres from the centreline of the transmission line's conductor bundles.

Radio Frequency Interference (RFI) can be generated by a range of electrical apparatus. The Australian Communications and Media Authority (ACMA) is the Australian regulator of radio communications, telecommunications, broadcasting and the internet, responsible for ensuring compliance with the *Radio Communications Act 1992*. Part of ACMA's role is to regulate the use of equipment that might affect important telecommunications.

There have been reports of household solar installations detrimentally affecting television reception. It appears that this reported interference is not strictly due to RFI affecting reception but are generally due to poor quality domestic inverters inserting RFI into the household wiring system that disturbs the television set power supply, which in turn causes screen distortion.

The Project area and adjacent land incudes utility scale electricity infrastructure comprising a substation and powerlines. The ElectraNet transmission network 275/132kV Bungama substation is located on Pirie Blocks Road in close proximity to the Project area. Overhead 275kV/132kV transmission lines connecting into the ElectraNet Bungama substation transect the Project land within registered easements. Two overhead 275kV transmission lines run north/north west from the substation across the western portion of the Project area within registered easements (Figure 2-3). Two overhead 275kV/132kV transmission lines run south/south east from the substation across adjoining land (Figure 2-3).

An ElectraNet 275kV transmission line running east/west crosses the southern portion of the Project area (Figure 2-3).

7.14.2. Potential Impacts

Substantial EMF's have the potential to interrupt electrical equipment and impact human health.

The Project's various EMF generating components include the PVS panels, the interconnecting buried cables, the direct to alternating current inverters, overhead transmission lines, step up transformers, the BESS, and overhead or underground connection to the Bungama substation.

Essentially EMF increases with voltage and proximity to the apparatus producing, transmitting or consuming electricity. EMF does vary according to specific design and construction parameters such as conductor height, electrical load and phasing, and most importantly, whether the conductors are overhead or buried.

The Project's components that will generate the highest EMF are the Project's substation, BESS and potentially the synchronous condenser(s) together with the overhead line connection to the Bungama substation.

With regard to RFI, solar inverters do emit harmonics but not radio frequency waves and so will not directly affect television transmissions. As discussed previously, poor quality household solar inverters can insert undesirable interference into wiring systems and so indirectly reduce picture quality. Inverters should be tested according to International Electrotechnical Commission (of which Australia is a full member) standards for radio interference, and, depending on the make and model may emit some radiation within acceptable limits. The commercial Inverters being considered for the Project, have been tested to international standards and have proven to not disturb radio signals except in the immediate area around the inverter (approximately <5m).

The Project's potential to adversely impact the existing EMF and RFI environment is low.

7.14.3. Mitigation Measures

Suitable mitigation measures for this potential impact typically include:

- Installing electricals to the relevant Australian Standards and guidelines;

- Post-construction confirmation that electricals have been installed to the relevant Australian Standards;
- Setting the PVS back behind the Project boundary;
- Setting the inverters for the PVS outside 200 metres of existing or anticipated dwellings;
- Locating the high voltage electrical equipment such as switchyard, substation, BESS and synchronous condensers (if required) appropriately on the Project area;
- Use of International Electrotechnical Commission compliant commercial inverters; and
- Restriction of access to areas of high voltage electrical equipment such as switchyard, substation, BESS areas and synchronous condensers (if required).

7.15. WATER RESOURCES

7.15.1. Existing Environment

A 2018 report by the World Resources Industry notes the following key points:

- Australia is one of the world's top 20 water-stressed nations.
- Every megawatt hour of electricity generated by coal withdraws around 60,700 litres and consumes about 2,600 litres of water.
- In the 2017-2018 financial year, Australian's have consumed 147 terawatt hours of electricity, about 73 per cent of which comes from coal, which equates to around 455 billion litres of water.

7.15.2. Potential Impacts

The Project's use of water to produce electricity is limited to cleaning the solar panels during the operational phase. Continual improvements in panel cleaning technology is reducing the small amount of water currently required to produce electricity.

The World Resources Industry report notes "*the potential for cheap renewable energy, solar and wind as opposed to fossil fuels, could reduce water consumption country-wide as these technologies use minimal water*".

If the Project produced 750GW/hours of electricity per year this would equate to approximately 45 billion litres of water annually not being required for electricity production.

The Project will contribute to reducing the current amount of water required to generate electricity in Australia.

7.15.3. Mitigation Measures

The Project is a mitigation measure, contributing to lower use of water for electricity generation.

7.16. SOCIO-ECONOMIC

A socio-economic impact assessment has been undertaken to consider the likely outcomes of the Bungama Solar Project. Key findings of this study are provided below. The full analysis and discussion are provided at Appendix 11.

7.16.1. Socio-Economic Benefits

The Project will:

- Deliver clean and renewable energy for Australia in the face of climate change;
- Assist in meeting renewable energy targets for the State and the Nation;
- For each year of its 30-year operational life, displace the equivalent of 497,000 tonnes of greenhouse gas emissions per annum, the equivalent of offsetting the impact of 195,000 cars or providing the equivalent benefit of 69,500 trees per annum;
- Provide clean energy to power an equivalent of 86,000 homes for each year of the Project's life;
- Create industry diversity for the Port Pirie region;
- Create substantial employment opportunities during Project construction phases;
- Be located in a suitable area with access to existing infrastructure;
- Provide a flexible, low-impact alternative to the existing agricultural land use;
- Generate an estimated economic benefit in the order of $292.5 million for the broader economy and approximately $164 million as direct domestic Project expenditure;
- Generate up to an estimated 275 equivalent full-time jobs during construction, and a further 410 indirect full-time equivalent jobs;
- Generate up to an estimated 8 equivalent full-time jobs during operations; and
- Provide a direct benefit to the community in the form of a community fund.

To ensure that the employment opportunities, afforded by the Project, are maximised for the local community, an expressions of interest register has been established. This register allows local people and businesses to express interest in participating with the construction and operations of the Project. The register has been established and maintained since initial community consultation phases.

This register will be passed onto the construction contractor, and where skills and resources can be appropriately matched, local and regional community members and businesses will be considered in participation opportunities.

7.16.2. Potential Socio-Economic Impacts and Mitigation Measures

Notwithstanding the positive impacts noted above, a number of potential or perceived impacts have also been raised, through assessment and community engagement including adjacent landowner concerns about visual impacts comprising general amenity and glint/glare, perceived impact on agricultural land, potential impacts arising during the construction phase including dust and noise and perceived health impacts from electromagnetic fields.

These and other potential impacts plus appropriate mitigation measures are addressed in this Planning Report.

7.17. GLINT AND GLARE

A Glint and Glare Analysis is attached as Appendix 12. The Glint and Glare Analysis assessed the potential optical effects on drivers on certain parts of relevant roads, residence in some adjacent areas for housing, a section of the railway line as well as airplanes approaching the Port Pirie Airport from PVS solar panels on a single axis tracking system during the Project's operational phase.

The Glint and Glare Analysis report explains the methodology and modelling undertaken to carry out the assessment of potential Glint and Glare impacts. The methodology's conservative assumptions and estimates gives quantified results. However, the results do not take into consideration a number of factors which mitigate the results and potential risks including:

- The model does not rigorously represent the detailed geometry of the solar panel arrays, for example gaps between panels, detailed variations in height of the array and support structures.

- The tool does not consider any obstacles (e.g. trees, structures or earth, topography, buildings) between the observation points and the solar panel arrays that may obstruct observed glare. The model does not consider mitigation measures such as proposed or existing vegetation buffers.
- The tool does not define directional viewpoints from each observation point. Instead it considers the cumulative impact of the entire solar panel array areas.
- The tool uses a typical clear-day solar irradiance profile (worst-case for glare). The model profile has a lower irradiance level in the mornings and evenings and a maximum at solar noon. Actual irradiance levels and profile on any given day can be affected by cloud cover and other environmental factors, however is not considered in this model.

7.17.1. Existing Environment

The Project area and surrounding landscape is characterised by mostly flat, smooth and open land. The dominant landform in the Project area is a plain, which has been extensively cleared for agriculture. There are little to no natural landscape features aside from clumped or scattered vegetation.

Port Pirie Airport is a located approximately 10km southwest of the Project area. Port Pirie Airport consists of three runways of which the east-west facing runway 80/26 is sealed and used for commercial aircrafts. The two other runways facing SW/NE, 35/17 and 03/21 are unpaved and most likely only used for private airplanes.

A number of houses are located northeast of the Project area in the Napperby rural living and township areas. Some houses are located in the primary production areas adjacent to the Project area.

The Project area is located immediately to the northeast of the Augusta Highway. Warnertown Road runs off the Augusta Highway in a westerly direction towards Port Pirie. Locks Road crosses the Project area in both a north- south and east – west direction. Bungama North Road follows part of the Project's western boundary. Gulf View Road follows part of the Project's northern boundary. Scenic Drive is located to the east of the Project area. Sections of these roads are included as part of the route locations (RO). Routes were chosen to assess potential areas where the public (car or train drivers) may experience Glint and Glare when looking towards the PVS solar panels.

7.17.2. Potential Impacts

The PVS solar panels can potentially cause a glint and/or glare impact beyond the Project area. The Glint and Glare Analysis key findings are:

Overall:

No harmful or dangerous glint or glare will be experienced for sensitive receivers as a result of the Project, with the potential for a low level of glare experienced for some locations either very early morning or late evening in the Autumn and or Winter, if these areas are not impeded by existing vegetation.

Air Traffic:

The Australian Civil Aviation Safety Authority (CASA) provides guidelines to planning authorities in relation to referring solar projects for assessment to ensure there is no likelihood of any glare and glint issues for pilots on approach to or on departure from an airport or impact on traffic controllers.

The Project is approximately 10km south-west of Port Pirie Airport and it is therefore considered unlikely that any Glint or Glare issues will be created for pilots on approach to or departure from Port Pirie Airport. However, CASA requires an assessment for any solar farm within approximately 5 nautical miles from an airport and therefore a calculation for potential Glint and Glare issues was performed.

Port Pirie Airport consists of three runways of which the east-west facing runway 80/26 is sealed and used for commercial aircrafts. The two other runways facing SW/NE, 35/17 and 03/21 are unpaved and most likely only used for private airplanes. All three runways were assessed.

The calculation for all six approach paths did not indicate any Glint or Glare issues for pilots.

Houses:

The observer locations (OP) described in Table 5 of the Glint and Glare Analysis and shown as white markers in the accompanying map were chosen to represent potential areas where the residents of houses may experience Glint and Glare when looking towards the PVS solar panels if the view is unimpeded.

The assessment identified areas within the Napperby rural living area as potentially where the residents of houses may experience low-level glare when looking towards the PVS solar panels.

Roads:

The section of Augusta Highway shown Table 6 of the Glint and Glare Analysis does not experience glare issues.

The section of Warnertown Road shown in Table 6 of the Glint and Glare Analysis experiences only a cumulative total of one hour per year (approximately 2 minutes on some Autumn and Winter days) of low-level glare.

The section of Gulf View Road shown in Table 6 of the Glint and Glare Analysis experiences only a total of two minutes per year of low-level glare.

Trains

The section of railway shown in Table 6 of the Glint and Glare Analysis does not experience glare issues.

7.17.3. Mitigation Measures

Air Traffic:

No mitigation measures are required.

Houses:

The observer locations (OP) described in Table 5 of the Glint and Glare Analysis and shown as white markers in the accompanying map were chosen to represent potential areas where the residents of houses or potential residents of houses may experience Glint and Glare when looking towards the PVS solar panels if the view is unimpeded.

The assessment identified areas within the Napperby rural living area where the residents of houses may potentially experience low-level glare during certain early mornings or late evenings in Autumn and or Winter when looking towards the PVS solar panels if the view is unimpeded. The key mitigation measures to address this low-level glare include:

1. A visual buffer zone in targeted sections of the Project area to further screen the Project shown in the Landscape Plan attached as Appendix 14. The visual buffer zone will provide for the following:
    - Setback the PVS behind a visual buffer zone from the Project boundary for existing residential receptors, including the potential future residences, and consequently, reduce the physical size/scale of Project, which also reduces the renewable energy production of the Project; and
    - Establish and maintain within the visual buffer zone a landscape screen of vegetation approximately 3-5m in height, further reducing views of the Project.
2. Existing obstacles including existing vegetation, structures and buildings between the residents of houses or potential residents of houses and the PVS panel arrays that may obstruct observed glare.
3. Additional landscape screening shown in the Landscape Plan attached as Appendix 14.

As a result, the buffer zone, landscaping within the buffer zone, additional landscape screening and existing obstacles including existing vegetation, structures and buildings between the residents of houses or potential residents of houses and the PVS panel arrays ameliorates the low-level glare identified in the Glint and Glare report.

<u>Roads:</u>

No mitigation measures are required for the section of Augusta Highway shown Table 6 of the Glint and Glare Analysis.

The section of Warnertown Road shown in Table 6 of the Glint and Glare Analysis experiences only a cumulative total of one hour per annum of low-level glare. The section of Gulf View Road shown in Table 6 of the Glint and Glare Analysis experiences a cumulative total of two minutes per year of low-level glare. The key mitigation measures to address this minimal low-level glare include:

1. A visual buffer zone in targeted sections of the Project area to screen the Project as shown in the Landscape Plan attached as Appendix 14. The visual buffer zone will provide for the following:
    - Setback the PVS behind a visual buffer zone from the Project boundary and consequently, reduce the physical size/scale of Project, which also reduces the renewable energy production of the Project; and

- Establish and maintain within the visual buffer zone a landscape screen of vegetation approximately 3-5m in height, further reducing views of the Project.

2. Existing obstacles including existing vegetation, structures and buildings between the residents of houses or potential residents of houses and the PVS panel arrays will obstruct observed glare.
3. Additional landscape screening along the Project's boundary with Augusta Highway shown in the Landscape Plan attached as Appendix 14.

As a result, the combined; buffer zone; landscaping within the buffer zone; additional landscape screening; and existing obstacles (including existing vegetation, structures and buildings) between the relevant sections of roads and the PVS panel arrays, ameliorates the low-level glare identified in the Glint and Glare report.

Railway line/Trains

No mitigation measures are required.

8. SUMMARY OF MITIGATION MEASURES

8.1. PVS ELEMENT AND ANCILLARY COMPONENTS

Table 8-1 provides a summary of mitigation measures for the PVS element and ancillary components of the Project.

Table 8-1: Summary of Mitigation Measures for the PVS element of the Project

Issue	Mitigation Measure	Section of Planning Report
Visual Impact and Landscape	• Landscape screening is proposed for some parts of the Project boundary; • Stakeholder engagement activities will continue be undertaken to understand relevant landowner and community relationships with visual aspects of the Project; • As far as practicable, the development will occur on land previously cleared of vegetation and disturbed; • Utility buildings or structures will be sited together, away from residences and constructed of materials that are muted in colour; • The use of reflective materials in construction will be limited, as far as practicable; • Any landscaping that is completed as part of the Project will be selected and designed so it is sensitive to the landscape and visual receptors; • Any signage will be designed and located so it is sensitive to the landscape and visual receptors; • Fencing will be sited and designed appropriately to blend with the facility; and • Construction equipment and waste will be removed from the Project area in a timely manner.	7.1
Land Use	• Following the Project's decommissioning the land will be available for current agricultural uses.	7.2
Biodiversity	• Prioritise use of cleared, agricultural land, and avoid unnecessary clearance of thin strips of vegetation along allotment boundaries and native scattered trees; • Removal of native vegetation be avoided and minimised, as far as practicable, as part of the final design;	7.3

Issue	Mitigation Measure	Section of Planning Report
	• Weed and pathogen hygiene measures will be employed as part of the removal process to ensure that no new weeds or other pathogens are introduced to existing native vegetation; and • An Application for approval to clear native vegetation under Division 5 of the *Native Vegetation Regulations 2017* be submitted to Native Vegetation Council based on the Project's final design.	
Surface Water and Erosion	• During construction main access tracks will be permanently gravelled where required; • Rows of PV panels will rotate and be separated from the next row, so providing an infiltration area and sunlight to potential pasture; • If practicable, the ground under and adjacent the PV panels will be sown with a permanent pasture mix, suitable to the region and long - term stock grazing; • If practicable, the Project area will be controlled grazed (most likely with sheep) to maintain ground cover density and manage the sward length; • During the construction and operation phases an erosion and sediment control plan for each phase will be developed detailing the control measures to be implemented; • Sewage treatment and disposal to be conducted in accordance with relevant Australian Standards and local regulations/approval; and • During the construction and operation phases a storage and handling of chemical and hazardous materials management plan for each phase will be developed detailing the control measures to be implemented.	7.5
Groundwater	• Erosion and sediment control devices will be installed where necessary and monitored to assess efficacy of erosion and sediment control measures; • No unnecessary clearing or earthworks; • Measures implemented to control flow velocities in such a manner that prevents soil erosion along drainage paths; • Ensure the use of appropriately designed laydown areas for vehicles and machinery and storage areas for chemicals, oils and fuels; • Make available spill kit(s) within the operational and maintenance area;	7.7

Issue	Mitigation Measure	Section of Planning Report
	• Ensure all staff to be made aware of spill response procedures and the requirement to report any spills or leaks; • Ensure regular maintenance and checks of heavy vehicles, machinery and equipment to identify potential leaks; and • All chemical storage vessels are to be bunded and/or constructed on impermeable surfaces in compliance with relevant Australian Standards.	
Climate	• Efficient PV components and Project design to maximise electricity production; • Components updated as they become obsolete or superseded by more efficient technologies, as required; and • Panels will be maintained to maximise solar collection.	7.8
Noise	• Work on-site will occur within the standard work hours of 7.00a.m. and 7.00p.m. Monday to Saturday; • Particularly noisy activities will be commenced after 9.00am if they exceed noise guidelines; • Noisy equipment and processes will be located so that their impact on neighbouring properties is minimised whether by maximising the distance to the premises, using structures or elevations to create barriers or otherwise; • Equipment will be shut down or throttled down whenever it is not in use; • Equipment will be equipped with feasible noise control (e.g. mufflers, silenced exhausts, acoustic enclosures); • Equipment will be properly maintained so as to eliminate or reduce noise as far as practicable; • Equipment shall be handled so as to minimise impact of noise; • As far as practicable, off-site or alternative processes that eliminate or lessen noise will be utilised; • A complaints hotline will be established and advertised for the receipt of feedback on the Project, including any complaints regarding noise nuisance; • Subject to approval from the relevant authority, circumstances, such as extreme summer heat, may warrant construction activity to be permitted outside of the hours of 7.00am and 7.00pm Monday to Saturday or on a Sunday or Public Holiday;	

Issue	Mitigation Measure	Section of Planning Report
	• Scheduling of construction activities to minimise the number of work fronts and simultaneous activities occurring along the boundaries of the Project area (within 200m) to minimise noise levels; • Development of a construction noise management protocol to minimise noise emissions, manage out of hours (minor) works to be inaudible, and to respond to potential concerns from the community; • Where possible use localised mobile screens or construction hoarding around plant to act as barriers between construction works and receptors, particularly where equipment is near the site boundary and/or a residential receptor including areas in constant or regular use (e.g. unloading and laydown areas); • Operating plant in a conservative manner (no over-revving), be shut down when not in use, and be parked/started at farthest point from relevant assessment locations; • Selection of the quietest suitable machinery available for each activity; • Avoidance of noisy plant/machinery working simultaneously where practicable; • Minimise impact noise wherever possible; • Utilise a broadband reverse alarm in lieu of the traditional high frequency type reverse alarm; • Provide toolbox meetings, training and education to drivers and contractors visiting the site during construction so they are aware of the location of noise sensitive receptors and to be cognisant of any noise generating activities; • Signage is to be placed at the front entrance advising truck drivers of their requirement to minimise noise both on and off-site; • Utilise Project related community consultation forums to notify residences within close proximity of the site with Project progress, proposed/upcoming potentially noise generating works, its duration and nature and complaint procedure; • Complete a one-off noise validation monitoring assessment to quantify emissions from site and to confirm emissions meet relevant criteria; and	

Issue	Mitigation Measure	Section of Planning Report
	• Prepare an operational noise management protocol to minimise noise emissions and to respond to potential concerns from the community regarding Project noise emissions.	
Archaeology	• Further cultural heritage works with the Nukunu Peoples Council Inc. will inform the final detailed Project layout plans; • Any Aboriginal sites and artefacts will be taken into consideration for the final detailed Project layout plans; • Compliance with the relevant provisions of the *Aboriginal Heritage Act 1988*; • Construction personnel will receive a heritage induction prior to work on-site; • A stop work/site discovery procedure for both Aboriginal and European heritage will be developed prior to the commencement of construction to manage the event of an unexpected find; and • The Construction Management Plan will include information on recorded heritage items.	7.10
Bushfire	• Installation of only Standard compliant components; • Ongoing monitoring and review of the solar system performance; • Installation of thermal overload protection on inverters; • Controlled grazing or machinery maintenance of pastures under panel arrays; and • Maintenance of firebreaks.	7.11
Traffic and Transport	• A Traffic Management Plan will be prepared, prior to commencement of construction works in consultation with DPTI and Port Pirie Regional Council; and • A dilapidation report or equivalent report, of the road conditions along the nominated local access roads will be undertaken prior to the commencement of construction in consultation with the Port Pirie Regional Council.	7.12
Air Quality	• Dust management measures will be included in the Construction Management Plan; • During construction, dust raised on site will be monitored and, if dust is creating a nuisance, a water cart will be used to manage problem areas;	7.13

Issue	Mitigation Measure	Section of Planning Report
	• Dust generation from construction traffic will be monitored and dust suppression activities will be undertaken to minimise dust emissions, if required; • Wind speed and direction will be monitored, and dust generating activities will be adapted to the wind conditions; and • Properly maintained equipment will be used to minimise emissions.	
Electric and Magnetic Fields	• Installing electrical componentry to the relevant Australian Standards and guidelines; • Post-construction confirmation that electricals have been installed to the relevant Australian Standards; • Setting the PVS back behind the Project boundary; • Setting the inverters for the PVS outside 200 metres of existing or anticipated dwellings; • Use of International Electrotechnical Commission compliant commercial inverters; and • Restriction of access to areas of high voltage electrical equipment such as switchyard, substation, BESS areas and synchronous condensers (if required).	7.14
Glint and Glare	• Landscape screening is proposed for some parts of the Project boundary.	7.17

8.2. BESS ELEMENT

Table 8-2 provides a summary of mitigation measures for the BESS element of the Project.

Table 8-2: Summary of Mitigation Measures for the BESS element of the Project

Issue	Mitigation Measure	Section of Planning Report
Visual Impact and Landscape	• Stakeholder engagement activities will continue be undertaken to understand relevant landowner and community relationships with visual aspects of the Project; • Utility buildings or structures will be sited together, away from residences and constructed of materials that are muted in colour; • The use of reflective materials in construction will be limited, as far as practicable;	7.1

Issue	Mitigation Measure	Section of Planning Report
	• Any landscaping that is completed as part of the Project will be selected and designed so it is sensitive to the landscape and visual receptors; • Any signage will be designed and located so it is sensitive to the landscape and visual receptors; • Fencing will be sited and designed appropriately to blend with the facility; and • Construction equipment and waste will be removed from the Project area in a timely manner.	
Land Use	• Following the Project's decommissioning the land will be available for current agricultural uses.	7.2
Surface Water and Erosion	• During the construction and operation phases an erosion and sediment control plan for each phase will be developed detailing the control measures to be implemented.	7.5
Groundwater	• Erosion and sediment control devices will be installed where necessary and monitored to assess efficacy of erosion and sediment control measures; • No unnecessary clearing or earthworks; and • Measures implemented to control flow velocities in such a manner that prevents soil erosion along drainage paths.	7.7
Noise	• Work on-site will occur within the standard work hours of 7.00a.m. and 7.00p.m. Monday to Saturday; • Particularly noisy activities will be commenced after 9.00am if they exceed noise guidelines; • Noisy equipment and processes will be located so that their impact on neighbouring properties is minimised whether by maximising the distance to the premises, using structures or elevations to create barriers or otherwise; • Equipment will be shut down or throttled down whenever it is not in use; • Equipment will be equipped with feasible noise control (e.g. mufflers, silenced exhausts, acoustic enclosures); • Equipment will be properly maintained so as to eliminate or reduce noise as far as practicable; • Equipment shall be handled so as to minimise impact of noise;	7.9

Issue	Mitigation Measure	Section of Planning Report
	• As far as practicable, off-site or alternative processes that eliminate or lessen noise will be utilised; • A complaints hotline will be established and advertised for the receipt of feedback on the Project, including any complaints regarding noise nuisance; • Subject to approval from the relevant authority, circumstances, such as extreme summer heat, may warrant construction activity to be permitted outside of the hours of 7.00am and 7.00pm Monday to Saturday or on a Sunday or Public Holiday; • Development of a construction noise management protocol to minimise noise emissions, manage out of hours (minor) works to be inaudible, and to respond to potential concerns from the community; • Where possible use localised mobile screens or construction hoarding around plant to act as barriers between construction works and receptors, particularly where equipment is near the site boundary; • Operating plant in a conservative manner (no over-revving), be shut down when not in use, and be parked/started at farthest point from relevant assessment locations; • Selection of the quietest suitable machinery available for each activity; • Avoidance of noisy plant/machinery working simultaneously where practicable; • Minimise impact noise wherever possible; • Utilise a broadband reverse alarm in lieu of the traditional high frequency type reverse alarm; • Provide toolbox meetings, training and education to drivers and contractors visiting the site during construction so they are aware of the location of noise sensitive receptors and to be cognisant of any noise generating activities; • Signage is to be placed at the front entrance advising truck drivers of their requirement to minimise noise both on and off-site; • Utilise Project related community consultation forums to notify residences within close proximity of the site with Project progress, proposed/upcoming potentially noise generating works, its duration and nature and complaint procedure;	

Issue	Mitigation Measure	Section of Planning Report
	• Complete a one-off noise validation monitoring assessment to quantify emissions from site and to confirm emissions meet relevant criteria; and • Prepare an operational noise management protocol to minimise noise emissions and to respond to potential concerns from the community regarding Project noise emissions.	
Archaeology	• Further cultural heritage works with the Nukunu Peoples Council Inc. will inform the final detailed Project layout plans; • Any Aboriginal sites and artefacts will be taken into consideration for the final detailed Project layout plans; • Compliance with the relevant provisions of the *Aboriginal Heritage Act 1988* if required; • Construction personnel will receive a heritage induction prior to work on-site; • A stop work/site discovery procedure for both Aboriginal and European heritage will be developed prior to the commencement of construction to manage the event of an unexpected find; and • The Construction Management Plan will include information on recorded heritage items.	
Bushfire	• Installation of only Standard compliant components; • Ongoing monitoring and review of the Battery system performance; and • Installation of thermal overload protection on inverters.	7.11
Electric and Magnetic Fields	• Locating the high voltage electrical equipment such as switchyard, substation, BESS and synchronous condensers (if required) appropriately on the Project area; • Installing electrical componentry to the relevant Australian Standards and guidelines; • Post-construction confirmation that electricals have been installed to the relevant Australian Standards; • Use of International Electrotechnical Commission compliant commercial inverters; and • Restriction of access to areas of high voltage electrical equipment such as switchyard, substation, BESS areas.	7.14

9. ENVIRONMENTAL MANAGEMENT AND MONITORING

While the purpose of the reviewing the key environmental issues is to consider the potential environmental impacts resulting from the Project, the role of an ongoing environmental management system is to ensure that the identified controls and commitments are maintained throughout the construction and operational phases of the Project. Further, a formal environmental management system will implement and monitor the objectives and measures outlined in the development consent, relevant licenses and legislation. Accordingly, this section outlines an overall environmental management framework to guide the development and management of the Project.

Following a development approval, an Environmental Management Plan (EMP) for the construction and operational phases of the development will be prepared taking into account the following documents:

- This Planning Report;
- Conditions of Approval; and
- Any other approval, licence or permit required, including but not limited to grid connection to the ElectraNet Bungama Substation.

It is intended to prepare a suite of EMPs including a Construction Management Plan and Operational Management Plan. These EMPs will be drafted and finalised following development approval. Notwithstanding, the EMPs are expected to specify all environmental management activities and measures used to control, prevent or minimise environmental impacts. In addition, the plan will assign responsibility for mitigation measures to specific personnel and allocate quantitative or qualitative criteria to the performance of each measure where applicable. The following matters are likely to be addressed in the suite of EMPs:

- Project description;
- Environmental management structure and responsibilities;
- Approval and licensing requirements;
- Environmental training requirements;
- Emergency contacts and responsible procedures;
- Risk assessment;
- Environmental management measures;
- Environmental management maps, as required;
- Environmental monitoring requirements;
- Environmental auditing, as required;
- Corrective action; and
- Review.

The nature of the Project means that environmental monitoring required by more intrusive projects (mines, quarries, roads, etc.) is likely not required.

Following development approval, environmental management will be implemented in accordance with the following environmental objectives:

- Implement a standard of environmental management that reflects proactive planning and recognition of environmental impact;
- Comply with applicable Commonwealth and South Australian legislative requirements;
- Comply with applicable environmental standards and approvals throughout all phases of the Project; and
- Commit to undertake all environmental management practices in accordance with best-practice.

Management procedures may be adjusted in the event of an environmental incident or the receipt of complaints.

10. CONCLUSION

The Project area selection, assessment and design has been a considered and iterative process influenced by a number of factors including legislative and technical requirements, on-ground environmental attributes, financial feasibility, and potential for economic, social and environmental benefits.

Detailed and measured investigations has allowed the Project to achieve its intent of maximising the benefits derived from increased production of renewable energy, while being sustainable for the needs of the present generation without compromising the ability of future generations to meet their future economic, social and environmental needs.

This Planning Report has considered the details of the Project, the strategic and statutory context, and identified key environmental, social and economic issues. Where potential impacts have been identified, mitigation measures have been proposed for incorporation in the Project design and future management plans.

Assessment of the Project against the Development Control Plan has demonstrated its compatibility and appropriateness for the Project land and locality. Specifically, the land selected is predominantly cleared and previously disturbed, and is located in close proximity to existing electricity network infrastructure.

The provision of appropriately designed new generating facilities, such as the Project, is critical for the future of South Australia's energy security. Further, it is considered the Project will have positive socio-economic and environmental impacts on the local, state and national scales.

The Planning Report concludes the Project:

- Is consistent with the relevant strategic and statutory provisions;
- Will not result in significant environmental impacts;
- Is suitable at the proposed site; and
- Is in the public interest.

Therefore, it is respectively requested the Project be approved subject to final Project documents and plans being approved by relevant Government authorities prior to the commencement of construction and operation.

11. REFERENCES

BV Consulting (2018) *Glint and Glare Analysis – Bungama Solar, South Australia, Draft, 06/05/2018*

CMW Geosciences (2018) *Bungama Solar Geotechnical Investigation,* ADL2018-0004AD Rev2. 06/07/2018

Department of Planning Transport and Infrastructure (DPTI) (2018) Annual Average Daily Traffic (AADT) estimates and Heavy Vehicle Estimates accessed at https://dpti.sa.gov.au/traffic_volumes

EBS Heritage (2018) *Bungama Solar Desktop Heritage Assessment*, Version 4, Project Number: G80401, Author Shannon Smith, 25/07/2018.

EBS Heritage (2018) *Bungama Solar Archaeological Survey Report*, Version 2, Project Number: G80401, Author Shannon Smith, 25/07/2018.

EBS Ecology (2018) *Bungama Solar Desktop Ecological Assessment*, Version 3, Project Number: G80401, Author Dr M. Louter, 14/05/2018.

EBS Ecology (2018) *Native Vegetation Clearance Proposal Bungama Solar*, Version 2, Project Number: G80401, Author Dr M. Louter, 25/07/2018.

Engel, Z., Wszołe, T. (1996) *Audible noise of transmission lines caused by the corona effect: Analysis, modelling, prediction*, Applied Acoustics, Volume 47, Issue 2, Pages 149-163, ISSN 0003-682X, https://doi.org/10.1016/0003-682X(95)00041-7, accessed at: http://www.sciencedirect.com/science/article/pii/0003682X95000417)

EPA South Australia (2013) *EPA 424/13 General Environmental Noise Information Sheet*

EPA South Australia (2009) *Wind farms environmental noise guidelines* ISBN 978-1-876562-43-9

Government of South Australia, *Environment Protection (Noise) Policy 2007* accessed at https://www.legislation.sa.gov.au/LZ/C/POL/Environment%20Protection%20(Noise)%20Policy%202007.aspx

South Australian Resource Information Gateway (SARIG) (2018) 1:100,000 Florieton sheet and geoscientific and geospatial data accessed at: http://minerals.statedevelopment.sa.gov.au/online_tools/free_data_delivery_and_publication_downloads/sarig

World Resources Institute (2018), *These 20 Water-Stressed Countries Have the Most Solar and Wind Potential*

APPENDIX 1

Regulatory Endorsement

1.1 Department for Energy and Mining's S49 endorsement

1.2 Office of Technical Regulator Certificate

1.1 Department for Energy and Mining's S49 Endorsement

Government of South Australia

Department for Energy and Mining

DEMC18/00022

Mr Steve McCall
Director
Energy Projects Solar (EPS) Pty Ltd
3/153 Pacific Highway
CHARLESTOWN NSW 2290

Email: stevemccall@epsenergy.com.au

Dear Mr McCall

CROWN SPONSORSHIP BUNGAMA SOLAR PROJECT

Thank you for your letter of 7 September 2018 requesting Crown Sponsorship under section 49 of the *Development Act 1993* to assist with Energy Projects Solar (EPS) Pty Ltd's Bungama Solar Project (Project).

This Project has been considered within the South Australian Department for Energy and Mining (DEM) with input from the Department of Planning, Transport and Infrastructure, the Department of Environment and Water, the Environmental Protection Agency and the Technical Regulator. In principle, the Project is supported, recognising the possible environmental and community issues that will need to be addressed through the development assessment process.

On balance, the development of the Project has the potential to benefit South Australia and can be considered public infrastructure. Accordingly I, as the Chief Executive of the DEM, will support the development and specifically endorse the Development Application to construct the Project comprising up to 280 MW solar photovoltaic with up to 140MW capacity battery with up to 560MWh of storage as a development of public infrastructure as required by section 49 of the *Development Act 1993* (the Act).

It is the responsibility of EPS to prepare all documentation as required by section 49 of the Act. All costs in the preparation of the development application, lodgement and any other subsequent action in relation to this application are the responsibility of EPS.

Office of the Chief Executive
Level 12, 11 Waymouth Street, Adelaide SA 5000 | GPO Box 320 Adelaide SA 5001 | DX 452
Tel +61 8 8429 3216 | **Email** DEM.OCE@sa.gov.au | **ABN** 83 768 683 934

SOUTH AUSTRALIA

The DEM makes no representations or gives no warranties in relation to the outcome of the Development Application or time that it takes to secure a planning outcome. It is EPS's responsibility to obtain all other statutory approvals, licences, connection agreements and permits from relevant authorities, manage community expectations and to fund the project. The State Government makes no commitment to purchase any product or service related to the project.

A Development Application under this Crown sponsorship must be lodged with the State Planning Commission and is valid for 12 months from the date of this letter. If this is not achieved by that time, my support under Section 49(2)(c) of the *Development Act 1993* for EPS's Project will lapse.

If you have any questions regarding the preparation of the material to support this section 49 application, please contact Mr Adam Cook on (08) 8429 3496 or via email: adam.cook@sa.gov.au.

Yours sincerely

Paul Heithersay
CHIEF EXECUTIVE

18 / 10 / 2018

1.2 Office of the Technical Regulator Certificate

Government of South Australia
Department of the Premier and Cabinet

Energy and Technical Regulation

Office of the Technical Regulator

Level 8, 11 Waymouth Street
Adelaide SA 5000

GPO Box 320
Adelaide SA 5001

Telephone: 08 8226 5500
Facsimile: 08 8226 5866

www.sa.gov.au/otr

Ref: 2017/01873.01 D18089943

27 June 2018

Steve McCall
EPS Energy
PO Box 195
Charlestown NSW 2290
By email: stevemccall@epsenergy.com.au

Dear Steve,

RE: CERTIFICATE FOR DEVELOPMENT OF THE BUNGAMA SOLAR PROJECT

The development of the Bungama Solar Project has been assessed by the Office of the Technical Regulator (OTR) under Section 37 of the Development Act 1993.

Regulation 70 of the *Development Regulations 2008* prescribes if the proposed development is for the purposes of the provision of electricity generating plant with a generating capacity of more than 5 MW that is to be connected to the State's power system – a certificate from the Technical Regulator is required, certifying that the proposed development complies with the requirements of the Technical Regulator in relation to the security and stability of the State's power system.

In making a decision on your application, our office has taken the following information into account:

- An email from yourself 18 June 2018, which included the project application attached '20180618 Bungama Solar Statement to OTR.pdf';
- Revised project information emailed by John Thompson of John Thompson Inclusive Pty Ltd on 27 June 2018;

After assessing the information provided, I advise that approval is granted for the proposed project.

Should you have any questions regarding this matter, please do not hesitate to call David Bosnakis on (08) 8226 5521.

Yours sincerely

Rob Faunt
TECHNICAL REGULATOR

cc: Jeff Burns – EPS Energy
Simon Duffy – EPS Energy
John Thompson – John Thompson Inclusive

APPENDIX 2

Certificate of Titles

BUNGAMA SOLAR

Government of South Australia
Department of Planning, Transport and Infrastructure

Product	Register Search
Date/Time	13/07/2016 01:02PM
Customer Reference	N/A
Order ID	20160713006061
Cost	$37.50

The Registrar-General certifies that this Title Register Search displays the records maintained in the Register Book and other notations at the time of searching.

Registrar-General

Certificate of Title - Volume 5949 Folio 272

REAL PROPERTY ACT, 1886
South Australia

Parent Title(s)	CT 5887/188
Dealing(s) Creating Title	TG 10236543
Title Issued	20/09/2005
Edition	1
Edition Issued	20/09/2005

Estate Type

FEE SIMPLE

Registered Proprietor

JOHN CORNELIUS CUNNINGHAM
OF 190 KINGSTON ROAD PORT PIRIE SA 5540

Description of Land

ALLOTMENT 4 DEPOSITED PLAN 24997
IN THE AREA NAMED BUNGAMA
HUNDRED OF PIRIE

Easements

SUBJECT TO THE EASEMENT(S) AS PROVIDED FOR BY SECTION 9 OF THE NATURAL GAS AUTHORITY ACT 1967

SUBJECT TO EASEMENT(S) OVER THE LAND MARKED A AND G TO TRANSMISSION LESSOR CORPORATION OF 1 UNDIVIDED 2ND PART (SUBJECT TO LEASE 9061500) AND ELECTRANET PTY. LTD. OF 1 UNDIVIDED 2ND PART (T 1801173 AND TG 10236543 RESPECTIVELY)

SUBJECT TO EASEMENT(S) OVER THE LAND MARKED B AND C TO DISTRIBUTION LESSOR CORPORATION (SUBJECT TO LEASE 8890000) (T 2839453 AND T 3398857 RESPECTIVELY)

SUBJECT TO EASEMENT(S) OVER THE LAND MARKED D.E AND F TO THE NATURAL GAS AUTHORITY OF SOUTH AUSTRALIA (T 3819714 T 4189221 AND RE 6961727 RESPECTIVELY)

Schedule of Dealings

NIL

Notations

Copyright Privacy Disclaimer: www.sailis.sa.gov.au/home/showCopyright www.sailis.sa.gov.au/home/showPrivacyStatement www.sailis.sa.gov.au/home/showDisclaimer

Dealings Affecting Title

NIL

Priority Notices

NIL

Notations on Plan

NIL

Registrar-General's Notes

CONTROLLED ACCESS ROAD VIDE PLAN 5

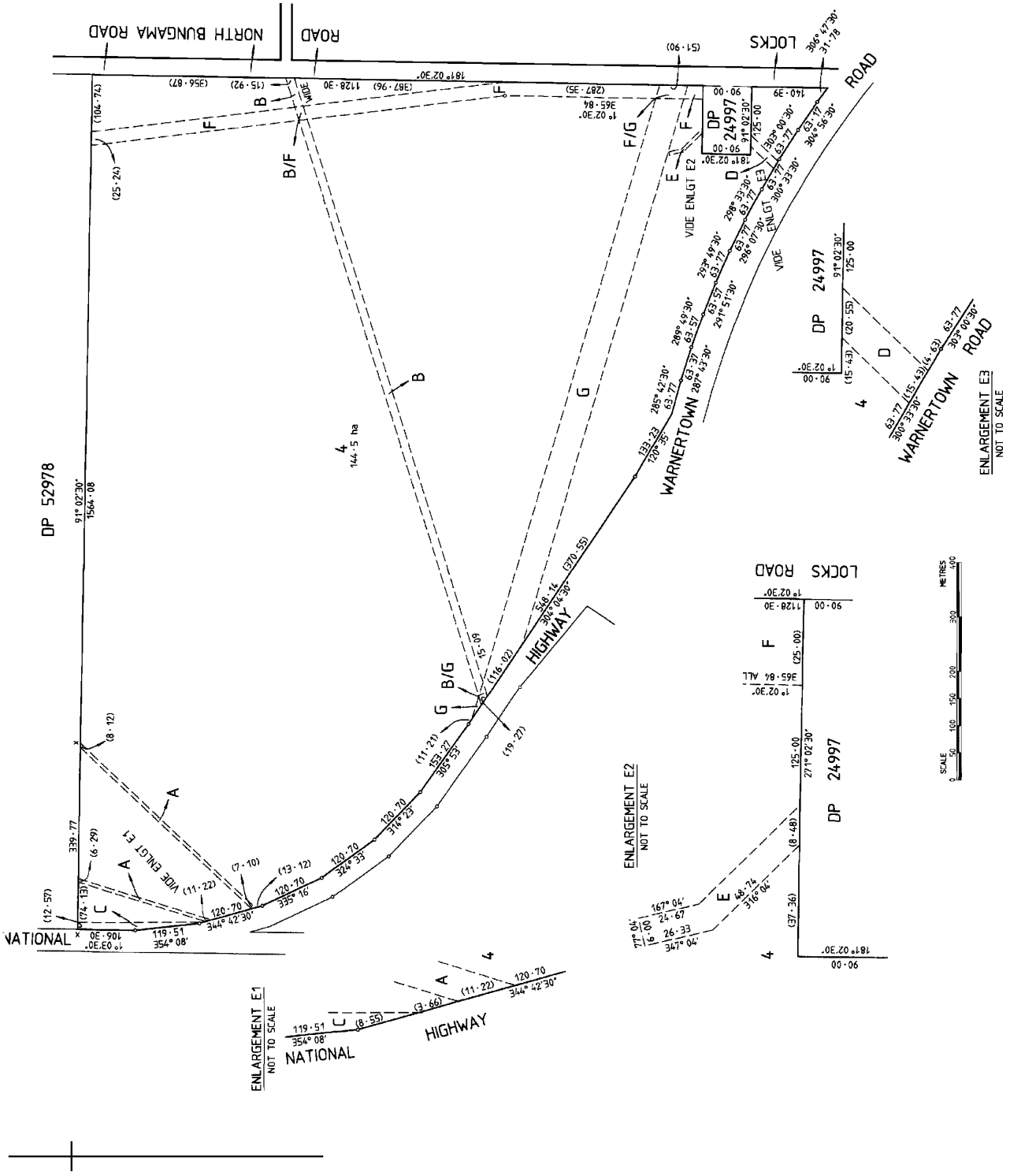
Administrative Interests

NIL

* Denotes the dealing has been re-lodged.

Copyright Privacy Disclaimer: www.sailis.sa.gov.au/home/showCopyright www.sailis.sa.gov.au/home/showPrivacyStatement www.sailis.sa.gov.au/home/showDisclaimer

Product	Register Search
Date/Time	13/07/2016 01:02PM
Customer Reference	N/A
Order ID	20160713006061
Cost	$37.50



Copyright Privacy Disclaimer: www.sailis.sa.gov.au/home/showCopyright www.sailis.sa.gov.au/home/showPrivacyStatement www.sailis.sa.gov.au/home/showDisclaimer

Government of South Australia
Department of Planning, Transport and Infrastructure

Product	Register Search
Date/Time	13/07/2016 01:10PM
Customer Reference	
Order ID	20160713006205
Cost	$37.50

The Registrar-General certifies that this Title Register Search displays the records maintained in the Register Book and other notations at the time of searching.

Registrar-General

Certificate of Title - Volume 5954 Folio 187

REAL PROPERTY ACT, 1886
South Australia

Parent Title(s)	CT 5887/34
Dealing(s) Creating Title	TG 10283691
Title Issued	28/11/2005
Edition	1
Edition Issued	28/11/2005

Estate Type

FEE SIMPLE

Registered Proprietor

ROBERT LESLIE LOCK
NEVILLE HARTLEY LOCK
OF PO BOX 276 PORT PIRIE SA 5540
AS JOINT TENANTS

Description of Land

ALLOTMENT 52 DEPOSITED PLAN 25903
IN THE AREA NAMED WARNERTOWN
HUNDRED OF NAPPERBY

Easements

SUBJECT TO THE EASEMENT(S) AS PROVIDED FOR BY SECTION 9 OF THE NATURAL GAS AUTHORITY ACT 1967

SUBJECT TO EASEMENT(S) OVER THE LAND MARKED A TO THE NATURAL GAS AUTHORITY OF SOUTH AUSTRALIA (T 3811284)

SUBJECT TO EASEMENT(S) OVER THE LAND MARKED B TO TRANSMISSION LESSOR CORPORATION OF 1 UNDIVIDED 2ND PART (SUBJECT TO LEASE 9061500) AND ELECTRANET PTY. LTD. OF 1 UNDIVIDED 2ND PART (TG 10283691)

Schedule of Dealings

NIL

Notations

Copyright Privacy Disclaimer: www.sailis.sa.gov.au/home/showCopyright www.sailis.sa.gov.au/home/showPrivacyStatement www.sailis.sa.gov.au/home/showDisclaimer

Dealings Affecting Title

NIL

Priority Notices

NIL

Notations on Plan

NIL

Registrar-General's Notes

CONTROLLED ACCESS ROAD VIDE PLAN 93

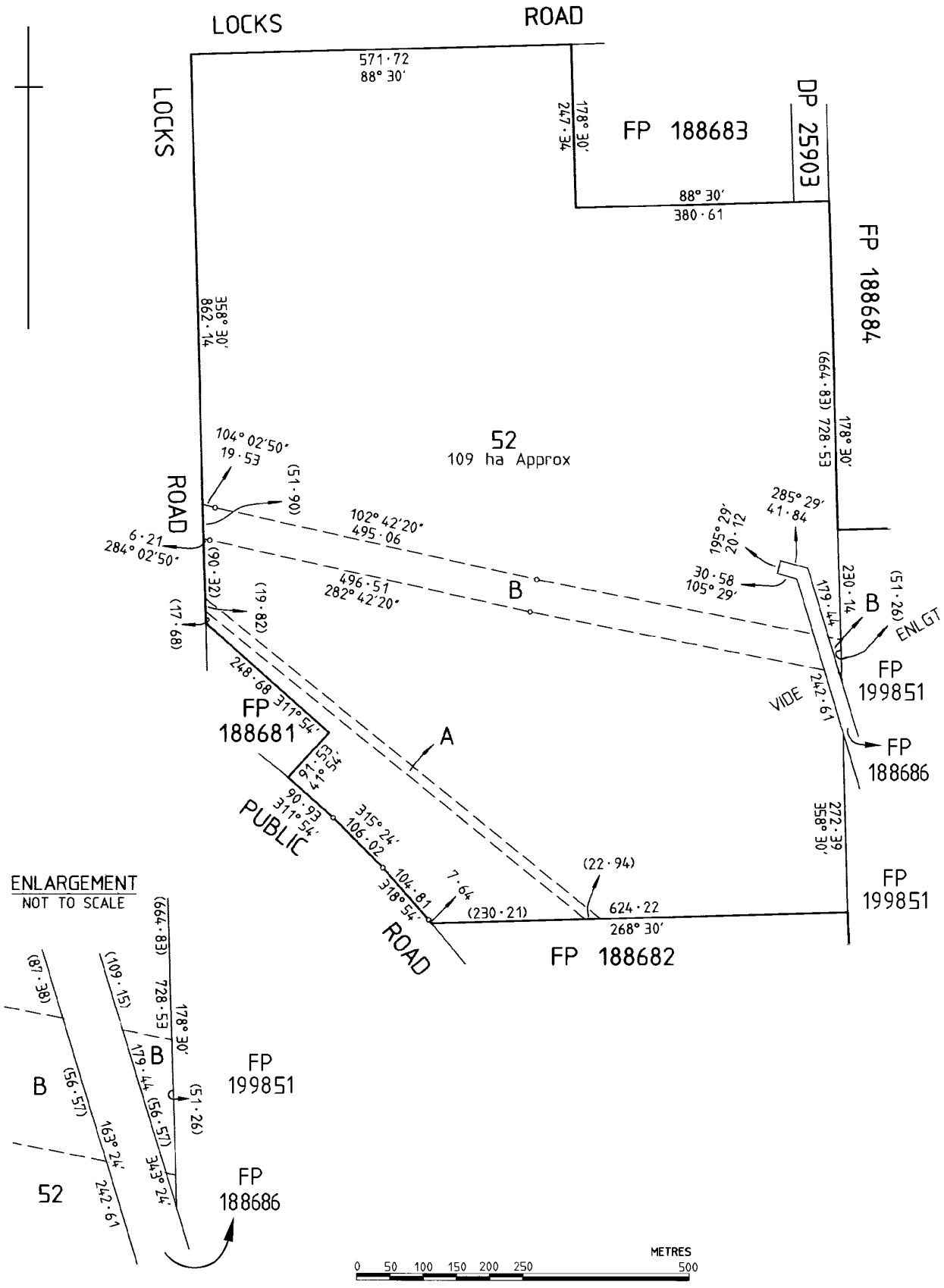
Administrative Interests

NIL

* Denotes the dealing has been re-lodged.

Copyright Privacy Disclaimer: www.sailis.sa.gov.au/home/showCopyright www.sailis.sa.gov.au/home/showPrivacyStatement www.sailis.sa.gov.au/home/showDisclaimer

Product	Register Search
Date/Time	13/07/2016 01:10PM
Customer Reference	
Order ID	20160713006205
Cost	$37.50



Copyright Privacy Disclaimer: www.sailis.sa.gov.au/home/showCopyright www.sailis.sa.gov.au/home/showPrivacyStatement www.sailis.sa.gov.au/home/showDisclaimer

Government of South Australia
Department of Planning, Transport and Infrastructure

Product	Register Search (CT 6127/5)
Date/Time	13/02/2018 01:41PM
Customer Reference	11297 Bungama
Order ID	20180213007723
Cost	$28.25

REAL PROPERTY ACT, 1886
South Australia

The Registrar-General certifies that this Title Register Search displays the records maintained in the Register Book and other notations at the time of searching.

Certificate of Title - Volume 6127 Folio 5

Parent Title(s) CT 5734/376

Creating Dealing(s) DDA 12041294

Title Issued 13/12/2013 **Edition** 3 **Edition Issued** 13/04/2017

Estate Type

FEE SIMPLE

Registered Proprietor

BRENDON NATHAN JOHNS
DENISE JOHNS
OF PO BOX 1385 PORT PIRIE SA 5540
WITH NO SURVIVORSHIP

Description of Land

ALLOTMENT 558 FILED PLAN 188690
IN THE AREA NAMED NAPPERBY
HUNDRED OF NAPPERBY

Easements

NIL

Schedule of Dealings

Dealing Number	Description
12295867	MORTGAGE TO COMMONWEALTH BANK OF AUSTRALIA
12826787	CAVEAT BY TELSTRA CORPORATION LTD. (ACN: 051 775 556) OVER PORTION (T IN F48977)

Notations

Dealings Affecting Title NIL

Priority Notices NIL

Notations on Plan NIL

Registrar-General's Notes

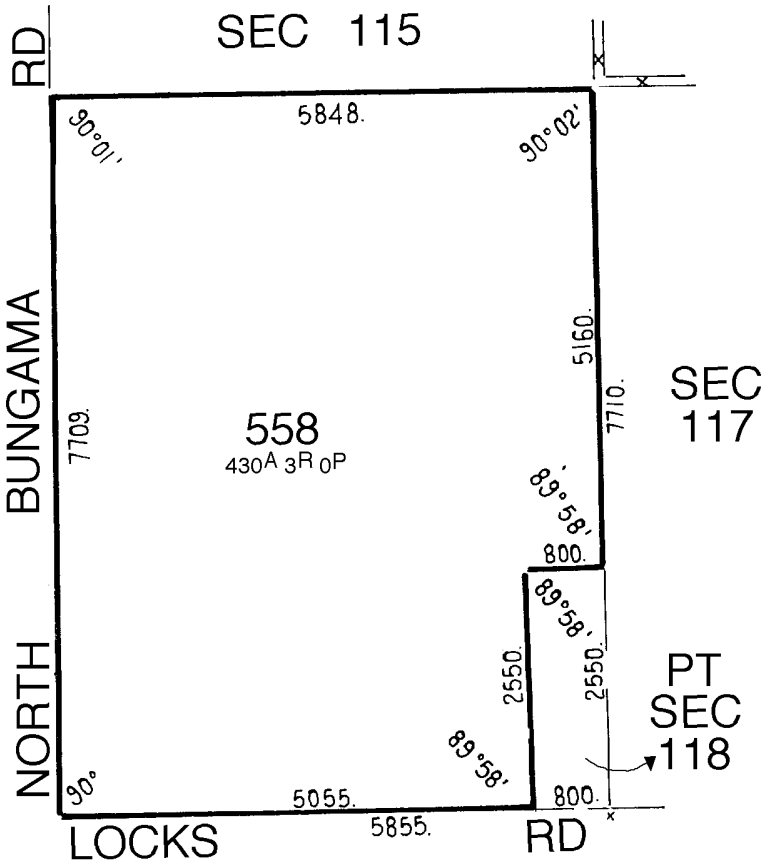
APPROVED FILED PLAN FOR LEASE PURPOSES FX48977
NEW EDITION CREATED DUE TO EXPIRATION OF LEASE

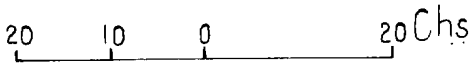
Administrative Interests NIL

Copyright Privacy Disclaimer: www.sailis.sa.gov.au/home/showCopyright www.sailis.sa.gov.au/home/showPrivacyStatement www.sailis.sa.gov.au/home/showDisclaimer

Product	Register Search (CT 6127/5)
Date/Time	13/02/2018 01:41PM
Customer Reference	11297 Bungama
Order ID	20180213007723
Cost	$28.25

THIS PLAN IS SCANNED FOR CERTIFICATE OF TITLE **3870/88**





FOR METRIC CONVERSION		
1 LINK	=	0·201168 METRES
1 CHAIN	=	100 LINKS
1 ACRE	=	0·404686 HECTARES
1 ROOD	=	1011·7 m²
1 PERCH	=	25·29 m²

NOTE: SUBJECT TO ALL LAWFULLY EXISTING PLANS OF DIVISION

Copyright Privacy Disclaimer: www.sailis.sa.gov.au/home/showCopyright www.sailis.sa.gov.au/home/showPrivacyStatement www.sailis.sa.gov.au/home/showDisclaimer

Government of South Australia
Department of Planning, Transport and Infrastructure

Product	Register Search (CT 5390/999)
Date/Time	21/06/2018 03:34PM
Customer Reference	11297 Bungama
Order ID	20180621009895
Cost	$28.25

REAL PROPERTY ACT, 1886
South Australia

The Registrar-General certifies that this Title Register Search displays the records maintained in the Register Book and other notations at the time of searching.

Certificate of Title - Volume 5390 Folio 999

Parent Title(s) CT 3870/87

Creating Dealing(s) CONVERTED TITLE

Title Issued 13/01/1997 **Edition** 6 **Edition Issued** 11/08/2017

Estate Type

FEE SIMPLE

Registered Proprietor

JACQUELYN ANN ATZE
ANTHONY GEORGE ATZE
OF 215 LOCKS ROAD NAPPERBY SA 5540
AS JOINT TENANTS

Description of Land

ALLOTMENT 559 FILED PLAN 188691
IN THE AREA NAMED NAPPERBY
HUNDRED OF NAPPERBY

Easements

NIL

Schedule of Dealings

NIL

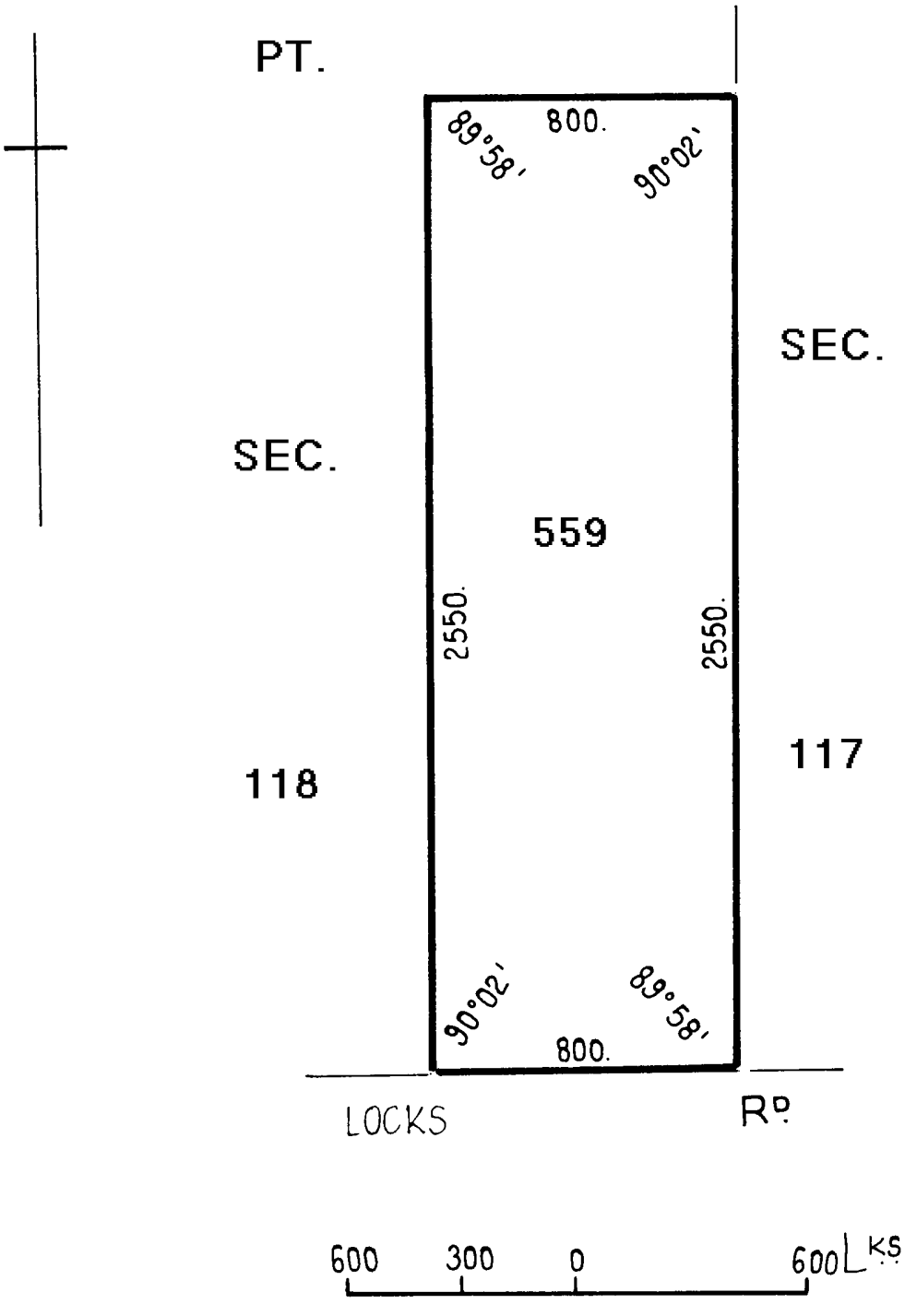
Notations

Dealings Affecting Title	NIL
Priority Notices	NIL
Notations on Plan	NIL
Registrar-General's Notes	NIL
Administrative Interests	NIL

Copyright Privacy Disclaimer: www.sailis.sa.gov.au/home/showCopyright www.sailis.sa.gov.au/home/showPrivacyStatement www.sailis.sa.gov.au/home/showDisclaimer

Product	Register Search (CT 5390/999)
Date/Time	21/06/2018 03:34PM
Customer Reference	11297 Bungama
Order ID	20180621009895
Cost	$28.25

THIS PLAN IS SCANNED FOR CERTIFICATE OF TITLE 3870/87



DISTANCES ARE IN LINKS
FOR METRIC CONVERSIONS
1 LINK = 0·201168 METRES
1 CHAIN = 100 LINKS

NOTE: SUBJECT TO ALL LAWFULLY EXISTING PLANS OF DIVISION

Copyright Privacy Disclaimer: www.sailis.sa.gov.au/home/showCopyright www.sailis.sa.gov.au/home/showPrivacyStatement www.sailis.sa.gov.au/home/showDisclaimer

Government of South Australia
Department of Planning, Transport and Infrastructure

Product	Register Search (CT 5360/334)
Date/Time	21/06/2018 03:28PM
Customer Reference	11297 Bungama
Order ID	20180621009773
Cost	$28.25

REAL PROPERTY ACT, 1886
South Australia

The Registrar-General certifies that this Title Register Search displays the records maintained in the Register Book and other notations at the time of searching.

Certificate of Title - Volume 5360 Folio 334

Parent Title(s) CT 3769/80

Creating Dealing(s) CONVERTED TITLE

Title Issued 09/09/1996 **Edition** 4 **Edition Issued** 28/04/2016

Estate Type

FEE SIMPLE

Registered Proprietor

ALAN WAYNE FRICKER
KATHLEEN TRAUDE FRICKER
OF PO BOX 764 PORT PIRIE SA 5540
AS JOINT TENANTS

Description of Land

ALLOTMENT 551 FILED PLAN 188683
IN THE AREA NAMED WARNERTOWN
HUNDRED OF NAPPERBY

Easements

NIL

Schedule of Dealings

Dealing Number	Description
12502264	MORTGAGE TO AUSTRALIAN CENTRAL CREDIT UNION LTD. (ACN: 087 651 125)

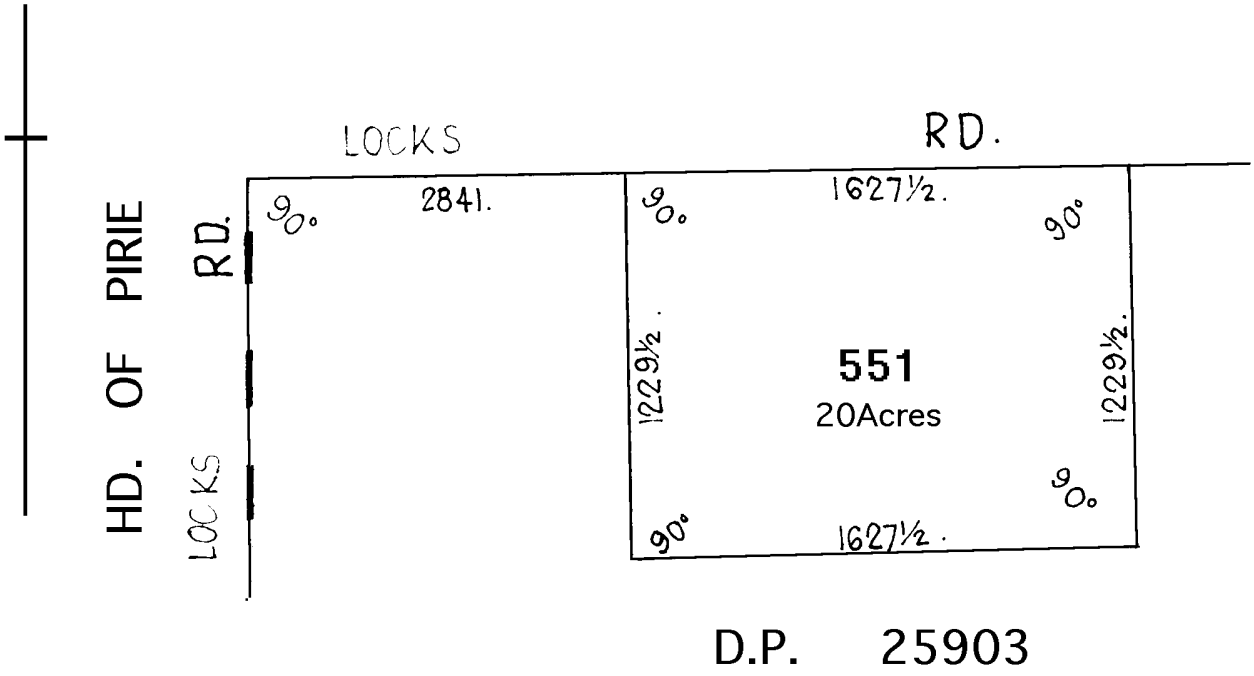
Notations

Dealings Affecting Title	NIL
Priority Notices	NIL
Notations on Plan	NIL
Registrar-General's Notes	NIL
Administrative Interests	NIL

Copyright Privacy Disclaimer: www.sailis.sa.gov.au/home/showCopyright www.sailis.sa.gov.au/home/showPrivacyStatement www.sailis.sa.gov.au/home/showDisclaimer

Product	Register Search (CT 5360/334)
Date/Time	21/06/2018 03:28PM
Customer Reference	11297 Bungama
Order ID	20180621009773
Cost	$28.25

THIS PLAN IS SCANNED FOR CERTIFICATE OF TITLE 3769/80



D.P. 25903

FOR METRIC CONVERSIONS		
1 LINK	=	0·201168 METRES
1 CHAIN	=	100 LINKS
1 ACRE	=	0·404686 HECTARES
1 ROOD	=	1011·7 m^2
1 PERCH	=	25·29 m^2

NOTE: SUBJECT TO ALL LAWFULLY EXISTING PLANS OF DIVISION

Copyright Privacy Disclaimer: www.sailis.sa.gov.au/home/showCopyright www.sailis.sa.gov.au/home/showPrivacyStatement www.sailis.sa.gov.au/home/showDisclaimer

REAL PROPERTY ACT, 1886
South Australia

The Registrar-General certifies that this Title Register Search displays the records maintained in the Register Book and other notations at the time of searching.

Certificate of Title - Volume 6037 Folio 29

Parent Title(s) CT 5108/759, CT 6028/970, CT 6028/974

Creating Dealing(s) RTC 11176946

Title Issued 18/06/2009 **Edition** 4 **Edition Issued** 14/09/2015

Estate Type

FEE SIMPLE

Registered Proprietor

TILLER AG PTY. LTD. (ACN: 130 458 552)
OF PO BOX 1475 PORT PIRIE SA 5540

Description of Land

ALLOTMENT 20 DEPOSITED PLAN 80628
IN THE AREA NAMED NAPPERBY
HUNDRED OF NAPPERBY

Easements

SUBJECT TO EASEMENT(S) OVER THE LAND MARKED A TO THE MINISTER FOR INFRASTRUCTURE (T 5096344)

SUBJECT TO FREE AND UNRESTRICTED RIGHT(S) OF WAY OVER THE LAND MARKED B

SUBJECT TO FREE AND UNRESTRICTED RIGHT(S) OF WAY OVER THE LAND MARKED C (RTC 11176946)

Schedule of Dealings

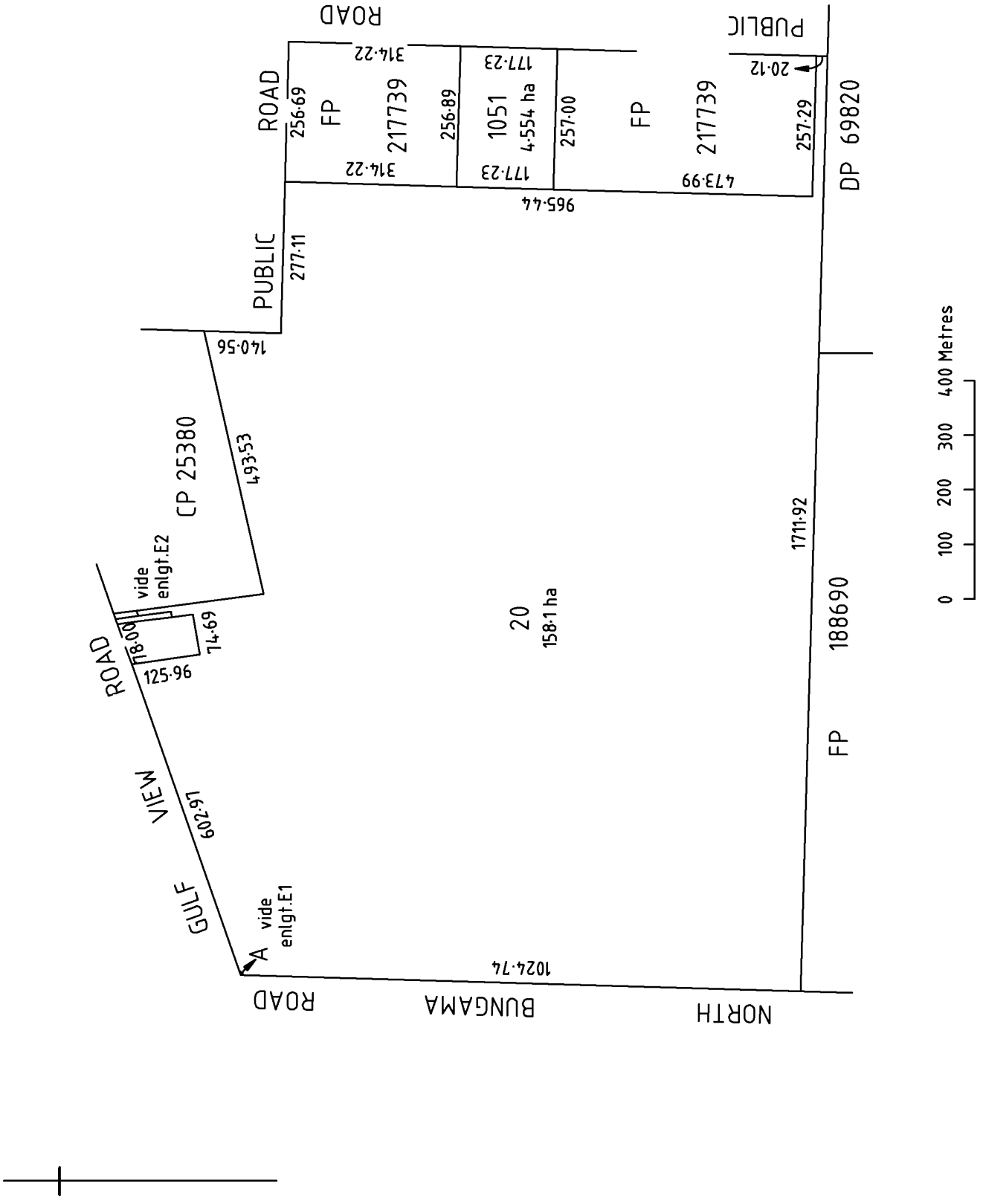
Dealing Number	Description
11200895	AGREEMENT UNDER DEVELOPMENT ACT, 1993 PURSUANT TO SECTION 57(2)
12382826	MORTGAGE TO RABOBANK AUSTRALIA LTD. (ACN: 001 621 129)

Notations

Dealings Affecting Title	NIL
Priority Notices	NIL
Notations on Plan	NIL
Registrar-General's Notes	NIL
Administrative Interests	NIL

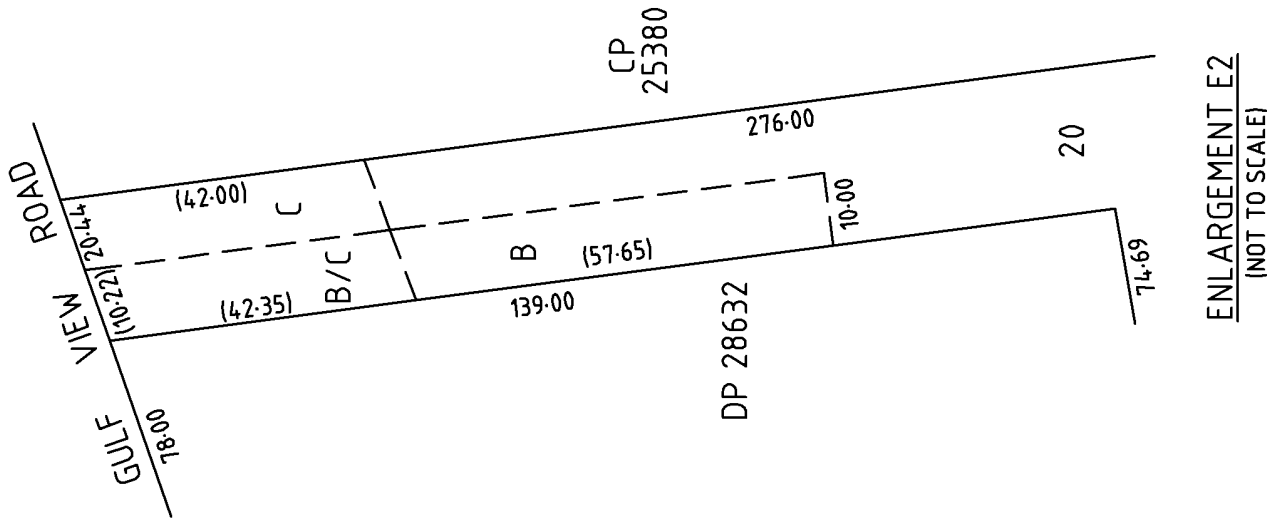
Copyright Privacy Disclaimer: www.sailis.sa.gov.au/home/showCopyright www.sailis.sa.gov.au/home/showPrivacyStatement www.sailis.sa.gov.au/home/showDisclaimer

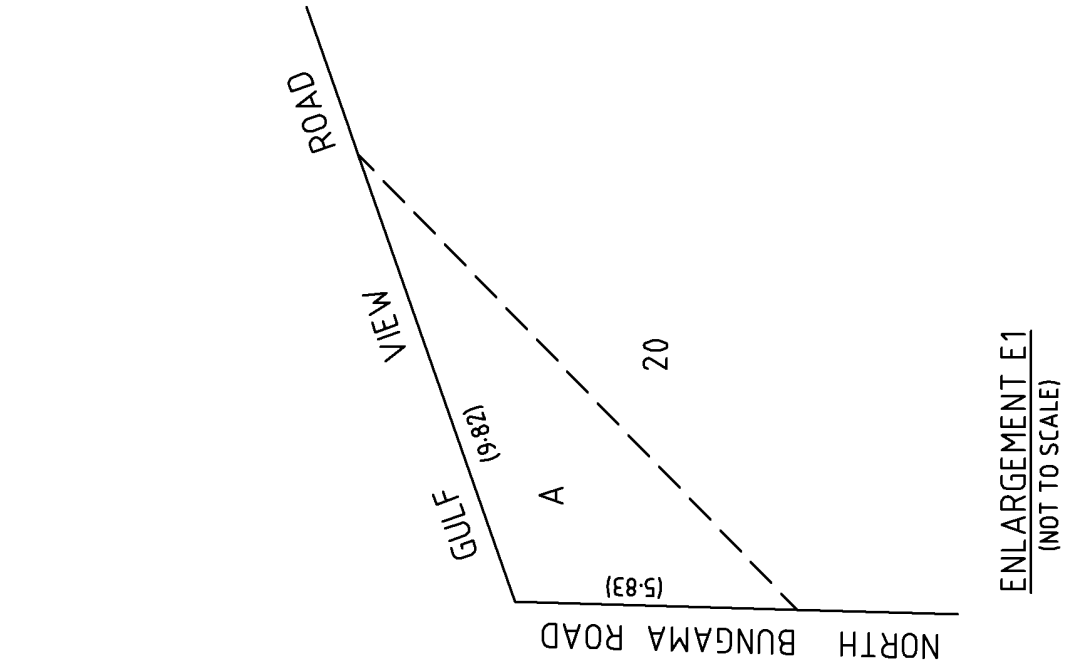
Product	Register Search (CT 6037/29)
Date/Time	13/02/2018 02:33PM
Customer Reference	
Order ID	20180213008991
Cost	$28.25



Copyright Privacy Disclaimer: www.sailis.sa.gov.au/home/showCopyright www.sailis.sa.gov.au/home/showPrivacyStatement www.sailis.sa.gov.au/home/showDisclaimer

Product	Register Search (CT 6037/29)
Date/Time	13/02/2018 02:33PM
Customer Reference	
Order ID	20180213008991
Cost	$28.25





Copyright Privacy Disclaimer: www.sailis.sa.gov.au/home/showCopyright www.sailis.sa.gov.au/home/showPrivacyStatement www.sailis.sa.gov.au/home/showDisclaimer

REAL PROPERTY ACT, 1886
South Australia

The Registrar-General certifies that this Title Register Search displays the records maintained in the Register Book and other notations at the time of searching.

Certificate of Title - Volume 5776 Folio 531

Parent Title(s) CT 5734/976

Creating Dealing(s) RTD 8718368, V 8826696

Title Issued 23/05/2000 **Edition** 3 **Edition Issued** 12/10/2001

Estate Type

FEE SIMPLE

Registered Proprietor

TRANSMISSION LESSOR CORPORATION
OF 200 VICTORIA SQUARE ADELAIDE SA 5000

Description of Land

ALLOTMENT 501 DEPOSITED PLAN 52803
IN THE AREA NAMED BUNGAMA
HUNDRED OF PIRIE

Easements

SUBJECT TO RIGHT(S) OF WAY OVER THE LAND MARKED A (V 8826696)

Schedule of Dealings

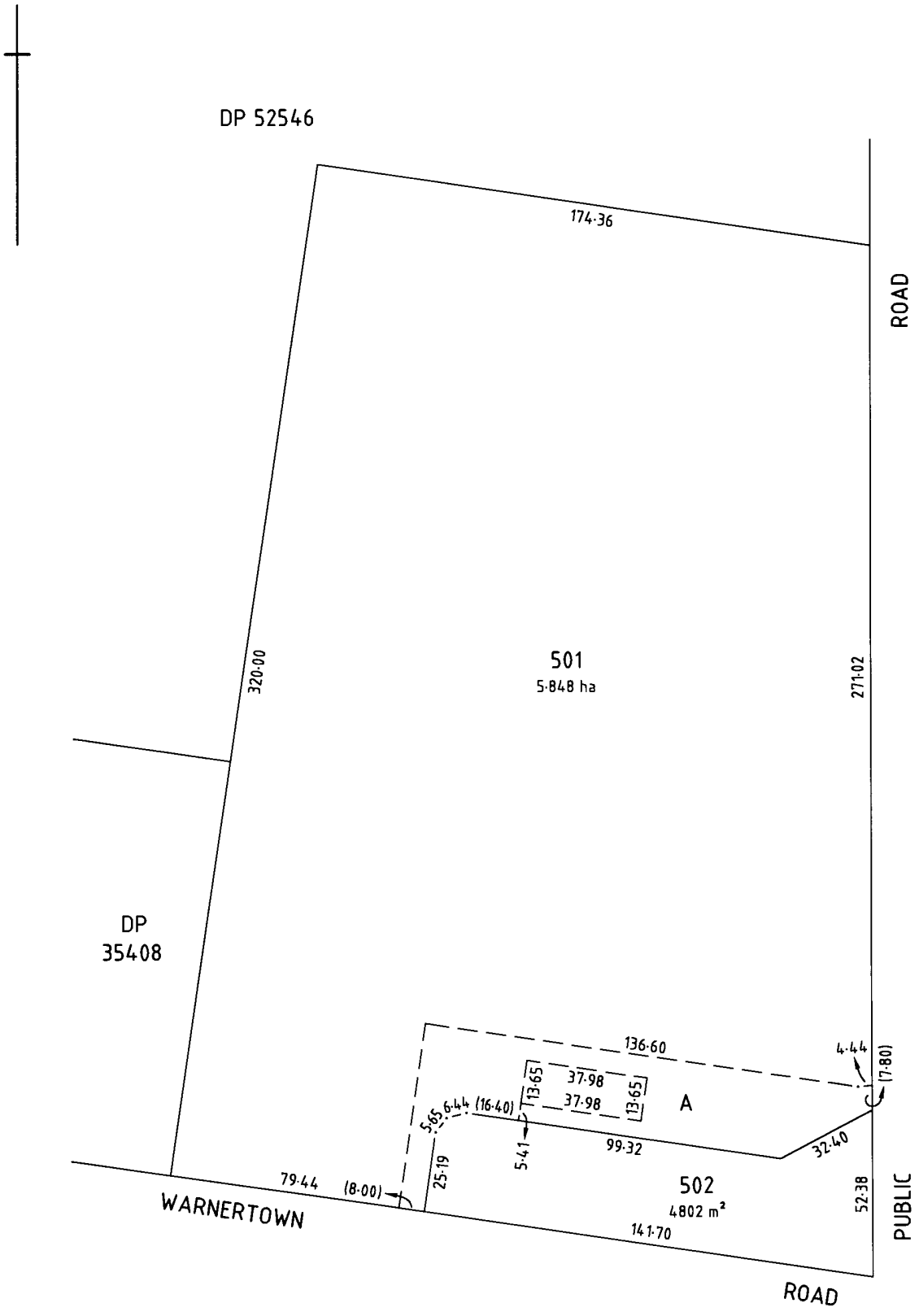
Dealing Number	Description
9061500	LEASE TO ELECTRANET PTY. LTD. COMMENCING ON 31/10/2000 AND EXPIRING ON 30/10/2200 PURSUANT TO ELECTRICITY CORPORATIONS (RESTRUCTURING AND DISPOSAL) ACT 1999

Notations

Dealings Affecting Title	NIL
Priority Notices	NIL
Notations on Plan	NIL
Registrar-General's Notes	NIL
Administrative Interests	NIL

Copyright Privacy Disclaimer: www.sailis.sa.gov.au/home/showCopyright www.sailis.sa.gov.au/home/showPrivacyStatement www.sailis.sa.gov.au/home/showDisclaimer

Product	Register Search (CT 5776/531)
Date/Time	13/03/2018 09:52AM
Customer Reference	11297 Bungama
Order ID	20180313001929
Cost	$28.25



Copyright Privacy Disclaimer: www.sailis.sa.gov.au/home/showCopyright www.sailis.sa.gov.au/home/showPrivacyStatement www.sailis.sa.gov.au/home/showDisclaimer

REAL PROPERTY ACT, 1886
South Australia

The Registrar-General certifies that this Title Register Search displays the records maintained in the Register Book and other notations at the time of searching.

Certificate of Title - Volume 5776 Folio 532

Parent Title(s) CT 5734/976

Creating Dealing(s) RTD 8718368, V 8826696

Title Issued 23/05/2000 **Edition** 2 **Edition Issued** 22/10/2000

Estate Type

FEE SIMPLE

Registered Proprietor

DISTRIBUTION LESSOR CORPORATION
OF 1 ANZAC HIGHWAY KESWICK SA 5035

Description of Land

ALLOTMENT 502 DEPOSITED PLAN 52803
IN THE AREA NAMED BUNGAMA
HUNDRED OF PIRIE

Easements

TOGETHER WITH RIGHT(S) OF WAY OVER THE LAND MARKED A (V 8826696)

Schedule of Dealings

Dealing Number	Description
8890000	LEASE TO CKI UTILITIES DEVELOPMENT LTD., PAI UTILITIES DEVELOPMENT LTD., SPARK INFRASTRUCTURE SA (NO. 1) PTY. LTD., SPARK INFRASTRUCTURE SA (NO. 3) PTY. LTD. AND SPARK INFRASTRUCTURE SA (NO. 2) PTY. LTD. COMMENCING ON 28/1/2000 AND EXPIRING ON 27/1/2200 AS TO THE SHARES SPECIFIED THEREIN PURSUANT TO THE ELECTRICITY CORPORATIONS (RESTRUCTURING AND DISPOSAL) ACT 1999

Notations

Dealings Affecting Title NIL

Priority Notices NIL

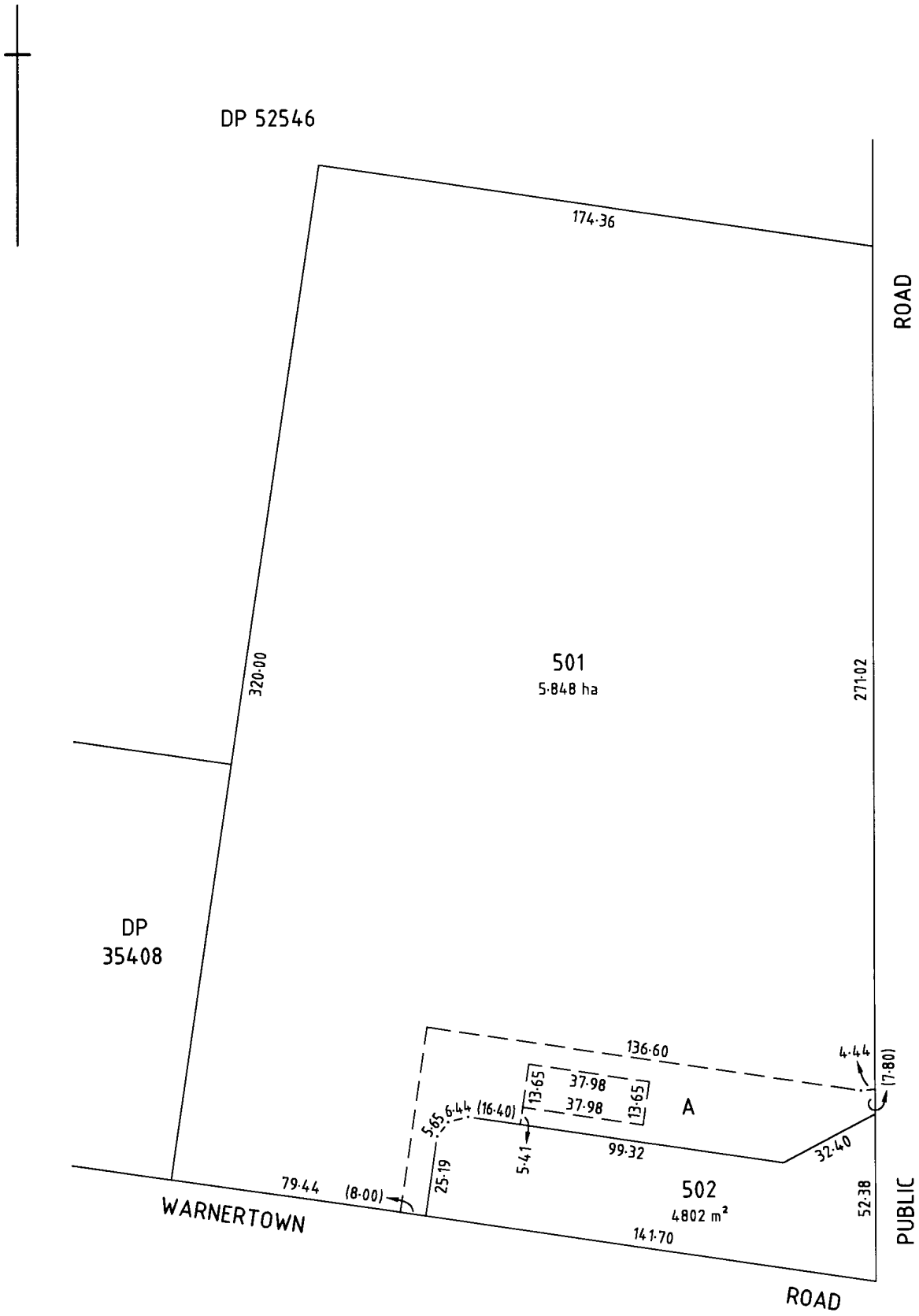
Notations on Plan NIL

Registrar-General's Notes

ENDORSEMENT NAME(S) UPDATED REFER DEALING 12261488

Administrative Interests NIL

Copyright Privacy Disclaimer: www.sailis.sa.gov.au/home/showCopyright www.sailis.sa.gov.au/home/showPrivacyStatement www.sailis.sa.gov.au/home/showDisclaimer



Copyright Privacy Disclaimer: www.sailis.sa.gov.au/home/showCopyright www.sailis.sa.gov.au/home/showPrivacyStatement www.sailis.sa.gov.au/home/showDisclaimer

Government of South Australia
Department of Planning, Transport and Infrastructure

Product	Register Search (CT 5978/766)
Date/Time	09/03/2018 02:42PM
Customer Reference	
Order ID	20180309008796
Cost	$28.25

REAL PROPERTY ACT, 1886
South Australia

The Registrar-General certifies that this Title Register Search displays the records maintained in the Register Book and other notations at the time of searching.

Certificate of Title - Volume 5978 Folio 766

Parent Title(s) CT 5971/856, CT 5971/857, CT 5971/858

Creating Dealing(s) RTU 10554746

Title Issued 22/01/2007 **Edition** 3 **Edition Issued** 11/11/2016

Estate Type

FEE SIMPLE

Registered Proprietor

BLUE SKY GENERATION PTY. LTD. (ACN: 612 989 634)
OF BOX 644 COLLINS STREET WEST POST OFFICE MELBOURNE VIC 8007

Description of Land

ALLOTMENT 55 DEPOSITED PLAN 71831
IN THE AREA NAMED BUNGAMA
HUNDRED OF PIRIE

Easements

SUBJECT TO EASEMENT(S) OVER THE LAND MARKED E AND F TO TRANSMISSION LESSOR CORPORATION OF 1 UNDIVIDED 2ND PART (SUBJECT TO LEASE 9061500) AND ELECTRANET PTY. LTD. OF 1 UNDIVIDED 2ND PART (RTC 8722735 AND TG 10500024 RESPECTIVELY)

Schedule of Dealings

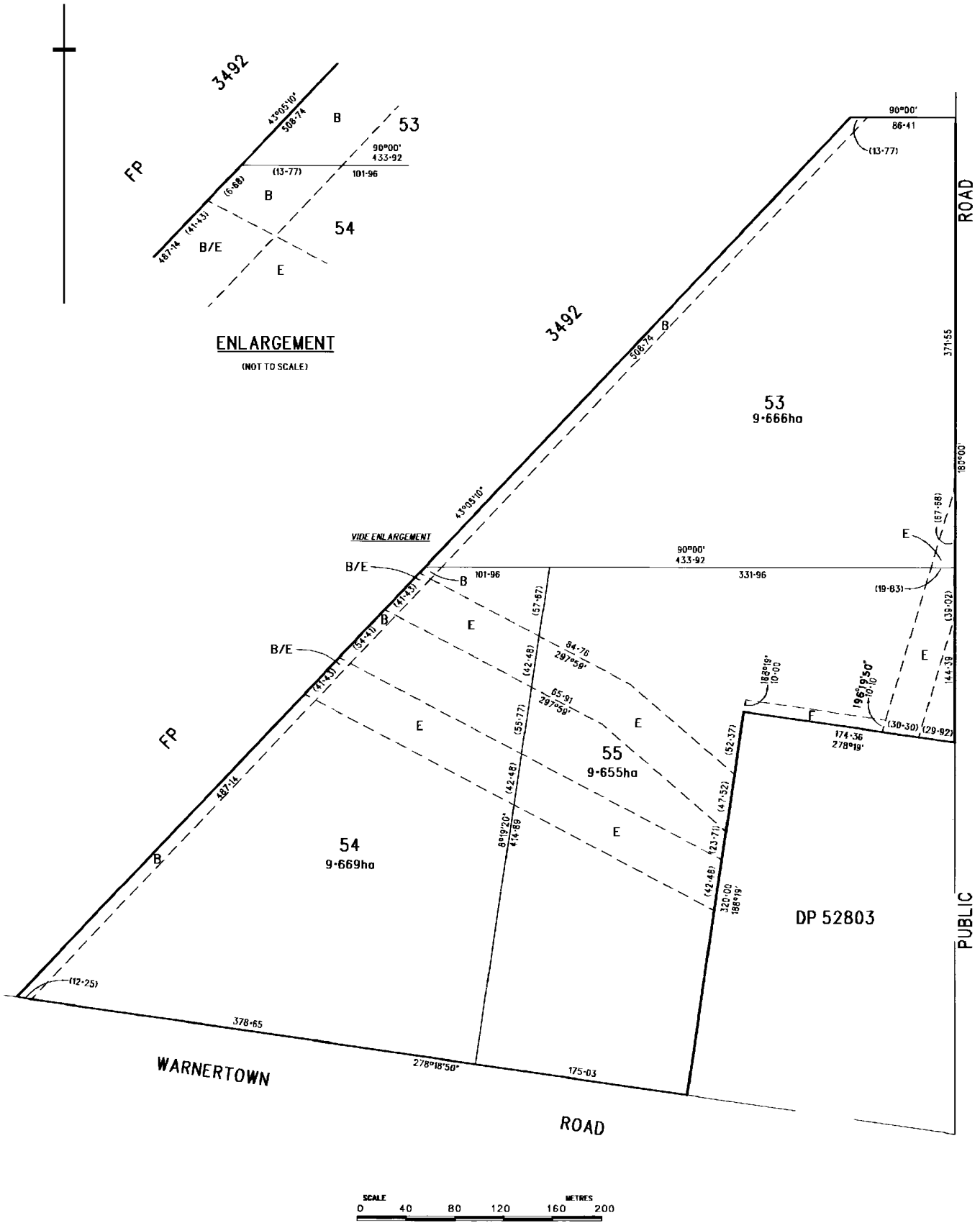
NIL

Notations

Dealings Affecting Title	NIL
Priority Notices	NIL
Notations on Plan	NIL
Registrar-General's Notes	NIL
Administrative Interests	NIL

Copyright Privacy Disclaimer: www.sailis.sa.gov.au/home/showCopyright www.sailis.sa.gov.au/home/showPrivacyStatement www.sailis.sa.gov.au/home/showDisclaimer

Product	Register Search (CT 5978/766)
Date/Time	09/03/2018 02:42PM
Customer Reference	
Order ID	20180309008796
Cost	$28.25



Copyright Privacy Disclaimer: www.sailis.sa.gov.au/home/showCopyright www.sailis.sa.gov.au/home/showPrivacyStatement www.sailis.sa.gov.au/home/showDisclaimer

Product	Register Search (CT 5972/304)
Date/Time	15/02/2018 11:49AM
Customer Reference	11297 Bungama
Order ID	20180215005014
Cost	$28.25

REAL PROPERTY ACT, 1886
South Australia

The Registrar-General certifies that this Title Register Search displays the records maintained in the Register Book and other notations at the time of searching.

Certificate of Title - Volume 5972 Folio 304

Parent Title(s) CT 3954/13, CT 5946/879

Creating Dealing(s) VE 10457315, TG 10457316

Title Issued 06/10/2006 **Edition** 3 **Edition Issued** 12/04/2016

Estate Type

FEE SIMPLE

Registered Proprietor

CRAIG ADAM MANNERS
LISA ANGELA MANNERS
OF 465 WARNERTOWN ROAD BUNGAMA SA 5540
AS JOINT TENANTS

Description of Land

ALLOTMENT 1 DEPOSITED PLAN 24255
IN THE AREA NAMED BUNGAMA
HUNDRED OF PIRIE

Easements

SUBJECT TO EASEMENT(S) OVER THE LAND MARKED E (TG 10457316)

SUBJECT TO EASEMENT(S) OVER THE LAND MARKED B AND F TO DISTRIBUTION LESSOR CORPORATION (SUBJECT TO LEASE 8890000) (T 2839453 AND T 3398857 RESPECTIVELY)

SUBJECT TO EASEMENT(S) OVER THE LAND MARKED A AND D TO TRANSMISSION LESSOR CORPORATION OF 1 UNDIVIDED 2ND PART (SUBJECT TO LEASE 9061500) AND ELECTRANET PTY. LTD. OF 1 UNDIVIDED 2ND PART (T 1801173 AND TG 10247803 RESPECTIVELY)

Schedule of Dealings

Dealing Number	Description
12493133	MORTGAGE TO WESTPAC BANKING CORPORATION (ACN: 007 457 141)

Notations

Dealings Affecting Title NIL

Priority Notices NIL

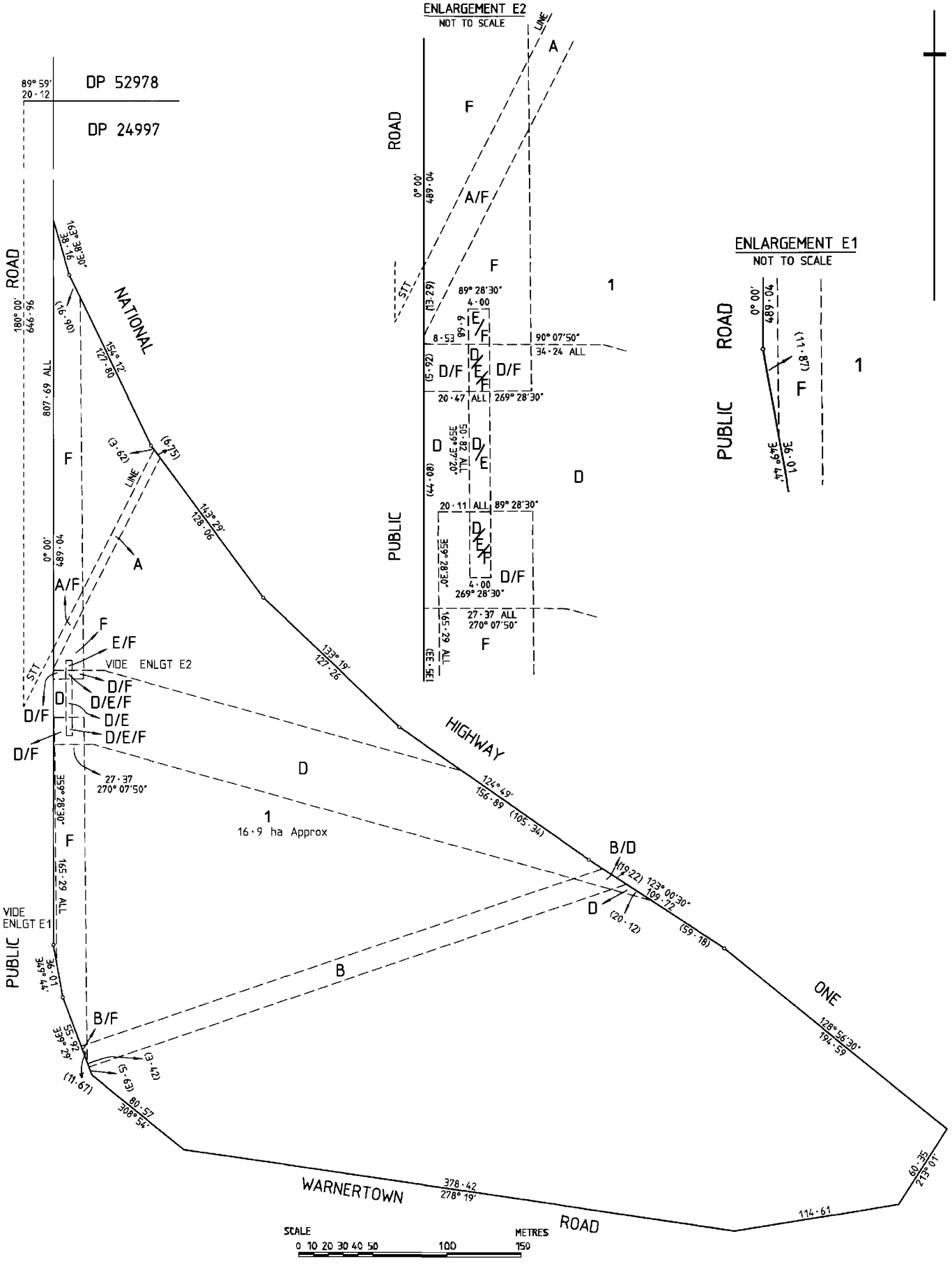
Notations on Plan NIL

Registrar-General's Notes

CONTROLLED ACCESS ROAD VIDE PLAN 5

Administrative Interests NIL

Copyright Privacy Disclaimer: www.sailis.sa.gov.au/home/showCopyright www.sailis.sa.gov.au/home/showPrivacyStatement www.sailis.sa.gov.au/home/showDisclaimer



Copyright Privacy Disclaimer: www.sailis.sa.gov.au/home/showCopyright www.sailis.sa.gov.au/home/showPrivacyStatement www.sailis.sa.gov.au/home/showDisclaimer

APPENDIX 3

Indicative Layouts

3.1 Indicative PVS Operations Layout

3.2 Indicative BESS Operations layout, Indicative Project Substation Layout and Indicative Operations and Maintenance Layout

3.3 Indicative Connection Layout to ElectraNet's Bungama Substation

3.1 Indicative PVS Operations Layout

Legend

- Project Area
- Bungama Substation
- Visual Buffer Zone
- Proposed Battery Energy Storage System
- Proposed Substation
- Proposed O & M Buildings
- Proposed Photovoltaic Energy Generation System (PVS) Infrastructure
- Proposed Internal Tracks
- Proposed Laydown Area
- Existing Easement
- Existing Overhead Transmission Line
- Existing Underground Gas Pipeline
- Existing Water Main

Site Entry

Site Entry

Site Entry

Site Entry

Site Entry

Proposed Substation & Battery Energy Storage System (BESS)

GULF VIEW ROAD

AUGUSTA HIGHWAY

BUNGAMA NORTH ROAD

LOCKS ROAD

LOCKS ROAD

WARNERTOWN ROAD

RAILWAY TERRACE

WAITS ROAD

AUGUSTA HIGHWAY

Note: Refer to Appendix 3 "Indicative Connection Layout to ElectraNet's Bungama Substation (Sheet 3 & 4 of 5)" for connection route to substation.

© Google (2018)

Author:	SW
Reviewer:	SMC/ JB
A3 Scale:	1:13,000
Job Ref/Version:	11297/ V05

0 100 200 300 400 500 m

Accuracy: location and scale of features is indicative only

Map Projection: GDA 1994 MGA Zone 54

Sheet 1 of 5

Indicative PVS Operations Layout

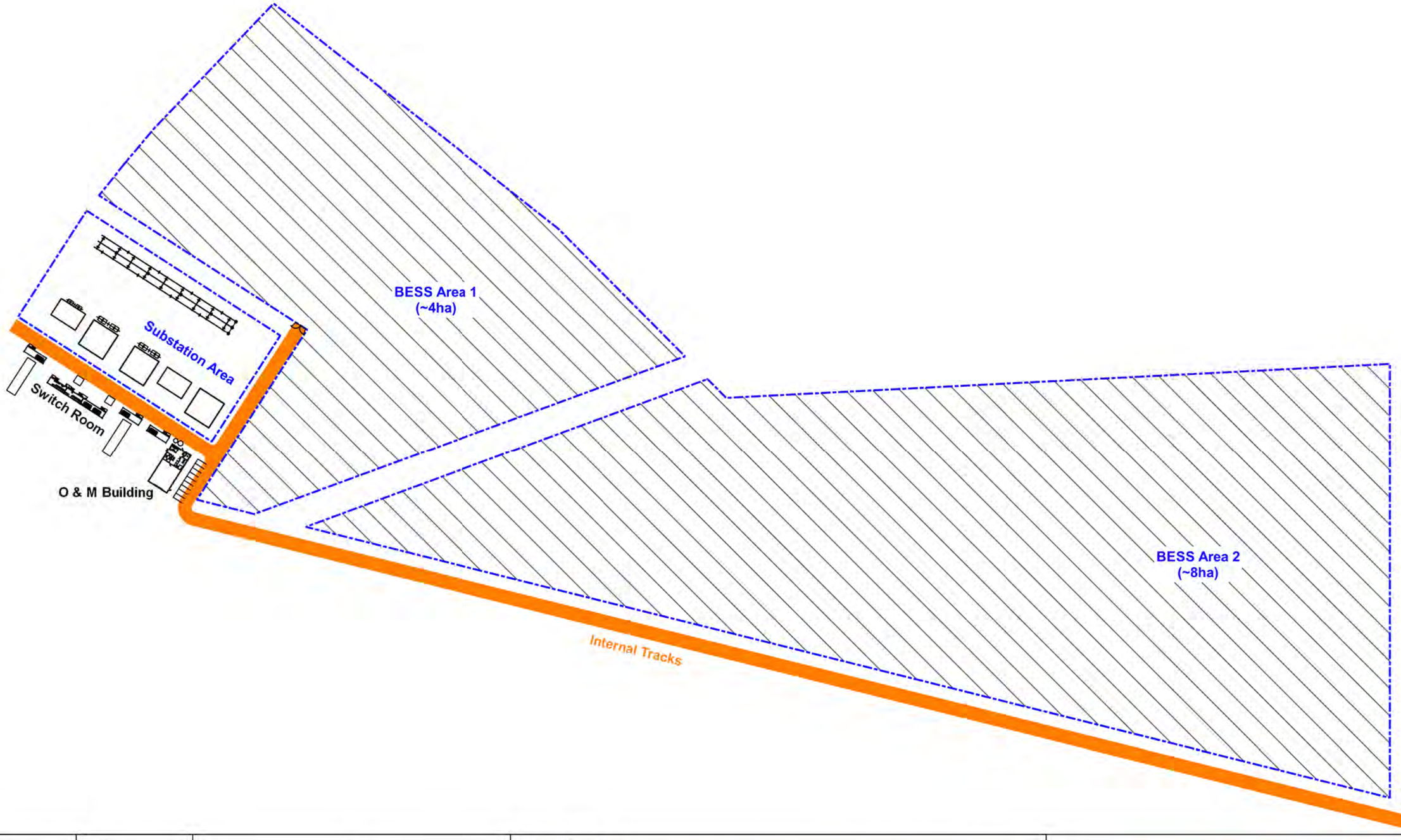
Bungama Solar | Bungama SA Australia

29/11/2018

BUNGAMA SOLAR

11297_PR_Preliminary Layout.qgs

3.2 Indicative BESS Operations layout, Indicative Project Substation Layout and Indicative Operations and Maintenance Layout



Author:	SW
Reviewer:	SMC/ JB
A3 Scale:	1:2,000
Job Ref/Version:	11297/ V01

0 25 50 75 100 m

Sheet 2 of 5

Indicative BESS Operations Layout, Project Substation Layout and Operations and Maintenance Layout

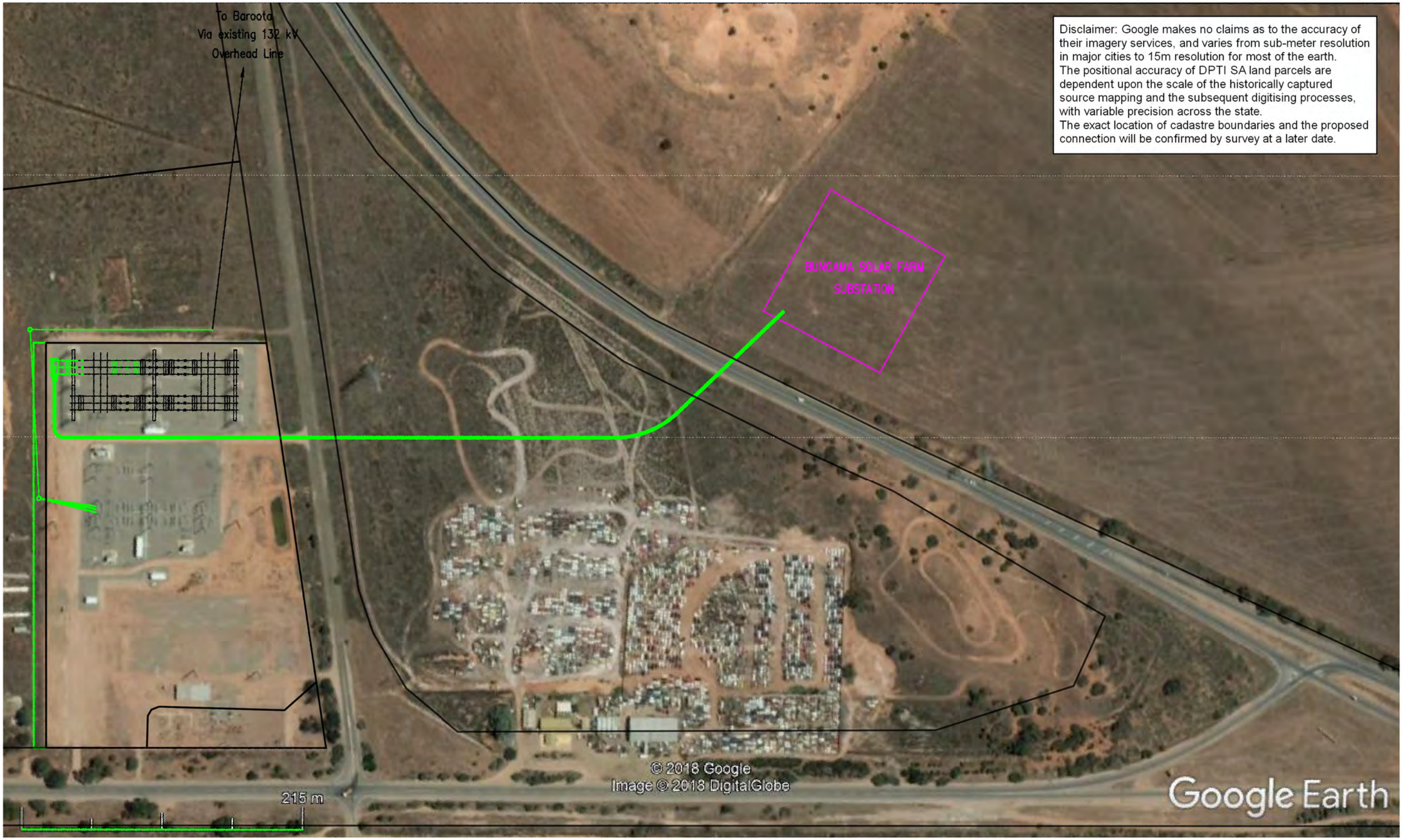
Bungama Solar | Bungama SA Australia

29/11/2018

BUNGAMA SOLAR

11297_PR_Indicative_BESS_Substation_OM.qgs

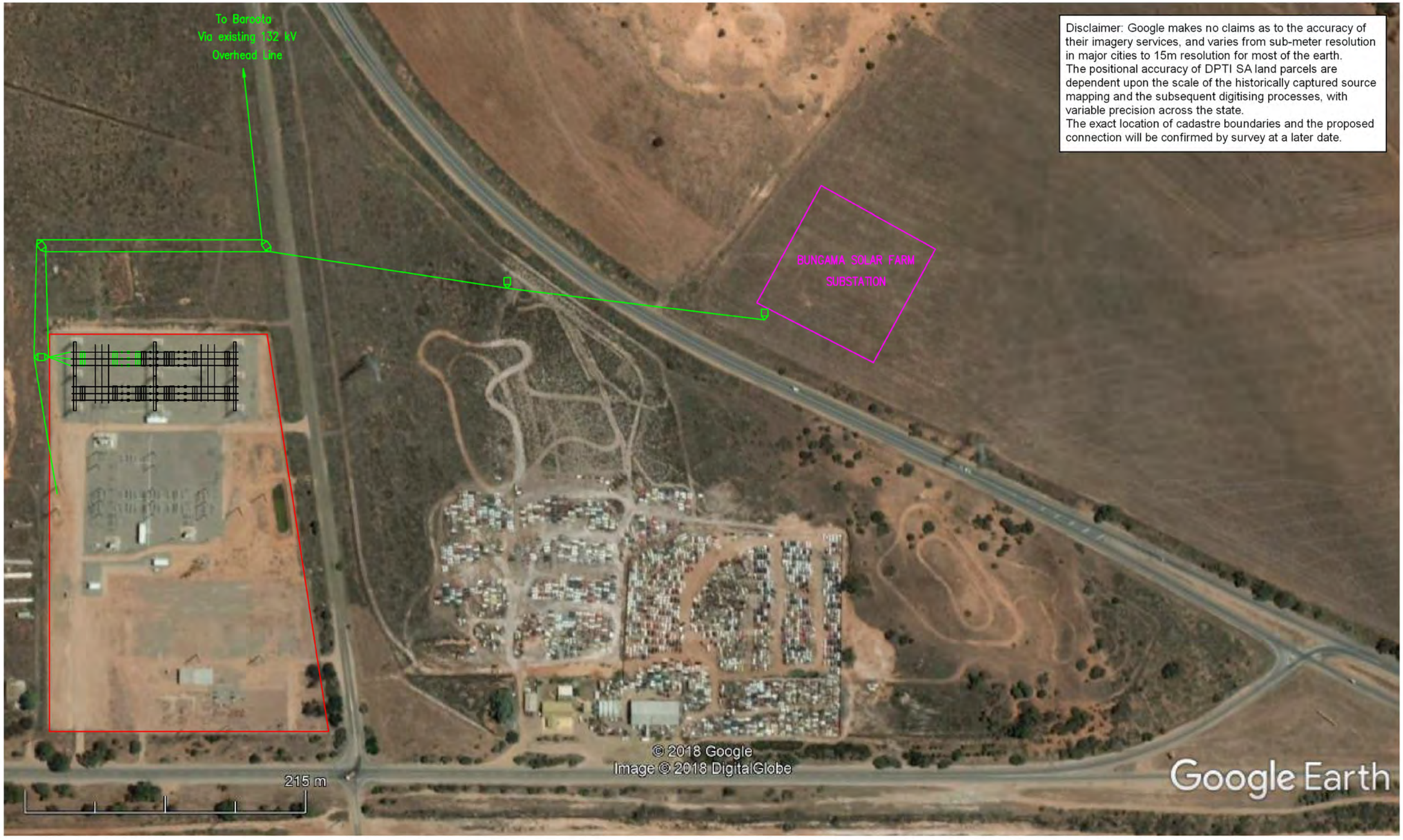
3.3 Indicative Connection Layout to ElectraNet's Bungama Substation



Author:	SW		**Sheet 3 of 5**	**Indicative Connection Layout to ElectraNet's Bungama Substation (Underground Cable - Option 1)**
Reviewer:	SMC/ JB			
A3 Scale:	N/A		**Bungama Solar | Bungama SA Australia**	
Job Ref/Version:	11297/ V02		29/11/2018	

BUNGAMA SOLAR

11297_PR_Indicative_Connection_Layout1.qgs



Disclaimer: Google makes no claims as to the accuracy of their imagery services, and varies from sub-meter resolution in major cities to 15m resolution for most of the earth.
The positional accuracy of DPTI SA land parcels are dependent upon the scale of the historically captured source mapping and the subsequent digitising processes, with variable precision across the state.
The exact location of cadastre boundaries and the proposed connection will be confirmed by survey at a later date.

Author:	SW
Reviewer:	SMC/ JB
A3 Scale:	N/A
Job Ref/Version:	11297/ V01

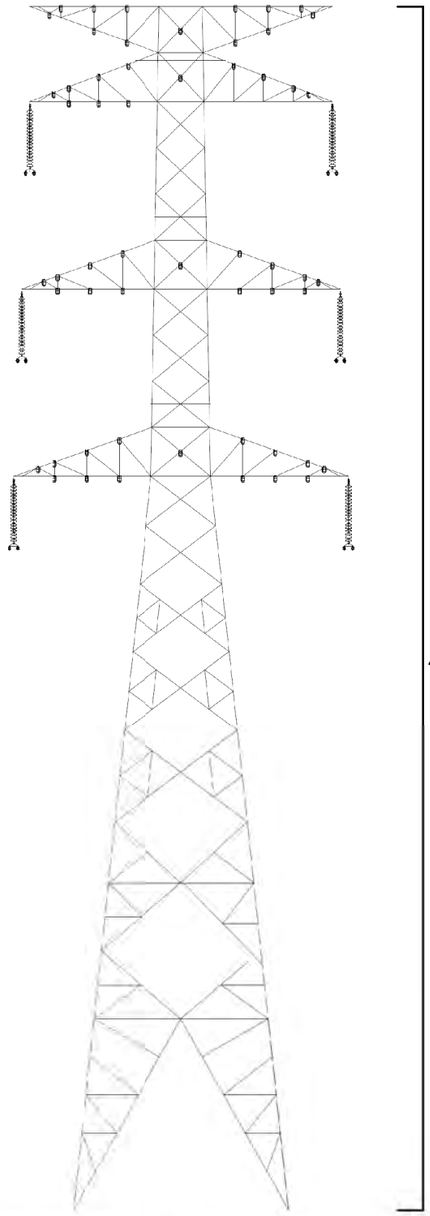
Sheet 4 of 5 **Indicative Connection Layout to ElectraNet's Bungama Substation (Overhead 275kV Transmission Line - Option 2)**

Bungama Solar | Bungama SA Australia

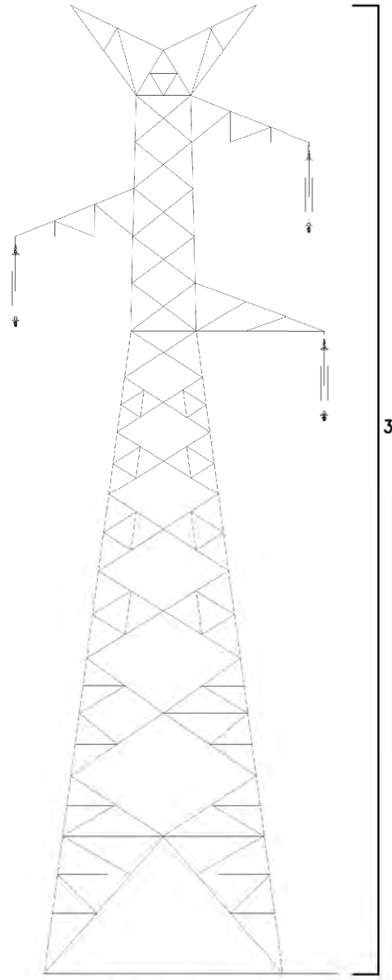
29/11/2018

BUNGAMA SOLAR

11297_PR_Indicative_Connection_Layout2.qgs



Double Circuit 275kV Lattice Tower



Single Circuit 275kV Lattice

Author:	SW		**Sheet 5 of 5**	BUNGAMA SOLAR
Reviewer:	SMC/ JB		**Typical Overhead Transmission Towers**	
A3 Scale:	N/A		**Bungama Solar | Bungama SA Australia**	
Job Ref/Version:	11297/ V01		29/11/2018	

11297_PR_Typical_OH_Transmission.qgs

APPENDIX 4

Typical Construction Camp Layout

BUNGAMA SOLAR

Legend

- Project Area
- Bungama Substation
- Possible Construction Camp Site
- Visual Buffer Zone
- Indicative PVS Operations Layout
- Existing Easement
- Existing Overhead Transmission Line
- Existing Underground Gas Pipeline
- Existing Water Main

Site Entry

GULF VIEW ROAD

AUGUSTA HIGHWAY

BUNGAMA NORTH ROAD

Site Entry

Site Entry

Site Entry

LOCKS ROAD

Proposed Substation & Battery Energy Storage System (BESS)

Site Entry

LOCKS ROAD

Site Entry

WARNERTOWN ROAD

Site Entry

Note: Refer to Appendix 3 "Indicative Connection Layout to ElectraNet's Bungama Substation (Sheet 3 & 4 of 4)" for connection route to substation.

RAILWAY TERRACE

WAITS ROAD

AUGUSTA HIGHWAY

© Google (2018)

Author:	SW
Reviewer:	SMC/ JB
A3 Scale:	1:13,000
Job Ref/Version:	11297/ V01

0 100 200 300 400 500 m

Accuracy: location and scale of features is indicative only

Map Projection: GDA 1994 MGA Zone 54

Sheet 1 of 2

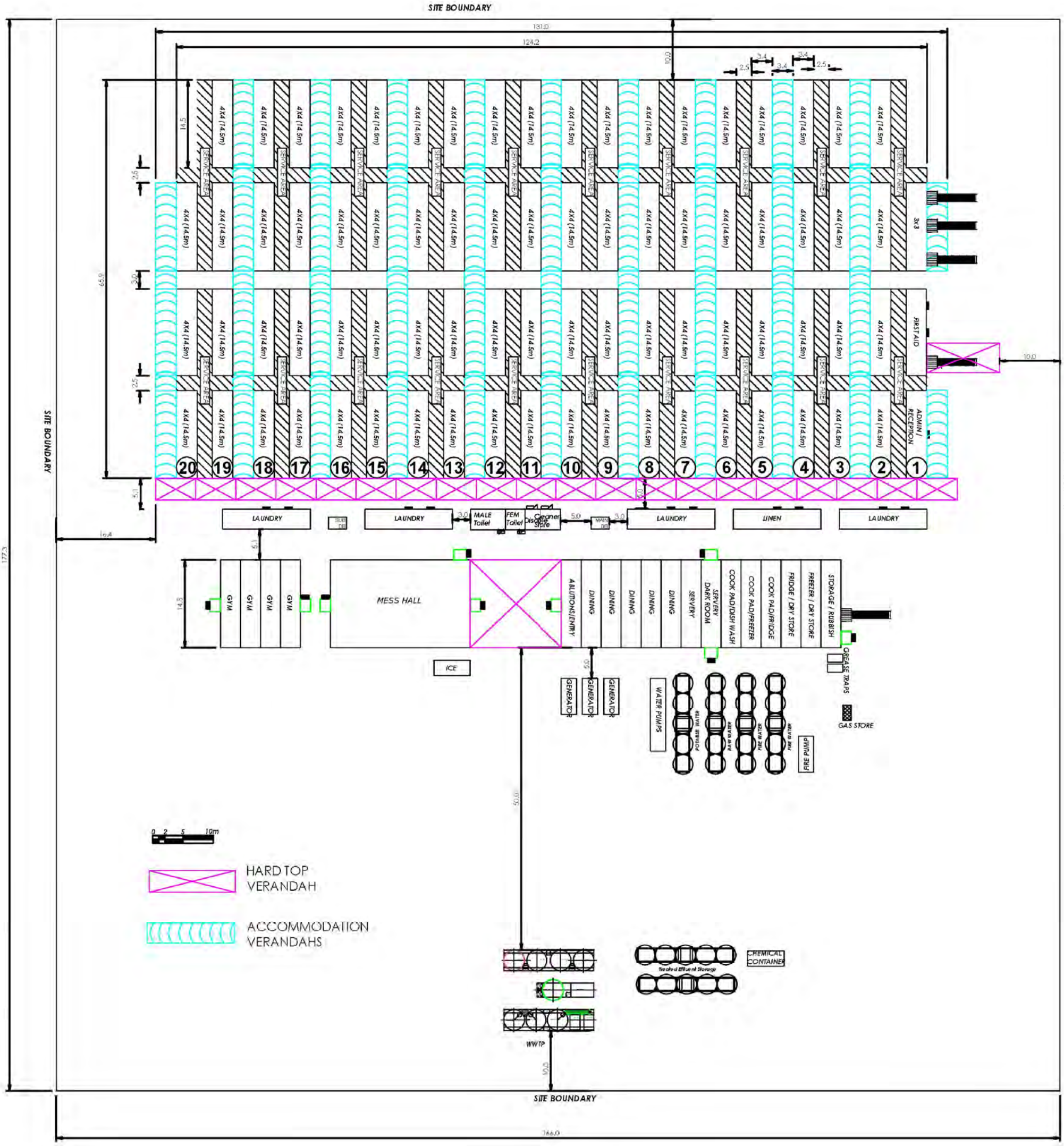
Possible Location of Construction Camp

Bungama Solar | Bungama SA Australia

23/11/2018

BUNGAMA SOLAR

11297_PR_Potential_Construction_Camps.qgs



Note: While the Project has a preference for local accommodation, if insufficient accommodation suitable to meet the requirements of the Project is not available, then a temporary construction workers camp on a suitable part of the Project area

Author:	SW
Reviewer:	SMC/ JB
A3 Scale:	N/A
Job Ref/Version:	11297/ V01

Sheet 2 of 2

Indicative Construction Camp Layout Plan

Bungama Solar | Bungama SA Australia

23/11/2018

BUNGAMA SOLAR

11297_PR_Indicative_Camp_Layout.qgs

APPENDIX 5

Development Plan Assessment

BUNGAMA SOLAR

DEVELOPMENT PLAN ASSESSMENT

Prepared for Bungama Solar

BUNGAMA SOLAR

EPS ENERGY

Reference No. 11297 November 18 www.bungamasolar.com.au

QUALITY ASSURANCE AND DECLARATION

Quality Assurance and Version Control Table		
Project:	Bungama Solar Project	
Client:	Bungama Solar 1 Pty Ltd and Bungama Solar 2 Pty Ltd	
Rev:	**Date:**	**Reference:**
V01	29.11.2018	11297_Bungama Development Plan Assessment
Checked by:	Marina Budisavljevic	
Approved by:	Steve McCall	
Declaration:	*The opinions and declarations in this document are ascribed to EPS Energy and are made in good faith and trust that such statements are neither false nor misleading.* *In preparing this document, EPS Energy has considered and relied upon information obtained from the public domain, supplemented by discussions between key EPS Energy staff, representatives from governing agencies and independents, including the client and specialist consultants.*	
Applicant:	EPS Energy PO Box 195 Charlestown NSW 2290 (02) 9258 1362	
Prepared By:	Simon Duffy	
Project Land:	CT 6037/29 – A20 DP80628 CT 6127/5 – A558 FP188690 CT 5954/187 – A52 DP25903 CT 5949/272 – A4 DP24997 CT 5390/999 – A559 FP188691 CT 5360/334 – A551 FP188683 CT 5972/304 – A1 DP24255 CT 5776/531 – A501 DP52803 CT 5776/532 – A502 DP52803 CT 5978/766 – A55 DP71831	

PORT PIRIE REGIONAL COUNCIL DEVELOPMENT PLAN (CONSOLIDATED – 31 OCTOBER 2017)

Assessment Section		Project Response
Primary Production Zone Provisions		
Objectives **(P147)**	*1. The long-term continuation of primary production, including value adding activities associated with primary production.*	The Bungama Solar project ('the Project') is located within the Primary Production Zone as shown in Zone Map PtPi/14 and PtPi/16. After the Project's decommissioning the Project area will be available for agricultural production. Consequently, the Project will not have an adverse impact on the long-term agricultural use of the land.
	2. Economically productive, efficient and environmentally sustainable primary production.	The Project will implement a Construction Management Plan for the construction phase and Operation Management Plan for the operation phase approved, by the Minister for Planning or delegate, to manage potential adverse impacts. The Project will not impede the operation of the established agricultural land uses in the area through any nuisance or harmful creating impact.
	3. Allotments of a size and configuration that promote the efficient use of land for primary production.	The Project will not alter the allotment size or configuration. After the Project's decommissioning, the Project area will be available for agricultural production. Consequently, the Project will not have an adverse impact on the long-term agricultural use of the land.

Assessment Section		Project Response
	4. Protection of primary production from encroachment by incompatible land uses and protection of scenic qualities of rural landscapes.	The Project is envisaged in the Primary Production Zone and therefore is not considered an incompatible land use. The key features of the Project's rural landscape include, cleared land used for cropping and grazing, vegetated land used for grazing and utility scale electricity infrastructure comprising a substation and powerlines. The ElectraNet Bungama Substation is located on Pirie Blocks Road, in close proximity to the Project area. The Planning Report's Figure 2-3 - key physical features of the Project land, show a number of major power transmission lines, i.e. overhead 132kV and 275kV transmission lines connecting into the Bungama substation from a north-north-east, north-west, south, and south-east direction. Some of the transmission lines cross the Project area. Solar and ancillary development is a type of development that is envisaged within the Primary Production Zone in Port Pirie Regional Council area. Utility scale solar projects are becoming more common place in rural setting and acceptable rurally located infrastructure. While the Project is not located within an area of known visual or scenic significance, the Project area is located between the Augusta Highway (A1) viewpoint and Landscape Protection Policy Area 11 and 12. A Visual Impact Assessment of the Project completed which concludes the overall visual impact rating to residential and viewpoint receptors is "Low" and "Moderate-Low" respectively.

Assessment Section		Project Response
	5. Wind farms and ancillary development located in the zone, accepting that this may need to be sited in visually prominent locations to take advantage of natural resources such as wind.	Wind farms are a type of a renewable energy facility. The Project is another type of renewable energy facility suitable in the Primary Production Zone. The Project is development that contributes to the desired character of the zone and is a form of development contemplated within the zone. While the Project is not sited in a visually prominent area, it is acceptable that it will be visible from some reception points. Its location has been selected to take advantage of the natural resource of the Project area, i.e. the flat, cleared land and sun exposure. The Project area is an appropriate location because of the co-location with existing utility scale electricity infrastructure and the short distance for the grid connection to the Bungama substation thereby minimising the expanse of overhead power lines.
	6. Development that contributes to the desired character of the zone.	Solar and ancillary development are envisaged within the zone and constitute a component of the zone's desired character subject to implementation of management techniques set out by general/Council wide policy regarding renewable energy facilities.
Desired Character **(P147)**	*Wind farms and ancillary development are an envisage form of development within the zone. Such facilities may be of a large scale, comprise a number of components and require an extended and/or dispersed development pattern. These facilities will need to be located in areas where they can take advantage of the natural resource upon which they rely and, as a consequence may be need to be:* • *located in visually prominent locations such as ridgelines*	The Project is a type of renewable energy facility envisaged within the zone and constitute a component of the zone's desired character subject to implementation of management techniques set out by general / Council wide policy regarding renewable energy facilities. The Project will contribute to the benefits derived from increased generation of renewable energy. The Project area is an appropriate location because of the co-location with existing utility scale electricity infrastructure and the short

Assessment Section		Project Response
	• *visible from scenic routes and valuable scenic and environmental areas* • *located closer to roads than envisaged by generic setback policy.* *This, coupled with the large scale of these facilities (in terms of both height and spread of components), renders it difficult to mitigate the visual impacts of wind farms to the degree expected of other types of development. Subject to implementation of management techniques set out by general / council wide policy regarding renewable energy facilities, these visual impacts are to be accepted in pursuit of benefits derived from increased generation of renewable energy.*	distance for the grid connection to the Bungama substation thereby minimising the expanse of overhead power lines.
Principles of Development Control (P148)	**Land Use:** *1. The following forms of development are envisaged in the zone:* • *solar and ancillary development* • *wind farm and ancillary development* • *wind monitoring mast and ancillary development.*	Solar and ancillary development, as well as other types of renewable energy facilities, are identified as suitable within the Primary Production zone. The Project is development envisaged in the zone.
	2. Development listed as non-complying is generally inappropriate.	The Project is not listed as a non-complying.
	3. Wind farms and ancillary development should be located in areas which provide opportunity for harvesting of wind and efficient generation of electricity and may therefore be sited: *(a) in visually prominent locations in the landscape*	The Project area has good energy generation potential and provides the opportunity for efficient generation of electricity. The Project area is not in a visually prominent location. The Project's final design may site some of the Project's components including buildings closer to Augusta Highway, Locks Road and Gulf

Assessment Section		Project Response
	(b) closer to roads and not to be subject to the setback requirements of other forms of development.	View Road than envisaged by the generic setback policy to maximise the opportunity to harvest the sun for the generation of electricity. The final Project layout that will be submitted to the relevant authority for approval prior to the commencement of construction will identify the setbacks.
	6. Buildings, other than where required to facilitate wind farms and ancillary development, should primarily to be limited to farm buildings, a detached dwelling associated with primary production or a tourist related use on the allotment and residential outbuildings that are: *(a) grouped together on the allotment and set back from allotment boundaries to minimise the visual impact of buildings on the landscape as viewed from public roads* *(b) screened from public roads and adjacent land by existing vegetation or landscaped buffers.*	The Project does not include dwellings or residential outbuildings. The Project's preliminary layout in the indicative design drawings attached as Appendix 3 to the Planning Report shows the buildings required for a utility scale solar development. For example, one of the buildings is for the Project's administration and control functions for Project. The building will likely be a single storey structure with the overall height of approximately six metres. Car parking will be located within the vicinity of the administration building that will accommodate staff, visitors and contractor parking. The BESS may be in open form boxes (Tesla technology), shipping container style structures or large sheds similar in size to buildings typically found in a primary production area e.g. intensive animal keeping infrastructure, to be determined by the technology installed. The buildings are grouped together and located near the Bungama substation and the existing transmission lines that aligns with the current infrastructure visual amenity when viewed from this part of the Augusta Highway. Depending on the final layout plan the buildings may be totally or partially screened from public roads by exiting vegetation. Targeted

Assessment Section		Project Response
		landscape screening for the buildings will be incorporated into the final design.
	Form and Character: *10. Development should not be undertaken unless it is consistent with the desired character for the zone.*	The Project is a type of development envisaged within the zone and constitute a component of the zone's desired character.
	12. Development should provide an access way of at least 3 metres wide that provides access for emergency vehicles to the rear of the allotment.	During the construction phase access will likely be via existing access points and additional access points to allow for the efficient transport of components onto and around the Project area. During the operation phase the access point will likely be reduced. Access points and internal access roads will be of a sufficient width to enable emergency vehicles to access to the rear of allotments.
	13. Development on land situated between National Highway 1 and Landscape Protection Policy Area 10 should be designed and sited to ensure the natural view of the ranges is not impaired.	While the Project is not located within an area of known visual or scenic significance, the Project area is located between the Augusta Highway (A1) viewpoint and Landscape Protection Policy Area 11 and 12. A Visual Impact Assessment of the Project completed which concludes the overall visual impact rating to residential and viewpoint receptors is “Low” and “Moderate-Low” respectively. Appropriate visual buffer zones and landscaping is proposed in Appendix 14 of the Planning Report.
	Land Division: *14. For land not within a policy area, land division, including boundary realignments, should only occur where it:*	The Project doesn’t trigger the Land Division requirements.

Assessment Section		Project Response
	(a) will promote economically productive, efficient and sustainable primary production and not create any allotment less than 40 hectares in area. *15. Land division involving boundary realignments should only occur where the number of resulting allotments of less than 40 hectares is not greater than the number that existed prior to the realignment.*	
Landscape Protection Policy Area 11		
Objectives (P169)	*1. The conservation and enhancement of the natural environment and natural ecological processes for their historic, scientific, landscape, faunal habitat, biodiversity and cultural values, with grazing continuing as the preferred rural use, where appropriate.* *2. Provision of opportunities for the public to experience and appreciate the significance of the native vegetation and original remnant natural habitat of the area through low impact recreational activities and interpretive facilities.* *3. Development that contributes to the desired character of the policy area.*	The Project area is not located within Landscape Protection Policy Area 11. The Project area is located approximately 4.5km distance from Landscape Protection Policy Area 11. The Project will not impact on the conservation and enhancement of the natural environment in Landscape Protection Policy Area 11. The Project will not impact on grazing within Landscape Protection Policy Area 11. The Project will not impede the publics opportunity to experience and appreciate Landscape Protection Policy Area 11 through low impact recreational activities and interpretive facilities. No development is proposed within Landscape Protection Policy Area 12.
Desired Character (P169)	*The policy area is of high environmental value and includes outstanding scenery, which includes the southern portion of the Mount Remarkable National Park known as the Napperby Block. The area also includes large tracts of well-vegetated grazing lands on the steep western hills overlooking, and clearly visible from, National Highway 1. There should*	The Project is not located within the portion of the Mount Remarkable National Park known as the Napperby Block. The Project area is located approximately 4.5km distance from Landscape Protection Policy Area 11.

Assessment Section		Project Response
	be no further vegetation clearance and development should be limited, particularly in those areas visible from a publicly accessible place.	Landscape Protection Policy Area 11 is considered in this Development Plan assessment as the Project Area is located between the Augusta Highway (A1) and Landscape Protection Policy Area 11 (as per Primary Production Zone Provisions – Item 13). A Visual Impact Assessment of the Project has been completed which concludes the overall visual impact rating to residential and viewpoint receptors is "Low" and "Moderate-Low" respectively. The development should not obstruct views of the Mount Remarkable National Park known as the Napperby Block from Augusta Highway (A1). From the Augusta Highway the Project will be visible in the middle ground for approximately 1 minute 48 seconds when travelling at the signposted limit.
Principles of Development Control (P169)	***Form and Character*** *3. Development should not be undertaken unless it is consistent with the desired character for the zone.* *4. Development should use the following measures to avoid impacting detrimentally on the natural environment, processes and/or conservation qualities of land in the policy area:* *(c) minimising the extent of earthworks* *(d) minimising the extent of vehicle access servicing that development* *(e) minimising the extent of locally indigenous vegetation removal*	No development is proposed on land within Landscape Protection Policy Area 12.

Assessment Section		Project Response
	(f) being sited in an unobtrusive manner preferably below hilltops or prominent ridgelines *(g) screening the visual impact by planting locally indigenous species having due regard to bushfire risk* *(h) utilising external low reflective materials and finishes that will minimise glare and blend in with the features of the landscape.* *7. The natural character and conservation of the scenic, scientific and heritage, features of the policy area should be retained and the area kept free of development that is not a necessary part of conservation or pastoral activities.*	
Landscape Protection Policy Area 12		
Objectives (P171)	*1. Preservation of the natural and rural character and scenic and heritage features of the ranges whilst accommodating established pastoral, agricultural and forestry activities within the policy area.* *2. Low intensity rural activities on large land holdings.* *3. Tourist facilities, attractions, and accommodation that are secondary to farming and blend with the natural environment.* *4. Development that contributes to the desired character of the policy area.*	The Project area is not located within Landscape Protection Policy Area 12. The Project area is located approximately 4.5km distance from Landscape Protection Policy Area 12. The Project will not impact established pastoral, agricultural and forestry activities within Landscape Protection Policy Area 12. The Project will not impact on low intensity rural activities or tourist facilities and accommodation within Landscape Protection Policy Area 12. No development is proposed within Landscape Protection Policy Area 12.
Desired Character (P171)	*This area has generally been cleared for farming, mainly for cropping and grazing purposes in the past, however the significant areas of native*	No development is proposed within Landscape Protection Policy Area 12. The Project will not impact on existing or proposed development or uses of Landscape Protection Policy Area 12.

Assessment Section		Project Response
	vegetation that remain in place throughout the policy area should be preserved for their amenity, conservation and scenic value. *Low intensity farming activities such as cropping and grazing activities are appropriate in previously cleared areas where buildings and structures associated with the farming activities on the land can be effectively screened from adjoining roads or public vantage points, either through the use of terrain to hide the development or with intensive landscaping using endemic species.*	
Principles of Development Control (P171)	***Form and Character*** *2. Development should not be undertaken unless it is consistent with the desired character for the policy area.*	No development is proposed within Landscape Protection Policy Area 12.
Rural Living Policy Area 13		
Objectives (P178)	*1. A policy area accommodating rural living on existing allotments with provision for low intensity animal keeping.* *2. No additional allotments.*	The northernmost portion of the Project area is located adjacent to Rural Living Policy Area 13. No Project development is proposed to be located in Rural Living Policy Area 13. The Project will not result in the creation of any additional allotments in Rural Living Policy Area 13.
Desired Character (P178)	*The policy area includes the existing rural living settlement of Bungama, located east of Port Pirie and the Napperby Creek Estate. This policy area contains allotments of varying sizes, which should primarily accommodate rural living and associated low intensity animal keeping on existing allotments.*	The northernmost portion of the Project area is located adjacent to Rural Living Policy Area 13. No Project development is proposed to be located in Rural Living Policy Area 13. The Project Planning Report has considered existing and potential rural living and associated low intensity animal keeping on existing

Assessment Section		Project Response
	The policy area is also located on the western side of the National highway and the township of Warnertown and provides for rural living and associated low intensity animal keeping on existing allotments.	allotments located in Rural Living Policy Area 13. Amendments have been proposed
Principles of Development Control (P178)	**Form and Character** *2. Development should not be undertaken unless it is consistent with the desired character for the policy area.*	No Project development is proposed to be located in Rural Living Policy Area 13. While there is currently only residential development on one (1) of the allotments within the Rural Living Policy Area 13 directly neighbouring the Project area, the Project has engaged in consultation with the landowners of the undeveloped allotments and considered the Project impacts on the desired character for the policy area as part of the Planning Report. The Project design incorporates a 50m visual and landscape screening buffer between the solar array areas and Rural Living Policy Area 13. The following amendments to the Project have been made as a result of consultation with neighbouring landowners and consideration of the desired character of the policy area: • Including in excess of 7 km of visual buffering in the form of landscape screening at a direct Project cost estimated to exceed $750,000; • Reducing the land area allocated to solar panels by approximately 24 hectares, equivalent to a reduction of 36,000 panels and equating to approximately $5,000,000 in relinquished income over the life of the Project; and • Power Conditioning Units near adjoining boundaries being relocated to reduce the potential for noise impact.

Assessment Section		Project Response
General Provisions		
Building near Airfields (P20)	**Objectives:** 1. *Development that ensures the long-term operational, safety, commercial and military aviation requirements of airfields (airports, airstrips and helicopter landing sites) continue to be met.* **Principles of Development Control:** 3. *Development in the vicinity of airfields should not create a risk to public safety, in particular through any of the following:* *(a) lighting glare* *(b) smoke, dust and exhaust emissions* *(c) air turbulence* *(d) storage of flammable liquids* *(e) attraction of birds* *(f) reflective surfaces (e.g. roofs of buildings, large windows)* *(g) materials that affect aircraft navigational aids.*	The Project area is located approximately 10km north-east of the Port Pirie Airport. A Glint and Glare Assessment is attached as Appendix 12 to the Planning Report. Port Pirie Airport consists of three runways of which the east west facing runway 80/26 is sealed and used for commercial aircrafts. The two other runways facing SW/NE, 35/17 and 03/21 are unpaved and most likely only used for private airplanes. All three runways were assessed. The calculation for all six approach paths did not indicate any Glint or Glare issues for pilots.
Coastal Areas (P24)	**Objectives:** 1. *The protection and enhancement of the natural coastal environment, including environmentally important features of coastal areas such as mangroves, wetlands, sand dunes, cliff tops, native vegetation, wildlife habitat shore and estuarine areas.*	While a portion of the site is mapped 'Wetlands' on Overlay Map PtPi/14 – Natural Resources it is not considered a delicate or environmentally sensitive coastal feature. The site has been heavily modified and used for agricultural purposes and does not display characteristics of a wetland.

Assessment Section		Project Response
	Environmental Protection: *3. Development should not be located in delicate or environmentally-sensitive coastal features such as sand dunes, cliff tops, wetlands or substantially intact strata of native vegetation.* *8. Development should be designed and sited so that it does not prevent natural landform and ecological adjustment to changing climatic conditions and sea levels and should allow for the following:* *(a) the unrestricted landward migration of coastal wetlands* *(b) new areas to be colonised by mangroves, samphire and wetland species* *(c) sand dune drift* *(d) where appropriate, the removal of embankments that interfere with the abovementioned processes.*	
Crime Prevention (P29)	**Objectives:** *1. A safe, secure, crime resistant environment where land uses are integrated and designed to facilitate community surveillance.* **Principles of Development Control:** *1. Development should be designed to maximise surveillance of public spaces through the incorporation of clear lines of sight, appropriate lighting and the use of visible permeable barriers wherever practicable.*	Alarms and cameras are likely to be used to monitor the Project facilities 24 hours a day, 7 days a week. Low spill Security lighting will be used in certain locations predominantly surrounding the BESS & the Substation. Approximately 4m will be provided free of infrastructure for visibility & monitoring between the perimeter fence and the solar panel blocks.

Assessment Section		Project Response
Design and Appearance (P30)	**Objectives:** *1. Development of a high design standard that responds to and reinforces positive aspects of the local environment and built form.* **Principles of Development Control:** *1. Buildings should reflect the desired character of the locality while incorporating contemporary designs that have regard to the following:* *(a) building height, mass and proportion* *(b) external materials, patterns, colours and decorative elements* *(c) roof form and pitch* *(d) façade articulation and detailing* *(e) verandas, eaves, parapets and window screens.* *2. Where a building is sited on or close to a side or rear boundary, the boundary wall should minimise:* *(a) the visual impact of the building as viewed from adjacent properties* *(b) overshadowing of adjacent properties and allow adequate sunlight access to neighbouring buildings.* *3. The external walls and roofs of buildings should not incorporate highly reflective materials which will result in glare to neighbouring properties, drivers or cyclists.*	The Project is defined as *'electricity infrastructure, in accordance with the definition provided in Section 4 of the Electricity Act 1996'*. The Project is an electricity generating plant with powerlines, substation/s, equipment for metering, monitoring and controlling electricity and will include items required in the connection and supply of electricity. The 'Design and Appearance' 'Objective' and 'Principles of Development Control' are predominately for urban built form. The principle objective in designing a solar farm is to configure the design that best utilises the space to collect as much of the sun's energy as possible on any given day. This includes the number, size, and angle of the panels. The Project area is an appropriate location because of the co-location with existing utility scale electricity infrastructure and the short distance required for the grid connection minimising the expanse of possible overhead power lines. The storage and service areas will be appropriately located, and adequate access will be provided. The Project's buildings have been sited to minimise any potential visual impacts of the Project's buildings when viewed from an adjoining property. The Project's buildings will not overshadow adjoining properties.

Assessment Section		Project Response
	6. Transportable buildings and buildings which are elevated on stumps, posts, piers, columns or the like, should have their suspended footings enclosed around the perimeter of the building, and the use of verandas, pergolas and other suitable architectural detailing to give the appearance of a permanent structure. **Outdoor Storage and Service Areas:** *19. Outdoor storage, loading and service areas should be:* *(a) screened from public view by a combination of built form, solid fencing and/or landscaping* *(b) conveniently located and designed to enable the manoeuvring of service and delivery vehicles* *(c) sited away from sensitive land uses.* **Building Setbacks from Road Boundaries:** *20. Except in areas where a new character is desired, the setback of buildings from public roads should:* *(a) be similar to, or compatible with, setbacks of buildings on adjoining land and other buildings in the locality* *(b) contribute positively to the function, appearance and/or desired character of the locality.*	The Project's buildings will not unreasonably restrict existing views available from neighbouring properties and public spaces. Any transportable buildings and buildings which are elevated on stumps, posts, piers, columns or the like, will have their suspended footings enclosed around the perimeter of the building, and were practicable adopt the use of verandas, pergolas and other suitable architectural detailing to give the appearance of a permanent structure. 'Primary Production Zone' 'Principles of Development Control - Land Use' 3 permits the Project to be closer to roads than envisaged by generic setback policy.
Hazards **(P36)**	*Objectives:* *1. Maintenance of the natural environment and systems by limiting development in areas susceptible to natural hazard risk.*	The Project is not in an area susceptible to significant natural hazard risk. A review of overlays from SA Map viewer indicate the only

Assessment Section		Project Response
	2. Development located away from areas that are vulnerable to and cannot be adequately and effectively protected from the risk of natural hazards. *3. Development located to minimise the threat and impact of bushfires on life and property.* *4. Expansion of existing non-rural uses directed away from areas of high bushfire risk.* *5. Critical community facilities such as hospitals, emergency control centres, major service infrastructure facilities, and emergency service facilities located where they are not exposed to natural hazard risks.* *6. The environmental values and ecological health of receiving waterways and marine environments protected from the release of acid water resulting from the disturbance of acid sulphate soils.* *7. Protection of human health and the environment wherever site contamination has been identified or suspected to have occurred.* *9. Minimisation of harm to life, property and the environment through appropriate location of development and appropriate storage, containment and handling of hazardous materials.*	potential hazard is bushfire. The Project area's bushfire risk is mapped General. The Project's final design will apply appropriate standards and management strategies to manage hazards such as bushfire, the Project area's environmental values, potential harm to life, potential harm to property and potential harm to environment. The South Australian Environment Protection Authority (EPA) holds a record of a Section 83 notification relating to a diesel spill at the nearby service station (Allotment 549 FP 188681). No works are proposed on Allotment 549 FP 188681. The Project area is not listed on the South Australian Contamination index. Based on the historical and current agricultural activities no areas of significant contamination are expected to be encountered during the Project's construction or operation. Based on the proposed use of the Project area the historical and current agricultural activities do not pose a significant human or environmental health risk.
	Principles of Development Control – Flooding: *5. Development should not occur on land where the risk of flooding is likely to be harmful to safety or damage property.* *6. Development should not be undertaken in areas liable to inundation by tidal, drainage or flood waters unless the development can achieve all of the following….*	A review of overlays in the Development Control Plan and from SA Map viewer indicate the Project area is not subject to inundation. There are a number of ephemeral natural watercourses/drainage lines in the Project area that may contain water from time to time. The Project's final design will consider the ephemeral watercourses/drainage lines.

Assessment Section		Project Response
	7. Development, including earthworks associated with the development, should not do any of the following: *(a) impede the flow of floodwaters through the land or other surrounding land* *(b) increase the potential hazard risk to public safety of persons during a flood event* *(c) aggravate the potential for erosion or siltation or lead to the destruction of vegetation during a flood* *(d) cause any adverse effect on the floodway function* *(e) increase the risk of flooding of other land* *(f) obstruct a watercourse.*	The Project including required earthworks will not impede the flow of floodwaters through the land or other surrounding land, is not on land where the risk of flooding is unacceptable having regard to personal and public safety and to property damage, will not increase the potential hazard risk to public safety of persons during a flood event, will not aggravate the potential for erosion or siltation or lead to the destruction of vegetation during a flood, will not cause any adverse effect on the floodway function, will not increase the risk of flooding of other land and will not obstruct a pertinent watercourse.
	Principles of Development Control – Bushfire: *10. Buildings and structures should be located away from areas that pose an unacceptable bushfire risk as a result of one or more of the following:* *(a) vegetation cover comprising trees and/or shrubs* *(b) poor access* *(c) rugged terrain* *(d) inability to provide an adequate building protection zone* *(e) inability to provide an adequate supply of water for fire-fighting purposes.*	The Project area's bushfire risk is mapped General. The majority of the Project area is cleared land with a few scattered trees and vegetation along boundary lines. The Project area's dominant landform is flat plains which have been extensively cleared for agriculture. Vegetation along boundary lines will likely be retained as part of the Project. The risk of initiating fire from commercial solar panels and inverters is very low due to their high quality. The Project area does pose a risk of fire due to ground cover. The Project will employ fire response measures to mitigate the risk and prevalence of bushfires including internal and perimeter roads

Assessment Section		Project Response
	16. Vehicle access and driveways to properties and public roads created by land division should be designed and constructed to: *(a) facilitate safe and effective operational use for fire fighting and other emergency vehicles and residents* *(b) provide for two-way vehicular access between areas of fire risk and the nearest public road.*	designed to facilitate safe and effective operational use for fire-fighting.
	Principles of Development Control – Salinity: *18. Development should not increase the potential for, or result in an increase in, soil and water salinity.*	The South Australian Resource Information Gateway (SARIG 2018) Salinity non-watertable (soil salinity) mapping layer identifies the Project area as having low to moderate salinity. The SARIG 2018 Salinity watertable induced (soil salinity) mapping layer identifies the Project area as having moderately high to very high or extreme salinity. The SARIG 2018 groundwater mapping layer indicates the Shallow Standing Water Level is 0-10m below Ground Level (BGL). The Shallow Standing Water Level represents the depth to standing water of the shallowest aquifer only. Other aquifers may well give rise to standing water at significantly different depths. The Project will involve short-term construction, followed by possibly decades of the land being inactive during operations. The limited or no cropping and consequently limited use of farm machinery on Project area will be beneficial for the soils. While constructing the Project will require removal of some vegetation and the Project's operations will require water to clean the panels from time to time these activities will not lead to an increase in the Project area's typical

Assessment Section		Project Response
		groundwater levels and/or the leaching of salts, consequently the Project will not contribute to an increase in salinity levels.
	Principles of Development Control – Acid Sulfate Soils: *21. Development and activities, including excavation and filling of land, that may lead to the disturbance of potential or actual acid sulfate soils should be avoided unless such disturbances are managed in a way that effectively avoids the potential for harm or damage to any of the following:* *(a) the marine and estuarine environment* *(b) natural water bodies and wetlands* *(c) agricultural or land-based aquaculture activities* *(d) buildings, structures and infrastructure* *(e) public health.*	The Australian Soil Resource Information System (ASRIS 2014) notes the probability of Acid Sulfate soils in the area is extremely low. However, on Overlay Map PtPi/14 – Development Constraints, the Project area is partially mapped 'Coastal Acid Sulfate Soils'. The Project will develop an environmental framework through implementing a Construction Environmental Management Plan (CEMP) for the construction phase and Operational Environmental Management Plan (OEMP) for the operation phase which will be finalised prior to the commencement of construction and operation. The CEMP will consider Acid Sulfate Soils.
	Principles of Development Control – Site Contamination: *23. Development, including land division, should not occur where site contamination has occurred unless the site has been assessed and remediated as necessary to ensure that it is suitable and safe for the proposed use.*	The Project area is not listed on the South Australian Contamination index. Preliminary geotechnical investigations in May 2018 of some of the Project area found *"The site and subsurface conditions was visually assessed for contamination during the site investigations. No fill materials were encountered during the site investigation and there was no indication of contaminated soils".*

Assessment Section		Project Response
		Based on the historical and current agricultural activities no areas of significant contamination are expected to be encountered during the construction or operation of the Project. Based on the proposed use of the Project area the historical and current agricultural activities do not pose a significant human or environmental health risk.
	Principles of Development Control – Containment of Chemical and Hazardous Materials: *24. Hazardous materials should be stored and contained in a manner that minimises the risk to public health and safety and the potential for water, land or air contamination.*	Fuels and chemicals are required during the construction and operation phases for light vehicles, plant and equipment. During the construction and operation phases a storage and handling of chemical and hazardous materials management plan for each phase will be developed detailing the control measures to be implemented.
	Principles of Development Control – Landslip: *27. Development, including associated cut and fill activities, should not lead to an increased danger from land surface instability or to the potential of landslip occurring on the site or on surrounding land.*	The Project area is not susceptible to land slip. The Project's earthworks will not lead to an increased danger from land surface instability or to the potential of landslip occurring on the Project area or on surrounding land.
Heritage Places **(P40)**	**Objectives:** *1. The conservation of State and local heritage places.* *2. The continued use, or adaptive reuse, of State and local heritage places that supports the conservation of their cultural significance.* *3. Conservation of the setting of State and local heritage places.*	The Project land is not identified in the Overlay Maps – Heritage or listed in PtPi/5 - State Heritage Places or in Table PtPi/4 - Local Heritage Places. The Project land is not identified on the Historic Conservation Area Maps. An archaeological assessment of the Project was completed to determine the presence of Aboriginal and/or European heritage value within the Project area.

Assessment Section		Project Response
	Principles of Development Control: 1. *A heritage place spatially located on Overlay Maps - Heritage and more specifically identified in Table PtPi/ 5 - State Heritage Places or in Table PtPi/4 - Local Heritage Places should not be demolished, destroyed or removed, in total or in part, unless either of the following apply:* *(a) that portion of the place to be demolished, destroyed or removed is excluded from the extent of the places identified in the Table(s)* *(b) the structural condition of the place represents an unacceptable risk to public or private safety.*	The desktop archaeological assessment is attached as Appendix 9. Preliminary field investigations in May 2018 entailed systematic inspection of high-risk areas using pedestrian survey approach. Survey visibility was high as the majority of the Project area was heavily disturbed by cropping and animal grazing. **European** The *Heritage Places Act 1993* makes provision for the identification, recording and conservation of places and objects of non-Aboriginal heritage significance in South Australia. Once registered, State Heritage Places are protected under the *Heritage Places Act 1993* and the *Development Act 1993*. It is an offence to damage, destroy, excavate or disturb locally and State significant heritage places without consent. There are no State Heritage Places or Local Heritage Places registered in the Project area.
Infrastructure **(P49)**	**Objectives:** 1. *Infrastructure provided in an economical and environmentally sensitive manner.* 2. *The visual impact of infrastructure facilities minimised.* 3. *The efficient and cost-effective use of existing infrastructure.*	The Project area is an appropriate location because of the co-location with existing utility scale electricity infrastructure i.e. Bungama Substation and associated transmission lines and the short distance required for the grid connection, minimising the expanse of connection resulting in efficient and cost-effective use of existing infrastructure. The Project is a type of renewable energy facility the Development Plan contemplates the presence of in the Council area and in the Primary Production Zone. The Development Plan acknowledges it is

Assessment Section		Project Response
		difficult to mitigate visual impacts of large-scale renewable energy facilities. The Project has been designed to minimise the visual impact of the infrastructure while maximising the generation of renewable energy from this Project.
	Principles of Development Control: *1. Development should only occur where it has access to adequate utilities and services, including:* *(a) electricity supply* *(b) water supply* *(c) drainage and stormwater systems* *(d) effluent disposal systems* *(e) formed all-weather public roads* *(f) telecommunications services* *(g) gas services.* *9. Electricity infrastructure should be designed and located to minimise visual and environmental impacts.* *10. Utilities and services, including access roads and tracks, should be sited on areas already cleared of native vegetation. If this is not possible, their siting should cause minimal interference or disturbance to existing native vegetation and biodiversity.*	The Project's design will incorporate the provision of adequate utilities and services. The Project area is an appropriate location because of the co-location with existing utility scale electricity infrastructure i.e. Bungama substation and associated transmission lines and the short distance required for the grid connection, minimising the expanse of connection. The Project is a type of renewable energy facility the Development Plan contemplates the presence of in the Council area and in the Primary Production Zone. The Development Plan acknowledges it is difficult to mitigate visual and environmental impacts of large-scale renewable energy facilities. The Project has been designed to minimise the visual and environmental impacts of the infrastructure while maximising the generation of renewable energy from this Project. A key criterion for selecting the Project area is the land is currently used for agricultural land uses, including cropping, that reduces and minimises the amount of native vegetation that may need to be cleared or disturbed for the Project. The Project has been designed to minimise the interference or disturbance to existing native vegetation and biodiversity. The Development Plan recognises that a

Assessment Section		Project Response
	11. Utility buildings and structures should be grouped with non-residential development, where possible. *12. Development in proximity to infrastructure facilities should be sited and be of a scale to ensure adequate separation to protect people and property.* *13. Incompatible uses should not encroach upon the easements of infrastructure corridors for existing and proposed transmission lines.* *15. Provision should be made for new transmission and distribution substations and overhead major electricity line corridors (having a capacity greater than or equal to 33kV) in areas which have the required buffer distance to protect people and allow for adequate access.*	large renewable energy facility cannot be constructed in the Primary Production Zone without some disturbance to wildlife and vegetation. The proposed substation and transmission lines will be positioned in close proximity to the existing Bungama substation buffered from residences and with provision for adequate access.
Interface between land uses **(P51)**	**Objectives:** *1. Development located and designed to minimise adverse impact and conflict between land uses.* *2. Protect community health and amenity from adverse impacts of development.*	The key neighbouring land uses are agricultural land uses, utility scale electricity infrastructure comprising a substation and powerlines and roads. The Project design and co-location with existing utility scale electricity infrastructure i.e. Bungama substation and associated transmission lines prevents adverse impact and conflict between land uses, prevents adverse impact to community health and amenity and will not unreasonable impede all desired land uses in this area. The Project is a type of renewable energy facility the Development Plan contemplates the presence of in the Council area and in the Primary Production Zone.

Assessment Section		Project Response
	Principles of Development Control: *1. Development should not detrimentally affect the amenity of the locality or cause unreasonable interference through any of the following:* *(a) the emission of effluent, odour, smoke, fumes, dust or other airborne pollutants* *(b) noise* *(c) vibration* *(d) electrical interference* *(e) light spill* *(f) glare* *(g) hours of operation* *(h) traffic impacts.* *2. Development should be sited and designed to minimise negative impacts on existing and potential future land uses desired in the locality.*	The Project is a type of renewable energy facility the Development Plan contemplates the presence of in the Council area and in the Primary Production Zone. The Development Plan acknowledges it is difficult to mitigate visual and environmental impacts of large-scale renewable energy facilities. The Project has been designed to minimise the visual and environmental impacts of the infrastructure while maximising the generation of renewable energy from this Project. The Planning Report concludes the Project will not detrimentally affect the amenity of the locality or cause unreasonable interference through the environmental issues listed in Development Control 1. The Project has been designed and sited to minimise negative impact on existing and potential future land uses considered appropriate in the locality. The Development Plan acknowledges it is difficult to mitigate the potential negative impacts of large-scale renewable energy facilities. The Project will develop an environmental framework through implementing a Construction Environmental Management Plan (CEMP) for the construction phase and Operational Environmental Management Plan (OEMP) for the operation phase which will be finalised prior to the commencement of construction and operation. The environmental framework establishes objectives and targets to manage the environmental aspects of the Project. The Project's CEMP and OEMP will address compliance with regulatory requirements, environmental protection policies and

Assessment Section		Project Response
		relevant guidelines and codes of practice. The specific regulatory requirements for each environmental aspect will be identified in the CEMP and / or OEMP and incorporated, where appropriate, in the performance indicators utilised for monitoring environmental compliance. Both the CEMP and OEMP will be implemented throughout the relevant phase of the Project, to ensure that potential environmental impacts are minimised.
	Principles of Development Control – Noise Generating Activities: *7. Development that emits noise (other than music noise) should include noise attenuation measures that achieve the relevant Environment Protection (Noise) Policy criteria when assessed at the nearest existing noise sensitive premises.*	The Project will be designed and sited to minimise negative impacts of noise and to avoid unreasonable interference. The Project will be constructed and operated in accordance with relevant Australian Standards and statutory guidelines. A Noise Assessment is attached as Appendix 13 of the Planning Report. The assessment found noise emissions during the construction and operation phase will be compliant with the Environment Protection (Noise) Policy 2007 and will not cause adverse impacts. The CEMP and OEMP will address compliance with regulatory noise requirements.
	Principles of Development Control – Air Quality: *11. Development with the potential to emit harmful or nuisance-generating air pollution should incorporate air pollution control*	The Project's potential to adversely impact the existing air quality environment is low.

Assessment Section		Project Response
	measures to prevent harm to human health or unreasonable interference with the amenity of sensitive uses within the locality.	
	Principles of Development Control – Rural Interface: *15. Existing primary production and mineral extraction should not be prejudiced by the inappropriate encroachment of sensitive uses such as urban development.*	The Project does not include urban development such as residential development.
Land Division **(P54)**	**Objectives:** *2. Land division that creates allotments appropriate for the intended use.* *5. Land division restricted in rural areas to ensure the efficient use of rural land for primary production and avoidance of uneconomic infrastructure provision.*	The Project will not trigger the division provisions.
Landscaping, Fences and Walls **(P58)**	**Objectives:** *1. The amenity of land and development enhanced with appropriate planting and other landscaping works, using locally indigenous plant species where possible.* *2. Functional fences and walls that enhance the attractiveness of development.* **Principles of Development Control:** *1. Development should incorporate open space and landscaping and minimise hard paved surfaces in order to:* *2. Landscaping should…*	Given the scale and extent of the proposed development and the low level of visual impact, providing landscaping which is adequate to screen the entire Project area is not considered practical. Targeted landscaping for some adjoining landowners is shown in the preliminary landscape plan attached in Appendix 14 of the Planning Report. Security fencing will be installed around the perimeter of the solar plant. Signage will be clearly displayed identifying hazards present within the solar plant. Targeted landscaping may be established to support erosion control and improved amenity adjacent to car parking areas and control

Assessment Section		Project Response
	3. Landscaping should not… *4. Fences and walls, including retaining walls, should…*	room/site office, BESS areas and the Project substation but this is anticipated to be minimal. Security fencing will be installed around the perimeter of the solar plant. Signage will be clearly displayed identifying hazards present within the solar plant.
Mineral Extraction **(P63)**	**Objectives:** *2. Protection of mineral deposits against intrusion by inappropriate forms of development.* **Principles of Development Control:** *1. Known reserves of economically-viable mineral deposits should be kept free of development that may inhibit their future exploitation.* *2. Development in proximity to mining operations should not be allowed where it may be exposed to adverse impacts resulting from mining activities.*	The SARIG 2018 Mineral tenements production layer does not indicate current mining activities within the Project area of 530ha. Outside the Project area, within the Project land, the current Extractive minerals lease is active: Tenement Label: EML 5945 Operation Name: Cunningham Sand Pit The extractive minerals lease is excluded from the Project area.
Natural Resources **(P65)**	**Objectives:** *1. Retention, protection and restoration of the natural resources and environment.* *2. Protection of the quality and quantity of South Australia's surface waters, including inland, marine and estuarine and underground waters.*	The Project is a type of renewable energy facility the Development Plan contemplates the presence of in the Council area and in the Primary Production Zone. The Development Plan acknowledges it is difficult to mitigate environmental impacts of large-scale renewable energy facilities. The Project has been designed to minimise environmental impacts of the infrastructure while maximising the generation of renewable energy from this Project. An objective of the Project is to apply appropriate standards and management strategies to minimise impacts to the areas natural

Assessment Section		Project Response
	3. The ecologically sustainable use of natural resources including water resources, including marine waters, ground water, surface water and watercourses. *5. Development consistent with the principles of water sensitive design.* *6. Development sited and designed to:…* *8. Native flora, fauna and ecosystems protected, retained, conserved and restored.* *10. Minimal disturbance and modification of the natural landform.* *12. Protection of areas prone to erosion or other land degradation processes from inappropriate development.*	resources and environment while maximising the generation capability of the Project. The Project's final design aims to retain, protect and restore the natural resources and environment where possible including protecting the natural resources via the adoption of a CEMP and OEMP that will address compliance with regulatory requirements, environmental protection policies and relevant guidelines and codes of practice. The specific regulatory requirements for each environmental aspect will be identified in the CEMP and OEMP and incorporated, where appropriate, in the performance indicators utilised for monitoring environmental compliance.
	Principles of Development Control – Water Sensitive Design: *5. Development should be designed to maximise conservation, minimise consumption and encourage re-use of water resources.* *6. Development should not take place if it results in unsustainable use of surface or underground water resources.* *7. Development should be sited and designed to:…* *8. Water discharged from a development site should: …* *9. Development should include stormwater management systems to protect it from damage during a minimum of a 1-in-100 year average return interval flood.* *10. Development should have adequate provision to control any stormwater over-flow runoff from the site and should be sited and designed to improve the quality of stormwater and minimise pollutant transfer to receiving waters.*	Australia is one of the world's top 20 water-stressed nations. A report by the World Resources Industry notes the following key points: • It identified Australia as one country vulnerable to water stress where the potential for cheap renewable energy, solar and wind as opposed to fossil fuels, could reduce water consumption country-wide as these technologies use minimal water. • Every megawatt hour of electricity generated by coal withdraws around 60,700 litres and consumes about 2,600 litres of water. • In the 2017-2018 financial year, Australian's have consumed 147 terrawatt hours of electricity, about 73 per cent of which

Assessment Section		Project Response
	11. Development should include stormwater management systems to mitigate peak flows and manage the rate and duration of stormwater discharges from the site to ensure the carrying capacities of downstream systems are not overloaded. *12. Development should include stormwater management systems to minimise the discharge of sediment, suspended solids, organic matter, nutrients, bacteria, litter and other contaminants to the stormwater system.* *13. Stormwater management systems should preserve natural drainage systems, including the associated environmental flows.* *14. Stormwater management systems should:…*	comes from coal, which equates to around 455 billion litres of water. The Project will contribute to reducing the amount of water required to generate electricity. Most of the Project area will be covered by solar array and spacing between the arrays. The areas underneath and surrounding the solar modules will not be impervious and therefore most of the Project area will be retained substantially in the current condition. Consequently, the runoff from most of the Project area, is likely to remain at the same post development levels and allow infiltration of rainfall. During the construction and operation phases a small area of the Project area will be occupied by administration buildings, laydown and compound area, inverters stations, battery area and switchyard/substation area that may increase runoff from this small area compared with current levels. The Project will include a minor wastewater treatment system. Discharge of treated sewage from the ablution block has the potential to decrease groundwater quality (e.g. through increased biological oxygen demands) if the sewage is not adequately treated or if the lining has not been appropriately designed the evapotranspiration bed could seep into the surrounding area. During the construction phase and operational phase, fuels oils and herbicides will be stored in the on-site compound area. Contaminants (e.g. hydrocarbons) from spills and leaks may potentially enter

Assessment Section		Project Response
		groundwater or drainage lines and impact on the environmental value of the receiving environment. The Project's CEMP and OEMP will include specific management measures or plans for a number of aspects including erosion and stormwater management, waste management, storage and handling of hazardous substances. The management strategies are designed in part to address the relevant principles of development controls for water sensitive design. The SARIG 2018 Salinity non-watertable (soil salinity) mapping layer identifies the Project area as having low to moderate salinity. The SARIG 2018 Salinity watertable induced (soil salinity) mapping layer identifies the Project area as having moderately high to very high or extreme salinity. While constructing the Project will require removal of some vegetation and the Project's operations will require water to clean the panels from time to time these activities will not lead to an increase in the Project area's typical groundwater levels and/or the leaching of salts, consequently the Project will not contribute to an increase in salinity levels. The Project area is not mapped as subject to inundation and is not located in the Murray Floodplain or within the River Murray protected area or within a local Catchment area. Figure 2-3 shows there are ephemeral watercourses and drainage lines on the Project area. The ephemeral watercourses and drainage lines do not hold permanent water and only run during high rainfall. The Project's final

Assessment Section		Project Response
		design will consider the Project area's watercourses and drainage lines.
	Principles of Development Control - Water Catchment Areas: *17. Development should ensure watercourses and their beds, banks, wetlands and floodplains are not damaged or modified and are retained in their natural state, except where modification is required for essential access or maintenance purposes.* *18. No development should occur where its proximity to a swamp or wetland will damage or interfere with the hydrology or water regime of the swamp or wetland.* *21. No development should be located within 50 metres of:* *(a) a watercourse identified as a blue line on a current series 1:50 000 SA Government topographic map* *(b) any river, stream, creek or channel in which water is contained or flows permanently, intermittently or occasionally.* *24. The location and construction of dams, water tanks and diversion drains should….* *26. Development should comply with the current Environment Protection (Water Quality) Policy.*	The Project is located outside both the Murray Darling Basin Water Management Area and Rangelands Natural Resource Management District. Figure 2-3 shows there are ephemeral watercourses and drainage lines on the Project area. The ephemeral watercourses and drainage lines do not hold permanent water and only run during high rainfall. The Project's final design will consider the Project area's ephemeral watercourses and drainage lines.
	Principles of Development Control – Biodiversity and Native Vegetation:	A key criterion for selecting the Project area is the land is currently used for agricultural land uses, including cropping, that reduces and minimises the amount of native vegetation that may need to be cleared or disturbed for the Project. The Project has been designed to

Assessment Section		Project Response
	28. Development should retain existing areas of native vegetation and where possible contribute to revegetation using locally indigenous plant species. *30. Native vegetation should be conserved and its conservation value and function not compromised by development if the native vegetation does any of the following:…* *31. Native vegetation should not be cleared if such clearing is likely to lead to, cause or exacerbate any of the following:…* *32. Development that proposes the clearance of native vegetation should address or consider the implications that removing the native vegetation will have on the following:…* *33. Where native vegetation is to be removed, it should be replaced in a suitable location on the site with locally indigenous vegetation to ensure that there is not a net loss of native vegetation and biodiversity.* *38. Trees and other vegetation* should be conserved which is of:…	minimise the interference or disturbance to existing native vegetation and biodiversity. The Development Plan recognises that a large renewable energy facility cannot be constructed in the Primary Production Zone without some disturbance to wildlife and vegetation. An objective of the Project is to minimise impacts to the areas Biodiversity and native vegetation while maximising the generation capability of the Project. An assessment of ecological values at the Project area was undertaken to determine the presence of species of conservation significance (i.e. species protected under Commonwealth or State legislation) and to identify any potential impacts on biodiversity. The desktop ecological assessment, attached as Appendix 8, and preliminary field flora assessment in May 2018 determined the dominant landform in the Project area is "*a plain, which has been extensively cleared for agriculture*" (EBS, 2018). As such, the likelihood of suitable habitat for threatened flora species being present was assessed as very low. The preliminary field flora assessment in May 2018 was performed in accordance with the Scattered Tree Assessment Method and Bushland Assessment Method derived by the Native Vegetation Council. The field fauna assessment included recording of opportunistic fauna sightings, signs of fauna (e.g. scats, burrows, nests and skeletons) and potential fauna habitat (e.g. hollows).

Assessment Section		Project Response
		No targeted fauna searches were conducted as part of the field investigations. However, four (4) bird and one mammal species were opportunistically observed during the flora assessment. None of these species are listed as threatened under the *Environment Protection and Biodiversity Conservation Act 1999* (Cth) or the *National Parks and Wildlife Act 1972* (SA). Six (6) vegetation associations and two (2) scattered trees were assessed within the Project area. The two scattered trees were considered to provide suitable roosting habitat for the state Rare, *Falco peregrinus* (Peregrine Falcon). The Peregrine falcon is known to forage over plains and to roost on dead limbs, cliffs and broadcasting pylons. No Peregrine falcon were observed during the preliminary Project area investigations. To assist with the construction of the PVS and BESS elements and the Project's effective operation, two (2) scattered trees (both *Eucalyptus camaldulensis var. camaldulensis*) and the six (6) vegetation associations may need to be removed. The six (6) vegetation associations of which all or part may need to be removed are: • *Acacia spp. +/- Senna artemisioides spp. petiolaris over Maireana brevifolia+/- Atriplex spp.* Low Shrubland; • *Acacia salicina* Tall Shrubland over *Maireana brevifolia*; • *Alectryon oleifolius* over *Enchylaena tomentose*; • *Typha domingensis* Small Wetland; • *Atriplex vesicaria / Maireana brevifolia* Low Shrubland; and • *Enneapogon nigricans* Grassland.

Assessment Section		Project Response
		Any adverse impact on native vegetation or ecosystems that cannot be avoided will be submitted to the Native Vegetation Council for approval as required.
	Principles of Development Control – Soil Conservation: *39. Development should not have an adverse impact on the natural, physical, chemical or biological quality and characteristics of soil resources.* *40. Development should be designed and sited to prevent erosion.* *41. Development should take place in a manner that will minimise alteration to the existing landform.* *42. Development should minimise the loss of soil from a site through soil erosion or siltation during the construction phase of any development and following the commencement of an activity.*	The Project will involve short-term construction, followed by possibly decades of the land being inactive. The limited or no cropping and consequently limited use of farm machinery on Project area will be beneficial for the soils. As previously discussed, erosion and sediment control measures will be implemented during the construction and operation phases to prevent erosion and loss of soil from the Project area.
Orderly and Sustainable Development **(P75)**	**Objectives:** *1. Orderly and economical development that creates a safe, convenient and pleasant environment in which to live.* *2. Development occurring in an orderly sequence and in a compact form to enable the efficient provision of public services and facilities.* *3. Development that does not jeopardise the continuance of adjoining authorised land uses.* *4. Development that does not prejudice the achievement of the provisions of the Development Plan.*	The Project area is an appropriate location because of the co-location with existing utility scale electricity infrastructure and the short distance required for the grid connection. The Project aligns with the Development Plan's Renewable Energy Facilities objective. The Project supports the existing electricity infrastructure and will not impede the operation of the established agricultural land uses in the area through any nuisance or harmful creating impact.

Assessment Section		Project Response
	Principles of Development Control: *1. Development should not prejudice the development of a zone for its intended purpose.* *2. Land outside of townships and settlements should primarily be used for primary production and conservation purposes.* *6. Development should be located and staged to achieve the economical provision of public services and infrastructure, and to maximise the use of existing services and infrastructure.* *7. Where development is expected to impact upon the existing infrastructure network (including the transport network), development should demonstrate how the undue effect will be addressed.*	The Project is located within the Primary Production Zone as shown in Zone Map PtPi/14 and PtPi/16. The Project is a type of development envisaged within the zone and constitute a component of the zone's desired character subject to implementation of management techniques set out by general / council wide policy regarding renewable energy facilities. The Project area is an appropriate location because of the co-location with existing utility scale electricity infrastructure and the short distance required for the grid connection (minimising the expanse of overhead power lines). The Project's construction traffic will impact the existing local transport network. A Traffic Management Plan will be developed with the DPTI, Safety and Services (Traffic Operations) and Port Pirie Regional Council to minimise the impact during the construction phase.
Renewable Energy Facilities **(P76)**	**Objectives:** *1. Development of renewable energy facilities that benefit the environment, the community and the state.* *2. The development of renewable energy facilities, such as wind farms and ancillary development, in areas that provide opportunity to harvest natural resources for the efficient generation of electricity.* *3. Location, siting, design and operation of renewable energy facilities to avoid or minimise adverse impacts on the natural environment and other land uses.*	The Project will complement and increase the generation of renewable energy within South Australia and the broader National Electricity Market, reduce greenhouse gases and decrease the use of water in the production of electricity. The Project area is an appropriate location because of the co-location with existing utility scale electricity infrastructure and the short distance required for the grid connection (minimising the expanse of overhead power lines).

Assessment Section		Project Response
		An objective of the Project is to minimise impacts on the natural environment and other land uses in the area while maximising the generation capability of the Project.
	Principles of Development Control: *1. Renewable energy facilities, including wind farms, solar farms and ancillary development, should be:* *(a) located in areas that maximize efficient generation and supply of electricity* *(b) designed and sited so as not to impact on the safety of water or air transport and the operation of ports, airfields and designated landing strips.*	The identification of the Project area is the result of an extensive solar site identification assessment of possible locations across Australia. The following factors/criteria were used to select the Project area: • Proximity to the Bungama substation; • Access to the Bungama substation and capacity of the substation to accept new generation; • Agreements with landowners to host the Project; • Marginal loss factors and future forecasts; • Details on interstate connectors and relevant known transmission constraints; • Consideration of known projects proximate to the Project's area and potential for impact on capacity and connection; • Irradiation levels; • Environmental analysis of topography and environmental constraints; • Topography of the Project area providing suitable conditions for the construction and operation of a solar farm; • Site visits and initial field investigations;

Assessment Section		Project Response
		• Located close to the regional centre of Port Pirie; • Suitable infrastructure surrounding the Project area e.g. road access for construction and operation of a solar farm; and • Most of the Project area is disturbed through continuous agricultural land uses reducing the likelihood that the Project's development footprint will contain significant areas of native vegetation, Aboriginal cultural heritage items, or other environmental constraints.
	Principles of Development Control - Wind Farms and Ancillary Development: *2. The visual impacts of wind farms and ancillary development (such as substations, maintenance sheds, access roads and wind monitoring masts) should be managed through:* *(a) wind turbine generators being:* *(i) setback at least 1000 metres from non-associated (non-stakeholder) dwellings and tourist accommodation* *(ii) setback at least 2000 metres from defined and zoned township, settlement or urban areas (including deferred urban areas)* *(iii) regularly spaced* *(iv) uniform in colour, size and shape and blade rotation direction*	The Project has been appropriately setback and is proposed to be screened from non-associated (non-stakeholder) dwellings. The Project is appropriately setback from tourist accommodation and areas defined and zoned township, settlement or urban areas (including deferred urban areas) Most of the Project area will be covered by solar panels mounted on single axis tracking modules and spacing. Depending on the type of single axis tracking modules the height of the bottom of the solar modules could be approximately 1.2m above ground level while the height of modules could be approximately 4m above ground level. The panels will be installed in parallel rows with the spacing being between approximately 4m to 10m depending on the type of single axis tracking module selected. The solar panels and single axis tracking modules will be uniform in colour, size, and shape. The solar arrays will be aligned north/south and track east/west. Viewing the solar arrays from parts of August

Assessment Section		Project Response
	(v) mounted on tubular towers (as opposed to lattice towers) *(b) provision of vegetated buffers around substations, maintenance sheds and other ancillary structures.* *3. Wind farms and ancillary development should avoid or minimise the following impacts on nearby property owners / occupiers, road users and wildlife:* *(a) shadowing, flickering, reflection or glint* *(b) excessive noise* *(c) interference with television and radio signals and geographic positioning systems* *(d) interference with low altitude aircraft movements associated with agriculture* *(e) modification of vegetation, soils and habitats* *(f) striking of birds and bats.* *4. Wind turbine generators should be setback from dwellings, tourist accommodation and frequently visited public places (such as viewing platforms) a distance that will ensure that failure does not present an unacceptable risk to safety.*	Highway and Locks Road will be similar in geometric layout as to viewing rows of grape vines aligned north/south on the Project area. The buildings required for operations will be similar in size to buildings and structures typically found in a primary production area and will be constructed using materials and colours that blend with the rural landscape as much as possible. The buildings are grouped together and located in close proximity to the Bungama Substation and near existing transmission lines that aligns with the current infrastructure visual amenity when viewed from this part of Augusta Highway and Locks Road. Targeted landscaping for some adjoining landowners is shown in the preliminary landscape plan attached in Appendix 14. The Project infrastructure, in particular the solar panels can potentially cause a glint and/or glare impact beyond the Project area. A Glint and Glare assessment 2018 Report is attached as Appendix 12. The report's key findings are: • No harmful glint or glare will be experienced for sensitive receivers as a result of the Project, with the potential for a low level (non-harmful) of glare experienced for some locations either very early morning or late evening in the Autumn and or Winter, if these areas are not impeded by existing vegetation. • There are no Glint or Glare issues for pilots or for the section of the railway line near the Project area or for the section of the Augusta Highway adjacent to the Project area.

Assessment Section		Project Response
		• A section of Warnertown Road experiences only 2 minutes late evening on some Autumn and Winter days for a total of less than one hour per annum of Green Glare or low-level glare. A section of Gulf View Road experiences two minutes per year of Green Glare or low-level glare. Proposed mitigation measures will ameliorate the Green Glare or low-level glare. • Some areas of the adjacent Napperby rural living area may experience some Green Glare or low-level glare in early morning or late evening during Autumn and or Winter if views directly to the PVS solar panels were unimpeded. Proposed landscape screening mitigation measures will ameliorate the potential for low-level glare. The Project's construction phase will generate noise emissions. Noise emissions occur during site preparation, the installation of the Project's infrastructure including the panel system and from the construction vehicles and machinery. Adopting standard environmental management controls, shutting down equipment when not in use and use of noise reduction devices will minimise the construction noise impacts at sensitive receivers which are expected to be negligible. Operating the Project will generate nominal noise emissions. The Project has been configured so all inverters are located at suitable noise attenuation distances from dwellings. A Noise Assessment of the Project found noise emissions during the construction and operation phase will be compliant with the Environment Protection (Noise) Policy 2007 and will not cause adverse impacts.

Assessment Section		Project Response
		The Project will not interfere with television and radio signals and geographic positioning systems or with low altitude aircraft movements associated with agriculture. The Project is not located near recreation areas, tourist accommodation or other frequently visited public places (such as viewing platforms) and is sited not to be an unacceptable risk to the public.
Short-Term Workers Accommodation (P81)	**Objective:** *1. A range of appropriately located accommodation types supplied for seasonal and short-term workers.*	Where suitable accommodation cannot be found at existing facilities within the Port Pirie area, a temporary construction workers camp on a suitable part of the Project area will likely be the most efficient/effective way to manage the construction workforce during the construction phase.
	Principles of Development Control *1. Accommodation intended to be occupied on a temporary basis by persons engaged in employment relating to the production or processing of primary produce including minerals should be located within existing townships or within primary production areas, where it directly supports and is ancillary to legitimate primary production activities or related industries.* *2. Buildings used for short-term workers accommodation should:* *(a) be designed and constructed to enhance their appearance* *(b) provide for the addition of a carport, verandas or pergolas as an integral part of the building*	Where suitable accommodation cannot be found at existing facilities within the Port Pirie area, a temporary construction workers camp on a suitable part of the Project area will likely be the most efficient/effective way to manage the construction workforce during the construction phase. The construction workers camp would be designed to accommodate up to an estimated 275 equivalent full-time workers during construction. Approximately 3ha – 5ha is required for the construction workers camp. An example of a typical construction workers camp layout is attached as Appendix 4. Adequate arrangements will need to be made for the provision of essential services to the construction workers camp including, the supply of water, the supply of electricity, the disposal and

Assessment Section		Project Response
	(c) where located outside of townships, not jeopardise the continuation of primary production on adjoining land or elsewhere in the zone *(d) be supplied with service infrastructure such as power, water, and effluent disposal sufficient to satisfy the living requirements of workers.* *3. Short-term workers accommodation should not be adapted or used for permanent occupancy.* *4. A common amenities building should be provided for temporary forms of short-term accommodation such as caravan and camping sites.*	management of sewage/waste water, stormwater drainage and general waste management. The final design, specification and layout of the temporary construction workers camp, including essential services, within the Project area will be submitted to the relevant authority for approval prior to the commencement of construction.
Siting and Visibility (P82)	**Objective:** *1. Protection of scenically attractive areas, particularly natural, rural and coastal landscapes.*	The Project area is not identified and listed scenically attractive area. The Project has been developed within regard to Landscape Protection Policy Area 11 and Landscape Protection Policy Area 12.
	Principles of Development Control: *1. Development should be sited and designed to minimise its visual impact on:…* *2. Buildings should be sited in unobtrusive locations and, in particular, should:* *(a) be grouped together* *(b) where possible be sited in such a way as to be screened by existing vegetation when viewed from public.*	The Project is not located within an area of known visual or scenic significance. The Project has been developed within regard to Landscape Protection Policy Area 11 and Landscape Protection Policy Area 12. The following amendments to the Project design have occurred to minimise visual impacts: • Including in excess of 7 km of visual buffering in the form of landscape screening at a direct Project cost estimated to exceed $750,000; and

Assessment Section		Project Response
		• Reducing the land area allocated to solar panels by approximately 24 hectares, equivalent to a reduction of 36,000 panels and equating to approximately $5,000,000 in relinquished income over the life of the Project. The buildings required for construction and operation phases are grouped together and located adjacent to the Bungama Substation and near existing transmission lines that aligns with the current infrastructure visual amenity when viewed from this part of Augusta Highway. Roadside vegetation is scattered along the Project boundaries and will assist with limiting and interrupting views of the whole Project from public roads.
	3. Buildings outside of urban areas and in undulating landscapes should be sited in unobtrusive locations and in particular should be: *(a) sited below the ridgeline* *(b) sited within valleys or behind spurs* *(c) sited in such a way as to not be visible against the skyline when viewed from public roads* *(d) set well back from public roads, particularly when the allotment is on the high side of the road.* *2. Buildings and structures should be designed to minimise their visual impact in the landscape…*	The Project is located outside an urban area but is not located on an undulating landscape. Roadside vegetation is scattered along the Project boundaries and will assist with limiting and interrupting views of the whole Project from public roads. The Project will be set back from public roads. The buildings required for operations are similar in size to buildings typically found in a primary production area e.g. intensive animal keeping infrastructure, shearing sheds, machinery sheds and grain facilities such as silos.
	5. The nature of external surface materials of buildings should not detract from the visual character and amenity of the landscape.	The buildings will be constructed using materials and colours that blend with the rural landscape as much as possible.

Assessment Section		Project Response
	6. The number of buildings and structures on land outside of urban areas should be limited to that necessary for the efficient management of the land.	Only the required number of structures to efficiently manage the solar farm will be located on the Project's land. No residential buildings are part of the development.
	7. Driveways and access tracks should be designed and surfaced to blend sympathetically with the landscape and to minimise interference with natural vegetation and landforms.	Access tracks required for the Project will be designed and constructed to blend sympathetically with the landscape and to minimise interference with natural vegetation and landforms where possible.
	8. Development should be screened through the establishment of landscaping using locally indigenous plant species: *(a) around buildings and earthworks to provide a visual screen as well as shade in summer, and protection from prevailing winds* *(b) along allotment boundaries to provide permanent screening of buildings and structures when viewed from adjoining properties and public roads* *(c) along the verges of new roads and access tracks to provide screening and minimise erosion.*	Given the scale and extent of the proposed development providing landscaping which is adequate to screen the entire Project area is not considered practical. Targeted landscaping to support erosion control and visual amenity for adjoining landowners is shown in the preliminary landscape plan attached in Appendix 14.
Transportation and Access **(P91)**	**Objectives:** *2. Development that:* *(a) provides safe and efficient movement for all motorised and non-motorised transport modes* *(b) ensures access for vehicles including emergency services, public infrastructure maintenance and commercial vehicles* *(c) provides off street parking*	The Projects' movement will be primarily motorised that will utilise the existing State and local transport facilities and networks to safely convey material and personnel to and from the Project area during the life of the Project.

Assessment Section		Project Response
	(d) is appropriately located so that it supports and makes best use of existing transport facilities and networks. *5. Safe and convenient freight movement throughout the State.*	
	Principles of Development Control - Movement Systems: *2. Development should be integrated with existing transport networks, particularly major rail, road and public transport corridors as shown on Location Maps and Overlay Maps - Transport, and designed to minimise its potential impact on the functional performance of the transport network.* *6. Development generating high levels of traffic, such as schools, shopping centres and other retail areas, and entertainment and sporting facilities should incorporate passenger pick-up and set-down areas. The design of such areas should minimise interference to existing traffic and give priority to pedestrians, cyclists and public and community transport users.* *12. Development should be designed to discourage commercial and industrial vehicle movements through residential streets and adjacent other sensitive land uses.* *13. Industrial/commercial vehicle movements should be separated from passenger vehicle car parking areas.* *14. Development should provide for the on-site loading, unloading and turning of all traffic* likely to be generated.	While the component delivery route will be finalised as part of the Traffic Management Plan preliminary analysis indicates the feasible trucking option is components are shipped to Flinders Port Adelaide and trucked direct to the Project area via National Highway A9 (Port River Expressway, Salisbury Highway) and National Highway A1 (Port Wakefield Road, Port Wakefield Highway, Augusta Highway) and Locks Road. Anticipated traffic volumes will be highest during the Project's construction while operational traffic volumes are expected to be minimal. A Transport Impact Assessment (TIA) attached as Appendix 10 assessed the potential impact of the Project's construction traffic movements on transport routes and other road users and assessed the potential impact of the Project's operational traffic movements on transport routes and other road users based on the Project being completely operational. The assessment reaches several conclusions including the traffic generated by the Project during the construction and operational phases is very low in comparison to existing traffic volumes on the State controlled roads and therefore is not expected to compromise the safety or function of the surrounding State road network and the traffic generated by the proposed Project area during the construction and operational phases is not expected to

Assessment Section		Project Response
		compromise the safety or function of the local roads that experience low volumes of traffic A Traffic Management Plan will be developed with the DPTI, Safety and Services (Traffic Operations) and Port Pirie Regional Council to minimise the impact. Section 7.12 of the Planning Report contains further detail on the Project's traffic and transport.
	Principles of Development Control – Access: *22. Development should have direct access from an all weather public road.* *23. Development should be provided with safe and convenient access which:…* *25. The number of vehicle access points onto arterial roads shown on Overlay Maps - Transport should be minimised and, where possible, access points should be:* *(a) limited to local roads (including rear lane access)* *(b) shared between developments.* *26. Development with access from arterial roads or roads as shown on Overlay Maps - Transport should be sited to avoid the need for vehicles to reverse onto or from the road.* *28. Driveways, access tracks and parking areas should be designed and constructed to:* *(a) follow the natural contours of the land*	The Project will not require vehicle access points onto arterial roads shown on the Development Plan Overlay Map PtPi/14– Transport. The Project area will primarily be accessed from Locks Road. Locks Road is an all-weather graded public road. Data is limited for Locks Road, but it is reasonable to assume it has relatively minor vehicle flows, except during harvest. The construction traffic therefore would provide significant flows on these local roads compared to the current use. During the construction phase access will likely be via existing access points and additional access points to allow for the efficient transport of components onto and around the Project area. During the operation phase use of certain access point may be reduced. The internal access roads will be sufficient to allow for safe on-site vehicle manoeuvring including large vehicle deliveries. Driveways, access tracks and parking areas will be designed and constructed to minimise excavation and/or fill, minimise the potential

Assessment Section		Project Response
	(b) minimise excavation and/or fill *(c) minimise the potential for erosion from surface runoff* *(d) avoid the removal of existing vegetation* *(e) be consistent with Australian Standard AS: 2890 - Parking facilities.*	for erosion from run-off, minimise the removal of existing vegetation and be consistent with relevant standards where practicable. An indicative internal access road layout is provided in Appendix 3.
	Principles of Development Control - Vehicle Parking: *31. Development should provide off-street vehicle parking and specifically marked accessible car parking places to meet anticipated demand in accordance with Table PtPi/2 - Off Street Vehicle Parking Requirements unless all the following conditions are met:* *(a) an agreement is reached between the Council and the applicant for a reduced number of parking spaces* *(b) a financial contribution is paid into the Council Car Parking Fund specified by the Council, in accordance with the gazetted rate per car park.*	The Project will provide parking on-site in accordance with relevant standards.
Waste **(P97)**	**Objective:** *1. Development that, in order of priority, avoids the production of waste, minimises the production of waste, re-uses waste, recycles waste for re-use, treats waste and disposes of waste in an environmentally sound manner.* *2. Development that includes the treatment and management of solid and liquid waste to prevent undesired impacts on the environment including, soil, plant and animal biodiversity, human health and the amenity of the locality.*	An objective of the Project is to avoid the production of waste, minimise the production of waste, reuse waste, recycle waste for reuse, treat waste and disposes of waste in an environmentally-sound manner when required. Waste management procedures will be implemented for the construction phase and operation phase with the intention of preventing undesired impacts on the environment including, soil,

Assessment Section		Project Response
		plant and animal biodiversity, human health and the amenity of the locality.
	Principals of Development Control *1. Development should be sited and designed to prevent or minimise the generation of waste (including wastewater) by applying the following waste management hierarchy in the order of priority as shown below:* *(a) avoiding the production of waste* *(b) minimising waste production* *(c) reusing waste* *(d) recycling waste* *(e) recovering part of the waste for re-use* *(f) treating waste to reduce the potentially degrading impacts* *(g) disposing of waste in an environmentally sound manner.*	The Project is not expected to generate a significant amount of waste during the construction or operation phases. Construction waste management procedures will be implemented via a CEMP. Operational waste management procedures will be implemented via an OEMP. Any waste to be disposed of will be disposed in accordance with relevant standards.
	Principals of Development Control – Wastewater: *7. The disposal of wastewater to land should only occur where methods of wastewater reduction and reuse are unable to remove the need for its disposal, and where its application to the land is environmentally sustainable.* *8. Wastewater storage lagoons…*	During the construction phase and operation phase wastewater will likely be captured and removed from the Project area using a licensed wastewater contractor. A sewerage treatment plant will likely be designed and constructed to accommodate the estimated construction and operational staff and contractors. The exact method for dealing with wastewater will be determined during the Project's final design. Construction wastewater management procedures will be implemented via a CEMP.

Assessment Section		Project Response
		Operational wastewater management procedures will be implemented via an OEMP. The Project does not involve a wastewater storage lagoon.
	Principals of Development Control - Waste Treatment Systems: *10. Development that produces any sewage or effluent should be connected to a waste treatment system that complies with (or can comply with) the relevant public and environmental health legislation applying to that type of system.* *11. The methods for, and siting of, effluent and waste storage, treatment and disposal systems should minimise the potential for environmental harm and adverse impacts on:* *(a) the quality of surface and groundwater resources* *(b) public health* *(c) the amenity of a locality* *(d) sensitive land uses.* *12. Waste treatment should only occur where the capacity of the treatment facility is sufficient to accommodate likely maximum daily demands including a contingency for unexpected high flows and breakdowns.* *13. Any on-site wastewater treatment system/ re-use system or effluent drainage field should be located within the allotment of the development that it will service.* *14. A dedicated on-site effluent disposal area should not include any areas to be used for, or could be reasonably foreseen to be used for, private outdoor open space, driveways, car parking or outbuildings.*	During the construction phase and operation phase wastewater will likely be captured and removed from the Project area using a licensed wastewater contractor. A sewerage treatment plant will likely be designed and constructed to accommodate the estimated construction and operational staff and contractors. The exact method for dealing with wastewater will be determined during the Project's final design. The wastewater treatment and disposal will be conducted in accordance with relevant standards. The exact method of for dealing with wastewater will be determined during the Project's final design. The methods for, and siting of, effluent and waste storage, treatment and disposal systems will minimise the potential for environmental harm and adverse impacts on the quality of surface and groundwater resources, public health, the amenity of a locality and sensitive land uses.

Assessment Section		Project Response
	15. The spreading or discharging of treated liquid or solid waste onto the ground should only occur where the disposal area consists of soil and vegetation that has the capacity to store and use the waste without contaminating soil or surface or ground water resources or damaging crops.	

APPENDIX 6

Community and Stakeholder Engagement Report

BUNGAMA SOLAR

COMMUNITY AND STAKEHOLDER ENGAGEMENT REPORT

Prepared for Bungama Solar

EPS ENERGY

Reference No. 11297 November 18

BUNGAMA SOLAR

www.bungamasolar.com.au

QUALITY ASSURANCE AND DECLARATION

Quality Assurance and Version Control Table		
Project:	Bungama Solar	
Client:	Bungama Solar 1 Pty Ltd and Bungama Solar 2 Pty Ltd	
Rev:	**Date:**	**Reference:**
V01	29.11.2018	Bungama Community and Stakeholder Engagement Report
Checked by:	L. Bryson	
Approved by:	S. McCall/ J. Burns	
Declaration:	*The opinions and declarations in this document are ascribed to EPS Energy and are made in good faith and trust that such statements are neither false nor misleading.* *In preparing this document, EPS Energy has considered and relied upon information obtained from the public domain, supplemented by discussions between key EPS Energy staff, representatives from governing agencies and independents, including the client and specialist consultants.*	
Applicant:	EPS Energy PO Box 195 Charlestown NSW 2290 (02) 9258 1362	
Prepared By:	M. Budisavljevic	
Reviewed By:	A. Tipper/ S. Duffy	
Project Land:	CT 6037/29 – A20 DP80628 CT 6127/5 – A558 FP188690 CT 5954/187 – A52 DP25903 CT 5949/272 – A4 DP24997 CT 5390/999 – A559 FP188691 CT 5360/334 – A551 FP188683 CT 5972/304 – A1 DP24255 CT 5776/531 – A501 DP52803 CT 5776/532 – A502 DP52803 CT 5978/766 – A55 DP71831	

Contents

APPENDICES

This page has intentionally been left blank.

1. INTRODUCTION

Bungama Solar is proposed to be an integrated but separately operated grid connected Photovoltaic Energy Generation System (PVS) of approximately 280MW (AC) generation capacity and a 140MW capacity Battery Energy Storage System (BESS) with 560MWh of storage that will feed into the National Electricity Market via ElectraNet's Bungama Substation. The PVS element, the BESS element and associated infrastructure, together are "the Project".

This Community and Stakeholder Engagement Report has been prepared by Energy Projects Solar (EPS) Pty Ltd ACN: 609 935 588 for Bungama Solar 1 Pty Ltd ACN: 621 450 762 the special purpose vehicle for the (PVS) and Bungama Solar 2 Pty Ltd ACN: 621 450 995 the special purpose vehicle for the (BESS).

EPS Energy has previously prepared a Community & Stakeholder Engagement Plan including the proposed tools and activities to assist with the engagement process. The purpose of this report is to summarise the outcomes of the engagement that has taken place.

The objectives of this report are to:

- Summarise the outcomes of the engagement undertaken to date;
- Analyse the comments, views and concerns raised by the community and other stakeholders;
- Demonstrate how the engagement process has informed the proposed Project; and
- Outline the ongoing communication tools to be implemented for the life of the Project.

1.1. PROJECT SUMMARY

Bungama Solar is proposed as a 280 MW (AC) utility scale solar photovoltaic plant and a 140 MW capacity battery energy storage system with up to 560 MWh of storage to feed into the National Electricity Market (NEM) through a 275kV connection to ElectraNet's Bungama Substation.

Bungama Solar is to be developed on approximately 530 hectares of cleared land in the suburbs of Bungama, Napperby and Warnertown, South Australia. The site is situated approximately 6 kilometres east of Port Pirie and 220 kilometres north of Adelaide. Bungama Solar is within the Local Government Area of Port Pirie Regional Council.

A Local Community Fund is proposed as a financial contribution for the life of the Project. The Community Fund is intended for the local community who are hosting the Project to assist with funding environmental, social and economic development opportunities.

One of the key purposes of the engagement process was to allow for the community and other stakeholders to input their values, concerns and feedback on various aspects of the Project, which intended to assist EPS Energy in managing the final Project design. Detailed discussions with the Port Pirie Regional Council, ElectraNet and other agencies will also continue to influence final decisions regarding the Project design. A description of each element of the proposal will be provided as part of the Development Application.

2. ENGAGEMENT STRATEGY

The Community & Stakeholder Engagement Plan (the Plan) was prepared at the Project Preparation Phase to ensure that the engagement was undertaken in a comprehensive and constructive manner for the proposed Project.

The Plan was used as a tool to assist with the planning and management of engagement activities proposed to be undertaken at various stages of the Project. The Plan is founded on a Statement of Intent and subsequent Aims and Objectives to promote effective engagement with community and other stakeholders. The Statement of Intent, Aims and Objectives are included below.

Section 3 of this report summarises the outcomes of the engagement activities undertaken in accordance with the Plan, making reference to the Aims and Objectives outlined below, where applicable.

Statement of Intent

EPS Energy intends to involve the community and other stakeholders at each phase of the Project to ensure local values and concerns are identified and inform the decisions and activities of the Bungama Solar Project.

Aim 1

Obtain and maintain a Social Licence to Operate with the identified community and other stakeholders.

Objectives:

- Undertake an audience analysis to identify the key community groups and other stakeholders who may be impacted/interested in the Project;
- Undertake early discussions with relevant landowners, Council, Departments and other agencies to determine Project support and feasibility;
- Engage with the community and other stakeholders early and throughout the Project's life;
- Review the key community groups and other stakeholders who may gain or lose interest in participating in the engagement process;
- Disclose any potential impacts that may occur during the construction, operation, and decommissioning of the Project;
- Obtain an understanding of specific community and other stakeholder values and concerns regarding the Project; and
- Demonstrate how input from the community and other stakeholders influences the Project.

Aim 2

Enable and collaborate with the community and other stakeholders to provide feedback and input to the Project.

Objectives:

- Raise awareness of the proposal with adjacent landowners, local community and Council, key Government agencies and other key stakeholders;
- Provide relevant information to educate the community and other stakeholders on solar development and the development approval process generally so that they can participate in a meaningful way;
- Actively seek local information and input from the community and other stakeholders on local matters of importance that are relevant to the Project;
- Use a variety of engagement tools and activities to reach the broadest sample of the community and other stakeholders; and
- Collaborate with the community and other stakeholders to develop acceptable solutions to raised issues and/or concerns, wherever practicable.

Aim 3

Establish and maintain an open, honest and genuine relationship with the community and other stakeholders.

Objectives:

- Be genuinely available to meet and talk to community members and interested individuals or groups;
- Provide opportunities to interact with the community and other stakeholders;
- Respond to questions and concerns raised by the community and other stakeholders in a respectful, clear, and honest manner;
- Provide updates on the status of the Project; and
- Prioritise the achievement of mutually agreed outcomes, wherever practicable.

2.1. PRELIMINARY AUDIENCE ANALYSIS

The preliminary audience analysis was conducted during the Project Preparation Phase. This analysis included the identification of parties known to be potentially impacted by the Project, and those who may have an interest in the Project, vested or otherwise.

EPS Energy contacted the Port Pirie Regional Council on 24 April 2018 to request a comprehensive list of all community groups and other stakeholders whom Council regularly engage with for developments in the area. This was to ensure the preliminary audience analysis was inclusive of all potential stakeholders.

The following stakeholders have been identified as key to the Project.

- Landowners and occupiers of the:
    - Properties forming the proposed Project Area; and
    - Adjacent properties;
- Key government and agency members:
    - Low Carbon Economy Unit within the Department for Energy and Mining;
    - ElectraNet;
    - Regional Development Australia;
    - Federal Member for Grey;
    - State Member for Frome; and
    - CEO, Mayor and relevant Development Officers of the Port Pirie Regional Council;
- The Nukunu Peoples Council Inc.;
- The wider Bungama/Napperby/Warnertown communities and established groups including:
    - Upper Spencer Common Purpose Group;
    - Napperby Tennis Club and Community Centre;
    - Napperby Memorial Hall;
    - Port Pirie CommUNiTY;
    - HOPE Partnership
    - Rotary Club of Port Pirie;
    - Uniting Care Wesley Country SA; and
    - Soroptimist International of Port Pirie Incorporated;
- The relevant authorities who manage the registered easements across the Project Area:
    - ElectraNet;
    - SA Power Networks;
    - Telstra; and
    - The Minister for Transport, Infrastructure and Local Government.

Additional stakeholders may be identified as the Project progresses over time. EPS Energy will continue to review the above list as stakeholders gain or lose interest in participating in the engagement process over the Project's life.

2.2. STAGED RELEASE OF INFORMATION

As outlined in the Plan, EPS Energy staged the initial release of Project information with the purpose of directly informing the local community and ensuring the parties considered to have the highest level of impact and/or interest in the Project were notified earliest. This direct communication was an effort to begin building trust and a genuine relationship with the local community and key stakeholders.

EPS Energy recognised the potential risks associated with staging the release of information and simultaneously contacting the adjacent residents and key stakeholders due to the rapidity of sharing information via digital social media. Where relevant risk management measures were implemented they are specified in the subsections below.

2.2.1. Commercial-Confidential Release

In order to conduct preliminary site selection and feasibility studies, EPS Energy discussed certain Project information to the landowners of the proposed Project Area prior to public release of any information. This included landowners and occupiers of land where the easement is proposed to connect the Project to the existing electricity substation.

For the same purposes, EPS Energy discussed Project information with members of ElectraNet and the Low Carbon Unit of the Department for Energy and Mining (then Department for Premier and Cabinet) prior to public release of any information.

EPS Energy also released certain Project information to subconsultants in order to complete preliminary studies on the proposed Project Area.

Where applicable, EPS Energy expressed the information shared was Commercial in Confidence and Confidentiality Deeds would be executed where necessary.

2.2.2. Initial Public Release

EPS Energy conducted a "cold-calling" process to correspond directly with the landowners and occupiers of adjacent properties with the purpose of introducing the Project, personally inviting them to a dedicated Neighbour Information Session and to seek their preference for receiving impending Project information materials.

A total of 27 neighbouring landowners were identified whose properties adjoin the Project Area. EPS Energy had access to 16 neighbouring landowners' telephone numbers, four (4) of these were disconnected lines and three (3) of these did not answer or return calls. Therefore, only nine (9) of the 27 neighbouring landowners were contacted on 8 – 9 May 2018 at various times of the day. EPS Energy sent an invitation for the dedicated Neighbour Information Session (Appendix 2) and Project Information Brochure (Appendix 1) to these nine (9) neighbouring landowners upon receiving their preference of delivery (i.e. express-post or Email).

EPS Energy express-posted the invitation and information brochure to the remaining 18 neighbouring landowners on 11 May 2018 to the PO Box listed on the Certificate of Title for the landholdings; three (3) of which returned unopened. The same three (3) were unable to be contacted via telephone as two (2) were disconnected lines and one (1) was a private number. It is anticipated that these remaining three (3) were captured in the unaddressed mailbox drop described in Section 2.2.3.

Concurrent to this, EPS Energy placed calls on 10 May 2018 to key members of the above-mentioned Government and agencies to introduce the Project and request preliminary meetings. A telephone conference was held on 25 May 2018 and additional meetings were held on 28 May 2018 and 1 June 2018 in South Australia.

During this process, EPS Energy declined numerous requests for interviews until after it had made sufficient efforts to directly contact the above-mentioned parties.

2.2.3. Secondary Public Release

Once communication had been established with these parties, EPS Energy directly notified the community groups and other stakeholders stated in Section 2.1 via Email and post on 14 May 2018.

This secondary stage also included publishing the Project website, an unaddressed mailbox drop of the invitation to the Community Information Sessions (Appendix 3) to 695 post office boxes and 13 over-the-counter addresses at the Port Pirie Post Office and releasing an announcement to the media on 21 May 2018 (Appendix 6).

3. ENGAGEMENT PROGRAM

As outlined in the Plan, EPS Energy developed a proposed Engagement Program, including the relevant timeframes and actions for each phase of the Project. The Engagement Program is divided into five distinct phases, providing a logical sequence for engagement activities.

Below is a summary of the outcomes achieved at each phase and the intended outcomes for phases that have not yet ensued.

3.1. PHASE 1: PREPARATORY PHASE

The purpose of the engagement conducted during the Preparatory Phase was predominantly to discuss/meet with the potential Project landowners to discuss hosting the Project.

The Preparatory Phase included the following engagement:

- Discussions and meetings with the Project landowners to discuss hosting the Project and executing Agreements, where relevant;
- Discussions and meetings with the Low Carbon Economy Unit within the Department for Energy and Mining (then Department for Premier and Cabinet) to discuss the process of applying for Crown Sponsorship; and
- Discussions and meetings with ElectraNet to discuss and execute a Preliminary Works Agreement and Works Orders to determine connection options to the Bungama Substation.

3.2. PHASE 2: PRE-LODGEMENT COMMUNITY & STAKEHOLDER ENGAGEMENT

The purpose of the engagement conducted during this phase was predominantly to introduce the Project to the community and other stakeholders prior to lodging a Development Application. This is to ensure that the comments, concerns and values of these parties are considered in project decision making.

Phase 2 engagement included the following:

- Correspondence with specialists as stated in Section 2.2 regarding site suitability and feasibility;
- Correspondence with the adjacent landowners to the Project to introduce EPS Energy and the Project, this entailed:
    - Telephoning the landowners directly and seeking their preference of receiving the impending Project information materials; and
    - Emailing and express-posting an invitation to the dedicated Neighbour Information Session and a Project Information Brochure;
- Correspondence and meeting with members of State and Local Government to further discuss the Project and expectations regarding ongoing engagement;

- Correspondence with the identified local community groups by Emailing and express-posting an invitation to the Community Information Session;
- Unaddressed mailbox-drop to 708 in the locality;
- Newspaper advertisement in local paper advising of the proposal and the particulars of the Community Information Sessions;
- Press release to local media;
- Activation of the Project website;
- Correspondence with the Project landowners to keep informed of upcoming community and other stakeholder engagement and the resulting outcomes;
- Community Information Sessions and Neighbour Information Session held at the Napperby Tennis and Community Centre on 31 May 2018 and 1 June 2018;
- Collating expressions of interest from the local and regional industry workforce seeking to participate in the construction phase;
- Sending a courtesy letter to key Local and State Government members to advise of the outcomes of the Information Sessions;
- Preparation of a Post- On-ground Consultation Summary Report to ensure the comments, concerns, values and feedback from the community and other stakeholders has been captured and considered; and
- Ongoing response to enquiries from the community and other stakeholders.

3.3. PHASE 3: DEVELOPMENT APPLICATION

The key objectives for this phase in relation to community and other stakeholder engagement is to provide updates on the status of the Project as key milestones are executed.

Phase 3 engagement included the following:

- Continued liaison with individual community and other stakeholder members who have expressed a high interest in the Project;
- Continued liaison with the Project landowners to keep informed of upcoming Project milestones;
- Publishing updates to the Project website, in particular the Frequently Asked Questions in response to regular enquiries and comments;
- Correspondence with the Office for the Technical Regulator to obtain the Certificate for Development to append the Crown Sponsorship application;
- Correspondence with the Low Carbon Economy Unit of the Department of Energy and Mining to lodge the Crown Sponsorship application; and
- Sending a courtesy update to key members of the Port Pirie Regional Council, State Government and other key agencies upon lodgement of the Crown Sponsorship application.

Phase 3 engagement will also include continued correspondence with Project landowners, adjoining landowners, and community and other stakeholders regarding the following matters:

- Lodgement of the Development Application with the State Commission Assessment Panel;
- Issuing responses to any potential submissions to the Development Application;
- Providing updates if/when approval is granted for the Development Application; and
- And any other matters resulting from the Conditions of Consent.

3.4. PHASE 4: CONSTRUCTION

The key purpose of engagement during Phase 4 is to ensure the community and other stakeholders are aware of the construction activities and any temporary disruptions.

Phase 4 engagement will likely include the following:

- Public notification and updates of construction information including timelines and contact information to be available on the Project website, via local media and on signage at the entrance to the site;
- Correspondence and potential meetings with adjacent landowners with the aim of minimising impacts during this phase; and
- The appointment of a dedicated "complaints line" for the public to report nuisance or negligence of construction terms.

3.5. PHASE 5: OPERATION AND DECOMMISSION

The key objective of engagement during this phase is to maintain ongoing and open channels of communication with the community and other stakeholders to ensure any potential concerns are appropriately managed.

With the end of the operational life of the Project, the Project will likely be decommissioned. An appropriate Community and Stakeholder Engagement plan or strategy should be developed approximately 12-18 months prior to decommissioning.

Phase 5 engagement will likely include the following:

- Public notification and updates of operation and/or decommissioning information and contact information to be available on the Project website and a sign at the entrance to the site;
- The establishment of a Local Community Fund and any correspondence relating to the management and governance of the Fund;
- Correspondence and potential meetings with adjacent landowners with the aim of minimising impacts during operation and decommissioning;
- The appointment of a dedicated Community Liaison Officer with contact details (phone, Email and mailing address) to be the priority point of contact for the community and other stakeholders. Their role should entail:
    - Developing and maintaining relationships with the key community and other stakeholders; and
    - Establishing and maintaining a complaints/comments register.

4. ENGAGEMENT TOOLKIT

The following Engagement Toolkit outlines the means by which EPS Energy engaged the community and other stakeholders to meet the Aims and Objectives stated in Section 2.

4.1. ENGAGEMENT ACTIVITIES

The engagement activities outlined below have been selected in accordance with industry practice. The activities are designed to be engaging, informative and promote deliberative discussions that aims to inform Project decision making.

4.1.1. Information Sessions

EPS Energy held four information sessions over two days; one of which was a dedicated Neighbour Information Session, while the remainder were general Community Information Sessions. The purpose of the information sessions was to promote a two-way exchange of information, where the community and other stakeholders could raise any concerns and provide local knowledge, while EPS Energy provided further information about the Project both verbally and via visual and documented communication materials.

Details of the communication materials used are outlined in Section 4.2 below.

The information sessions were held at the Napperby Tennis and Community Centre, 33 Second Street, Napperby, South Australia 5540. The session times were as follows:

- Community Information Sessions:
  - Thursday, 31 May 2018, between 11:00am – 1:00pm and 5:00pm – 7:00pm;
  - Friday, 1 June 2018, between 10:30am – 12:30pm.
- Neighbour Information Session:
  - Thursday, 31 May 2018, between 2:00pm – 4:00pm.

As detailed in the Community and Stakeholder Engagement Plan, the information sessions were intended to be delivered in a casual setting where attendees could engage at their own pace. A total of five EPS Energy representatives were present at the information sessions. The communication materials were arranged in an open display that enabled attendees to walk through at their own pace, or with an EPS Energy representative. A table of refreshments was also available.

This was positively received by attendees who preferred this delivery over a seminar style.

An estimated 124 guests attended the information sessions over the two days. This included 13 of the 27 identified adjacent landowners who attended the dedicated Neighbour Information Session. This also included a number of representatives from the Port Pirie Regional Council, Regional Development Australia and ElectraNet.

4.2. COMMUNICATION MATERIALS

The intention of the communication materials outlined below were to facilitate the exchange of information between EPS Energy and the community and other stakeholders in an engaging manner.

4.2.1. Website

During the Project Preparation Phase, EPS Energy created a Project specific website to provide information in an engaging manner. The website has been used to publish Project updates and facilitate the exchange of information via a downloadable Information Brochure and responses to frequently asked questions, while the Contact Page includes an electronic feedback form. The Project website is located at www.bungamasolar.com.au

4.2.2. Preliminary Information Package

During the Preparation Phase EPS Energy prepared the Information Brochure (Appendix 1) outlining the key features of the Project including its proposed location, summary of the technical functions of the Project, current status, key social and environmental benefits, a map of the Project and contact information.

EPS Energy also prepared an invitation to the designated Neighbour Information Session (Appendix 2) for the adjoining landowners and a separate invitation to the broader Community Information Sessions (Appendix 3). Both invitations include a brief summary of the proposal as it was at that time, the session dates and times, venue address, photograph of the venue and contact information. The reverse side of the invitations include a summary of the Project information brochure.

Copies of the Information Brochure were made available at the Information Sessions and were distributed along with the invitation to the Neighbour Information Session to adjoining landowners during the Initial Public Release between 8 - 9 May 2018.

The invitations to the Community Information Sessions were delivered to the Community Groups outlined in Section 2.1 and a further 708 unaddressed mailboxes (including the 13 over-the-counter collections) in Port Pirie on 21 May 2018.

4.2.3. Feedback Form

EPS Energy prepared the Feedback Form (Appendix 4) including a short questionnaire to gain valuable information about the community and other stakeholders attending the Information Sessions including, their age group, the distance they reside from the Project, and how long they have resided in the area. The questionnaire aimed to gain information about the community and other stakeholders' opinion of renewable energy generally and whether they consider there to be any positive or negative impacts from the Project.

The Feedback Form will also be a useful tool to inform future engagement with the community and other stakeholders, specific to their values and concerns.

Analysis of the Feedback Form demonstrated a largely positive opinion of the Project (approximately 75%) and renewable energy generally (75% positive; 25% neutral; nil negative).

The positive comments included:

- Potential for local employment during construction;
- Interest in the locality for future projects;
- Economic benefit to the locality during construction;
- Clean energy production/ reduction in use of fossil fuels;
- Environmental benefits;
- Lower power costs; and
- Science, technology, engineering and mathematics (STEM) education.

The concerns recorded in the Feedback Forms included:

- Visual impacts on the scenery; and
- Uncertainty of negative effects on property values.

Responses to these concerns have been included in the revised frequently asked questions on the Project website.

4.2.4. Attendance Register

EPS Energy prepared an attendance register (Appendix 5) for the Information Sessions. This enabled the collection of key information about attendees including, their name, contact details and if they wish to receive Project updates via Email.

A total of 28 attendees signed the Register providing further positive feedback.

4.2.5. Media Release

EPS Energy advertised the Community Information Sessions in The Recorder and The Flinders News. An example of the advertisement is shown in plate 1 below.

A press release was issued to both of the above-mentioned local media outlets on 21 May 2018 (Appendix 6).

Plate 1: Clipping of Bungama Solar advertisement in The Recorder, Thursday 24 May 2018, page 4

4.2.6. Correspondence Register

EPS Energy developed a correspondence register to record known key stakeholder contact information and details of any correspondence that has occurred. The register is a 'live' document and updated according to all communication proceedings. The register is intended for internal-use only.

4.2.7. Visual Communication

A number of types of visual communication such as maps, images, information boards and a video were used to assist in the exchange of information in an engaging way and demonstrate examples of similar projects.

Mapping

The following maps were created by EPS Energy to visually communicate the Project's location:

- Bungama Solar - Locality Plan; and
- Bungama Solar – Site Plan.

Information Boards

A number of information boards were prepared providing the following information:

- Summary of EPS Energy;
- Summary of the technical aspects of solar technology;
- The development approval process and the Project's status;
- Example images of solar panels from both the front and behind the panels;
- Example images of solar panel cleaning technology; and
- Images of the visibility and scale of an existing solar farm.

As described above, these information boards were arranged in an open display that enabled attendees to walk through at their own pace or with an EPS Energy representative. The following Plates depict examples of the layout.

Plate 2: EPS Energy representatives with attendees of the Community Information Session, 31 May 2018

Plate 3: EPS Energy representatives with attendees of the Community Information Session, 31 May 2018

Video

EPS Energy compiled videos from solar technology suppliers demonstrating examples of the types of technology that may be used for the Project. The video provided an overview of the process involved in planning, designing, constructing and maintaining similar projects as well as an example of an operating project.

The video was set to play on a continuous loop positioned at the end of the displays and near the refreshments table. Many attendees watched the video while helping themselves to the refreshments and filled out the Feedback Form or conversed further with EPS Energy representatives.

5. COMMUNITY AND STAKEHOLDER RESPONSE

The initial response from the community and other stakeholders has been largely positive and supportive of the Project. Some adjoining rural residential land owners, while supporting solar energy, have raised concerns about the Project area adjoining their land. The project has been amended in response to the concerns raised, as detailed within this section.

Overall, the response has remained positive and supportive at the time of this report.

5.1. PRE- MAY/JUNE 2018 INFORMATION SESSIONS

5.1.1. Government and other Agencies

The response from Government and other Agencies to the initial contact was largely positive. Most organisations expressed interest in attending the sessions.

Some organisations were unavailable during the scheduled Information Session times therefore could not attend, and organised meetings with EPS Energy at other suitable times, or simply requested to be provided with project updates as the project progressed.

Key members of the Port Pirie Regional Council expressed their commendation of EPS Energy's early and comprehensive engagement approach.

5.1.2. General Community

As stated in Section 2.2.3, EPS Energy directly notified the identified community groups and other stakeholders via email and post on 14 May 2018.

This secondary stage also included publishing the Project website, conducting an unaddressed mailbox drop of the invitation to the Community Information Sessions (Appendix 3) to 695 post office boxes and 13 over-the-counter addresses at the Port Pirie Post Office and releasing an announcement to the media on 21 May 2018 (Appendix 6).

During this time, EPS Energy conducted interviews via telephone with ABC News (North and West), the Port Pirie Recorder and Southern Cross News Port Pirie.

EPS Energy received numerous expressions of interest via the Project website and Email for the provisions of services and employment.

EPS Energy were not contacted during this time by the general community otherwise.

5.1.3. Adjacent Landowners

As stated in Section 2.2.2, EPS Energy conducted a "cold-calling" process to correspond directly with the landowners and occupiers of adjacent properties with the purpose of introducing the Project, personally inviting them to a dedicated Neighbour Information Session and to seek their preference for receiving impending Project information materials. A total of 27 neighbouring landowners were identified whose properties adjoin the Project Area. EPS Energy had access to 16 neighbouring landowners' telephone numbers, four (4) of these were disconnected lines and three (3) of these did not answer or return calls.

During this time, only three (3) of the 27 adjacent landowners contacted EPS Energy via telephone to ask questions and raise initial concerns about the Project. Concerns raised by adjacent landowners prior to the May/June Information Sessions were specifically regarding:

- Project approval status;
- The potential adverse visual impact on their land;
- The potential adverse noise impacts on their land; and
- The potential negative impacts on the value of their land.

EPS Energy recorded all concerns and encouraged adjacent landowners to attend the dedicated Neighbour Information Session to further discuss their queries and concerns in detail with key Project team members.

Prior to the May/June Information Sessions, EPS Energy undertook a follow-up calling exercise to the adjacent landowners to gauge the expected attendance for the Information Sessions. During this time only one (1) adjacent landowner expressed their concerns regarding the Project, which was related to Project's effect on the value of their land. This landowner agreed to attend the dedicated Neighbour Information Session to discuss the matter further.

5.1.4. Nukunu Peoples Council Inc.

On 14 May 2018 EPS Energy sent the Nukunu Peoples Council Inc. information about the Project and an invitation to the Community Information Sessions. Further attempts to contact the group via telephone occurred on 28 May 2018. It is noted that EPS Energy did not receive a response during this time.

5.1.5. Easement Authorities

On 21 May 2018 EPS Energy sent a letter with information about the Project and an invitation to the Community Information Sessions to representatives of Department for Transport, Infrastructure and Local Government, Telstra, ElectraNet and SA Power Networks.

5.2. POST- MAY/JUNE 2018 INFORMATION SESSIONS

5.2.1. Government and other Agencies

A number of key members of Council, State Government and other agencies attended the Community Information Sessions. The responses remained largely positive and supportive of the Project.

EPS Energy has since provided a number of Project updates via email to these parties and will continue to do so as the Project continues to progress.

5.2.2. General Community

Most attendees of the Community Information Sessions were generally interested in learning more about the Project and looking for additional details around some of the information in the Information Brochure. Conversations with the attendees also identified anecdotal information about the area, including potential risks that may be useful to inform various aspects of the Project (e.g. the occurrence of strong winds, local resources).

The key themes that have arisen from correspondence with the general community to date include:

- Expressions of interest to participate in the Construction Phase by providing services and/or equipment;
- Interest in the locality for future projects;
- Economic benefit to the locality during construction;
- The potential adverse visual impacts of the Project;
- Clean energy production/ reduction in use of fossil fuels;
- Environmental benefits; and
- Lower power costs.

5.2.3. Adjacent Landowners

A total of 13 of the 27 identified adjacent landowners attended the Information Sessions. While supporting renewable energy in the form of solar energy, some landowners raised concerns about the Project being located near their land. Common concerns that were raised included:

- The potential adverse visual impact on their land;
- The potential adverse noise impacts on their land;
- The potential adverse impacts on their livestock and horses on their land;
- The potential negative impacts on the value of their land; and
- The potential safety issues with construction traffic.

These concerns corresponded to those raised during contact with adjacent landowners prior to the sessions.

Key members of EPS Energy attended individual site visits of particularly interested adjacent landowners to discuss their specific concerns with the Project.

Overall, the remaining adjacent landowners were complaisant and/or supportive of the Project. Many of the adjoining properties are primarily used for agricultural purposes with those landowners residing on different properties. Other enquiries and interests from the adjacent landowners included:

- Their land being part of the Project;
- Shared use of the land (i.e. grazing under/around panels); and
- Management of land under the panels.

After the Information Sessions, EPS Energy continued to correspond with adjacent landowners who remained concerned about the Project. This correspondence occurred via telephone, short message service (SMS) and email.

Despite the continued direct correspondence, one (1) adjacent landowner contacted the media regarding concerns. One (1) media outlet published an article on the matter.

The key concerns expressed within the article reflect the same concerns that this adjacent landowner discussed directly with EPS Energy both via telephone before the May/June Information Sessions, at the dedicated Neighbour Information Session and at an individual site visit to their land. These concerns include the siting of the Project, noise and visual effects of the Project, fiscal value of their land and recompense.

EPS Energy note that this article was also published on the media outlet's digital social media webpage on 22 July 2018, and while it received approximately 180 comments in approximately three (3) days of being published, only approximately ten (10) individuals were primarily involved in these comments, one (1) of these being the adjacent landowner who contacted the media. EPS Energy conducted a review of these comments three (3) days after the article was published and note that of the 180 comments approximately 36.7% were negative, 26.1% were positive and 37.2% were either neutral or not applicable. EPS Energy has continued to correspond with this landowner and all others who have expressed concerns or sought to discuss the Project's progress.

EPS Energy recognised a substantial amount of misleading information being shared through the comments relating to the above-mentioned article. As a result, EPS Energy distributed a letter on 5 July 2018 to the adjacent landowners clarifying this information, which essentially stated:

- The community feedback received to date (at the time of the letter), along with information from reports and investigations required for the Project is being used to inform the next round of solar farm design and information for a Development Application;
- A Development Application had not been lodged (at the time of the letter) and a number of works needed to be completed before a Development Application is lodged; and
- EPS Energy would directly provide an update when the Development Application is lodged and details on how submissions about the Project could be made.

In direct response to adjacent landowner concerns, designs have been amended to reduce the potential for adverse impacts by;

- Including in excess of 7 kilometers of visual buffering in the form of landscape screening at a direct project cost estimated to exceed $750,000;
- Reducing the land area allocated to solar panels by approximately 24 hectares, equivalent to a reduction of 36,000 panels and equating to approximately $5,000,000 in relinquished income over the life of the project; and
- Power Conditioning Units near adjoining boundaries being relocated to reduce the potential for noise impact.

Further, EPS Energy has commissioned a Traffic Impact Assessment (Appendix 10), a Visual Impact Assessment (Appendix 7), a Glint and Glare Assessment (Appendix 12) an Acoustic Assessment (Appendix 13) and prepared a Landscaping Plan (Appendix 14) to assist in ameliorating potential or perceived impacts.

5.2.4. Nukunu Peoples Council Inc.

Although representatives from the Nukunu Peoples Council Inc. were unable to attend the Information Sessions correspondence has occurred via telephone, Email and post.

EPS Energy is continuing to correspond with Nukunu Peoples Council Inc. representatives to gain an understanding of their expectations of involvement in the Project post lodging a Development Application.

The Nukunu Peoples Council Inc. has thus far expressed that they are pleased with EPS Energy corresponding with them prior to lodging a Development Application.

EPS Energy understand that the Nukunu Peoples Council Inc. have experience in engaging in Heritage aspects of other types of development on Native Title land.

5.2.5. Easement Authorities

A representative of ElectraNet attended the Community Information Session in June 2018. ElectraNet is a key stakeholder to the Project and has worked collaboratively with EPS Energy on a number of matters including Connection Options and auxiliary advice and guidance on matters where ElectraNet is referenced in the Development Application.

EPS Energy liaised with a representative of Epic Energy on 01 June 2018 to discuss the Project and its location adjacent to Epic Energy's gas substation on Locks Road. Epic Energy have been responsive to communication with EPS Energy and have not expressed any concerns.

Ongoing correspondence with these authorities will continue as the Project progresses to ensure no encroachment on any easement authorities' registered interest on the land.

5.3. ONGOING COMMUNICATION MEASURES

Notwithstanding the current generally positive response toward the Project, EPS Energy intend to maintain an open dialogue with the community and other stakeholders. These measures are described in Sections, 3.4 and 3.5 of this report.

6. CONCLUSION

EPS Energy consider early and ongoing engagement with the community and other stakeholders that are involved, impacted or interested in Bungama Solar Project an essential component of the Project's development process and overall success.

The main purpose of the engagement process thus far has been to involve the community and other stakeholders and identify local values and concerns, to inform the decisions and activities of the Project. The tools and activities outlined in this Community & Stakeholder Engagement Plan seek to create numerous opportunities to foster a genuine relationship between EPS Energy and these parties.

The outcomes of the engagement undertaken thus far indicate there is an interest from the local community and other stakeholders. It is considered that the comprehensive Engagement Program developed at the Preparatory Phase has facilitated a process of genuine and effective community and other stakeholder engagement.

As noted, to address directly adjacent landowner concerns, designs have been amended to reduce the potential for adverse impacts by;

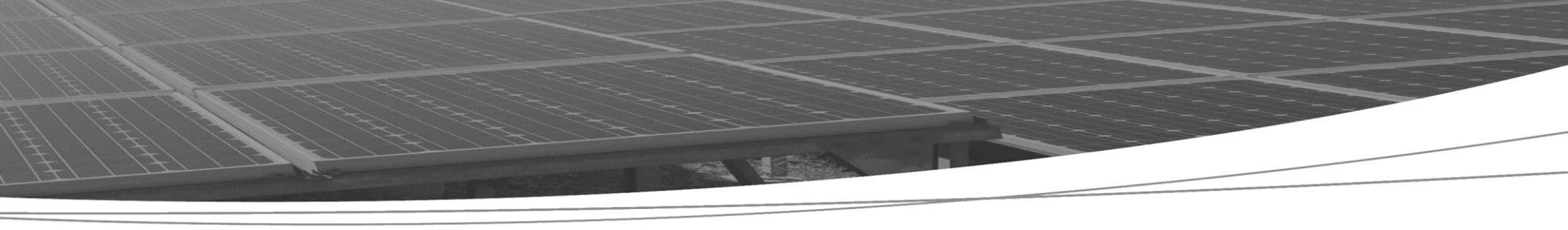
- Including in excess of 7 kilometers of visual buffering in the form of landscape screening at a direct project cost estimated to exceed $750,000;
- Reducing the land area allocated to solar panels by approximately 24 hectares, equivalent to a reduction of 36,000 panels and equating to approximately $5,000,000 in relinquished income over the life of the project; and
- Power Conditioning Units near adjoining boundaries being relocated to reduce the potential for noise impact.

Recognising the ongoing engagement measures to be maintained during the construction and operational phases, it is not anticipated that any adverse impacts upon the community or other stakeholders will arise with respect to the Project.

APPENDIX 1

Project Information Brochure

BUNGAMA SOLAR



BUNGAMA SOLAR

PROJECT INFORMATION

Bungama Solar is a proposed 280 MW (AC) utility scale solar photovoltaic and battery storage plant to integrate into the National Electricity Market through a 275kV connection to ElectraNet's Bungama Substation in South Australia.

LOCATION

Bungama Solar is to be developed on approximately 500 hectares of cleared land in the suburbs of Bungama, Napperby and Warnertown, South Australia. The site is situated approximately 6 kilometres east of Port Pirie and 220 kilometres north of Adelaide. The project is within the Local Government Area of Port Pirie Regional Council.

PROJECT

HOW BUNGAMA SOLAR WORKS

Bungama Solar is a large-scale utility power plant that creates energy from the sunlight via photovoltaic (PV) cells most likely to be mounted on sun tracking systems.

Tracking solar panel systems follow the sun's movement throughout the day for maximum collection. At the end of the day the panels track back to the east ready for the next operation.

The DC electricity that is created by sun through the cells is fed through cables to a series of invertors where the electricity is converted to AC and increased in voltage. The invertors are connected through underground cables to a switching yard and by overhead transmission lines to the Bungama Substation for connection to the South Australian electrical grid.

Battery storage is proposed as part of Bungama Solar and will provide additional power system security for South Australia's grid.

During the operational phase, regular inspections, panel cleaning, componentry servicing and site maintenance are required. Additional infrastructure includes internal access tracks, offices, workshop sheds, fence lines and drainage.

Solar farms typically have a minor physical disturbance footprint. As such, investigations into co-agriculture opportunities are underway to ascertain opportunities within Bungama Solar for other forms of traditional agriculture such as sheep grazing and apiculture to co-exist with the solar operations.

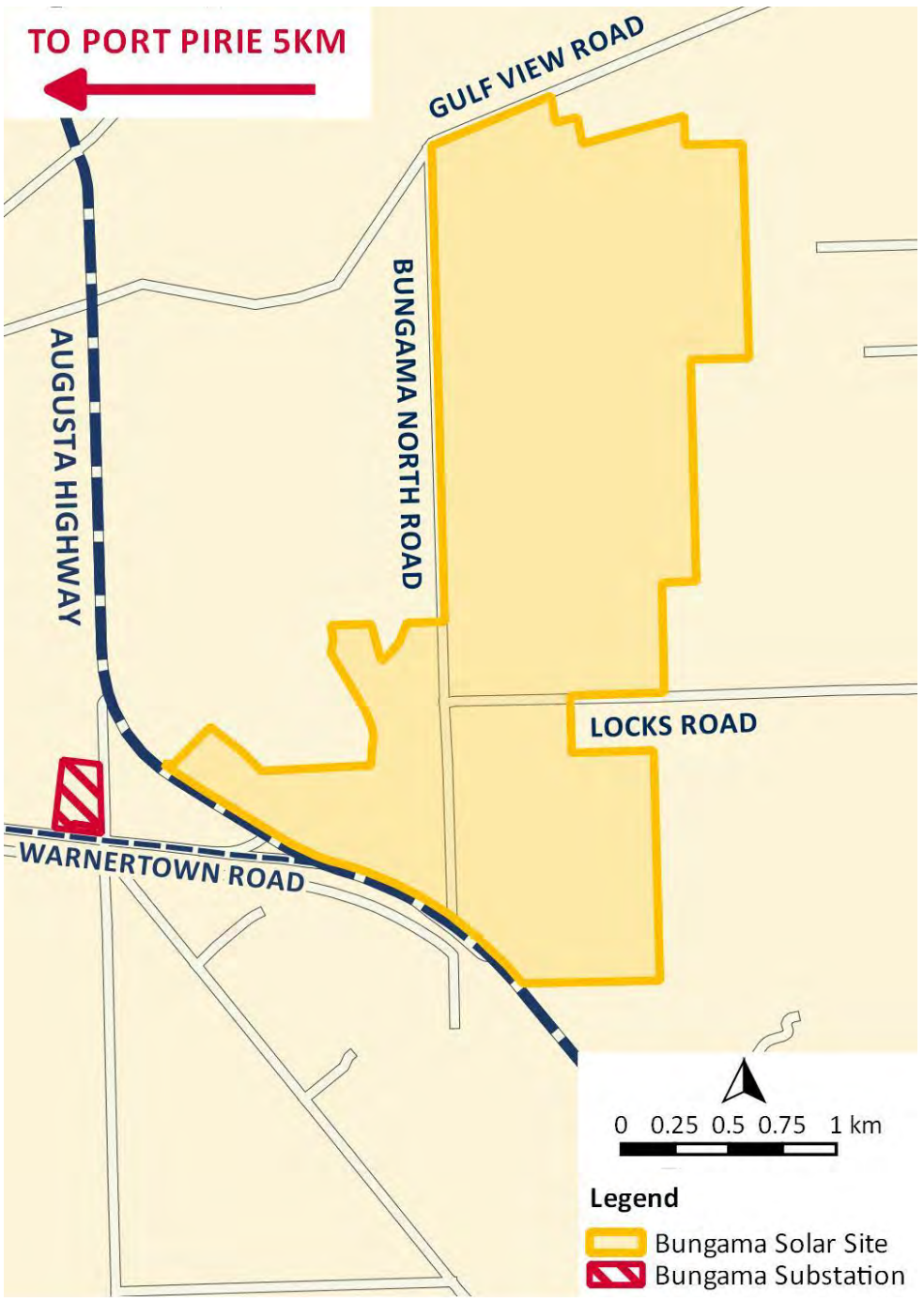


Figure 1 – Bungama Solar Project Area (Source: Google Earth Pro, 2018).

Bungama Solar
www.bungamasolar.com.au

Contact us:
E: enquiries@bungamasolar.com.au
P: 0474 319 195

KEY PROJECT STATISTICS

BUNGAMA SOLAR

PROJECT STATUS

SOCIAL AND ENVIRONMENTAL BENEFITS

Bungama Solar local community social contribution includes:

- Local Community Fund
- 150-200 construction jobs with a large component from the regional workforce

Bungama Solar 280 MW generating capacity is equivalent to:

- Powering 86,000 homes each year
- 195,000 cars off the road each year
- Reducing 487,000 tonnes of GHG emissions each year
- Planting 70,000 trees each year

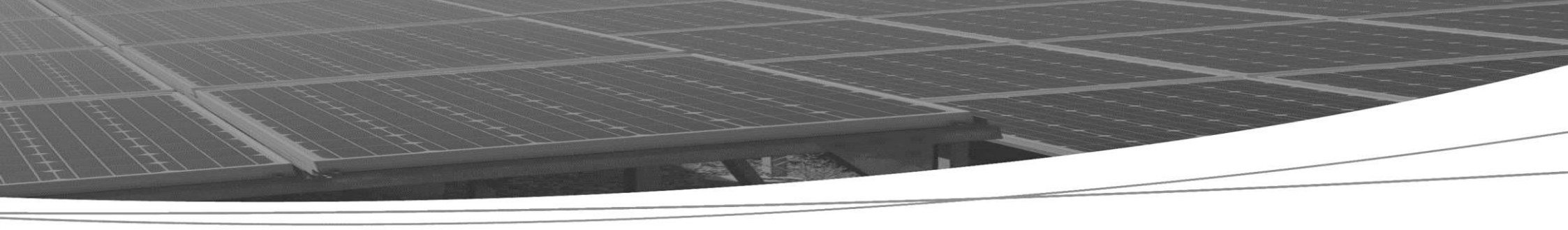
CONTACT INFORMATION

Phone:	**0474 319 195**
E-mail:	enquiries@bungamasolar.com.au
Website:	www.bungamasolar.com.au

APPENDIX 2

Invitation to Neighbour Information Session

BUNGAMA SOLAR



BUNGAMA SOLAR

invite you to join us for our

Neighbour Information Session

Bungama Solar is a new large scale solar and battery storage facility proposed near Port Pirie, South Australia. Bungama Solar is a 280 MW (AC) utility scale solar photovoltaic plant with battery storage to feed into the National Electricity Market through a 275kV connection to ElectraNet's Bungama Substation. Bungama Solar is to be developed on approximately 500 hectares of existing cleared land in the suburbs of Bungama, Napperby and Warnertown, South Australia.

Bungama Solar is committed to a genuine and early community and stakeholder engagement process. As part of this process, Bungama Solar is seeking to inform neighbouring property owners about the project. We look forward to discussing the project with you.

SESSION DATES & TIMES

Thursday 31st May 2018
2.00pm — 4.00pm

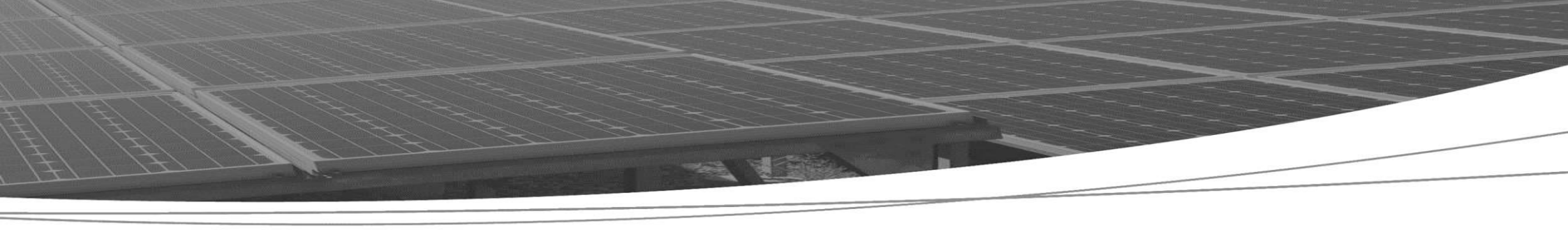
LOCATION

Napperby Tennis and Community Club
33 Second Street
Napperby
South Australia 5540

ENQUIRIES

Phone:	**0474 319 195**
E-mail:	**enquiries@bungamasolar.com.au**
Website:	**www.bungamasolar.com.au**

Please note that if you cannot attend this session we will be holding information sessions for the wider community, which you are welcome to attend. These will be held Thursday 31st of May between 11.00am – 1.00pm and 5.00pm – 7.00pm and Friday 1st of June between 10.30am – 12.30pm.

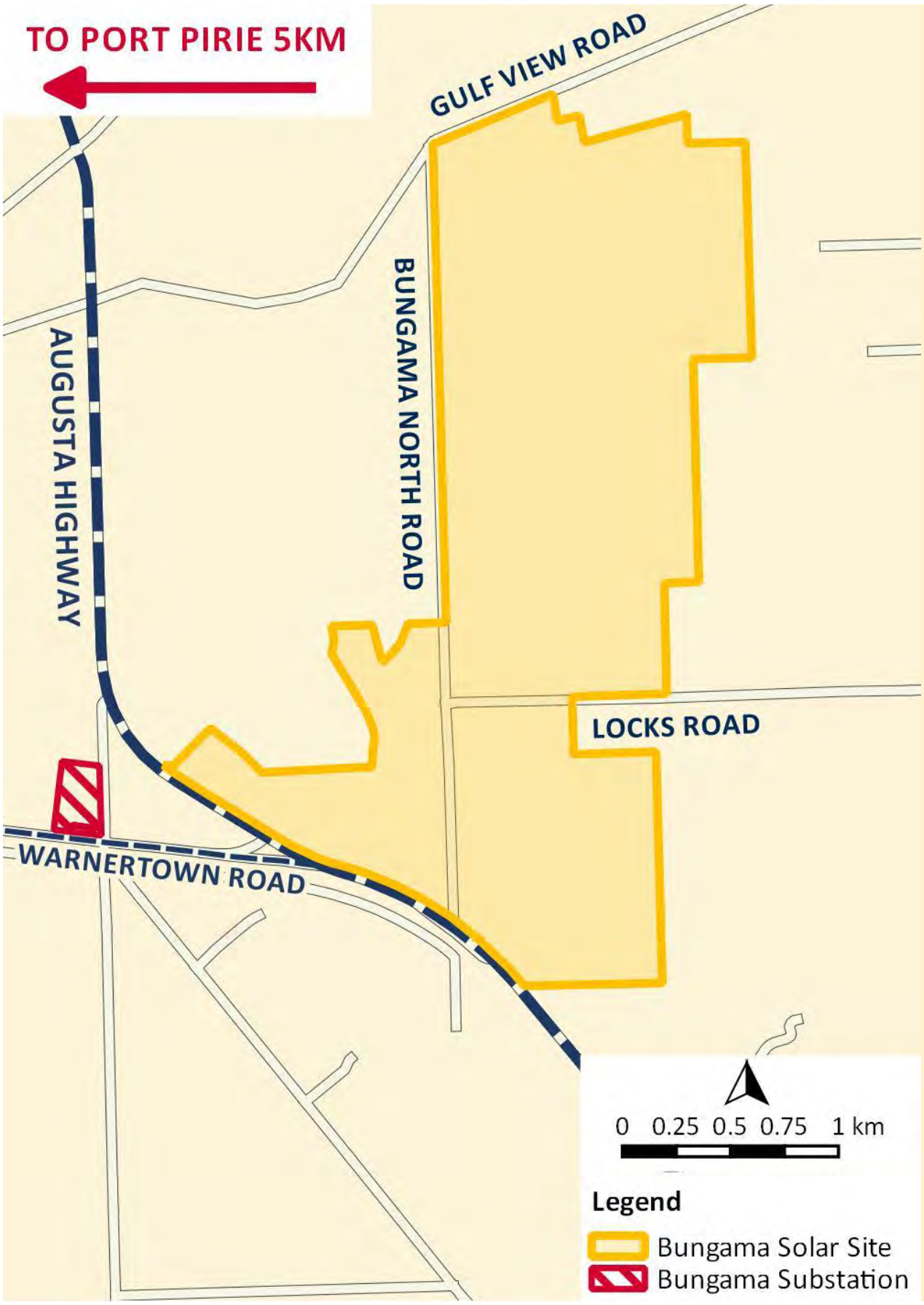


BUNGAMA SOLAR

Bungama Solar local community social contribution includes:

Local Community Fund

150-200 construction jobs with a large component from the regional workforce



Bungama Solar 280 MW generating capacity is equivalent to:

Powering 86,000 homes each year

Reducing 487,000 tonnes of GHG emissions each year

195,000 cars off the road each year

Planting 70,000 trees each year

For more visit:
www.bungamasolar.com.au

Bungama Solar
www.bungamasolar.com.au

Contact us:
E: enquiries@bungamasolar.com.au
P: 0474 319 195

APPENDIX 3

Invitation to Community Information Sessions

BUNGAMA SOLAR

BUNGAMA SOLAR

invite you to join us for our

Community Information Session

Bungama Solar is a new large scale solar and battery storage facility proposed near Port Pirie, South Australia. Bungama Solar is a 280 MW (AC) utility scale solar photovoltaic plant with battery storage to feed into the National Electricity Market through a 275kV connection to ElectraNet's Bungama Substation. Bungama Solar is to be developed on approximately 500 hectares of existing cleared land in the suburbs of Bungama, Napperby and Warnertown, South Australia.

Bungama Solar is committed to a genuine and early community and stakeholder engagement process. As part of this process, Bungama Solar is seeking a cooperative approach with the local community, key stakeholders and the Council to inform the project and to identify opportunities for local engagement and employment during construction and operation. We look forward to discussing the project with you.

SESSION DATES AND TIMES

Thursday 31st May 2018
at 11.00am – 1.00pm and
5.00pm – 7.00pm
and **Friday 1st June 2018**
at 10.30am – 12.30pm

LOCATION

Napperby Tennis and Community Club
33 Second Street
Napperby
South Australia 5540

ENQUIRIES

Phone:	**0474 319 195**
E-mail:	**enquiries@bungamasolar.com.au**
Website:	**www.bungamasolar.com.au**

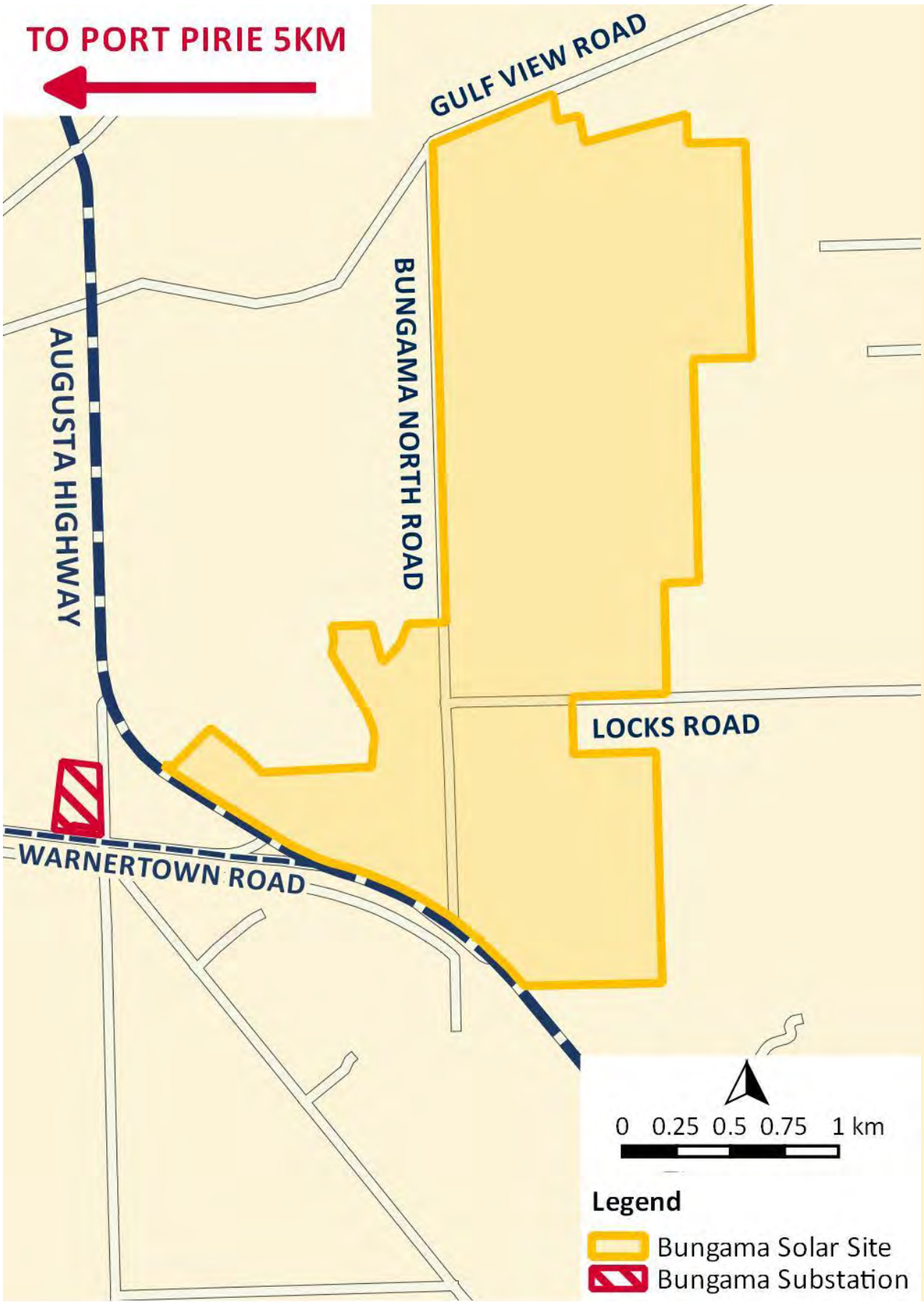
Please note that if you cannot attend, project information is available on the Bungama Solar website.

BUNGAMA SOLAR

Bungama Solar local community social contribution includes:

Local Community Fund

150-200 construction jobs with a large component from the regional workforce



Bungama Solar 280 MW generating capacity is equivalent to:

Powering 86,000 homes each year

Reducing 487,000 tonnes of GHG emissions each year

195,000 cars off the road each year

Planting 70,000 trees each year

For more visit:
www.bungamasolar.com.au

Bungama Solar
www.bungamasolar.com.au

Contact us:
E: enquiries@bungamasolar.com.au
P: 0474 319 195

APPENDIX 4

Feedback Form

BUNGAMA SOLAR

BUNGAMA SOLAR

FEEDBACK FORM

We value your honest feedback and opinions to ensure our project appropriately addresses local values and concerns. This feedback will be used to inform future engagement with the community as well as the Project so we can prioritise mutually beneficial outcomes.

QUESTIONNAIRE

Of the options listed below, which best describes where you live in relation to the Bungama Solar project?

- ☐ Less than 1 km
- ☐ Between 1 km and 5 km
- ☐ Greater than 5 km

Which age group are you included in?

- ☐ 18—34
- ☐ 35—54
- ☐ 55+

Approximately, how long have you lived in the area?

- ☐ Less than 5 years
- ☐ 5 to 10 years
- ☐ 10 years+

What is your opinion of renewable energy, generally?

- ☐ Posiveạ
- ☐ Neutral
- ☐ Negaveạ

Do you consider there to be any positive impacts from the Bungama Solar project?

Do you consider there to be any negative impacts from the Bungama Solar project?

Other comments:

CONTACT US

P: 0474 319 195

E: enquiries@bungamasolar.com.au

BUNGAMA SOLAR

APPENDIX 5

Attendance Register

BUNGAMA SOLAR

BUNGAMA SOLAR

Full Name	Contact Number	Email Address	Postcode	Feedback/ Comments
		☐ Please tick if you **would like** updates via email*		

*Alternatively, you can check www.bungamasolar.com.au for updates relating to the Project.

APPENDIX 6

Media Release

BUNGAMA SOLAR

BUNGAMA SOLAR

21/05/2018

Media Release: Bungama Solar

Bungama Solar is a new large-scale solar and battery storage facility proposed near Port Pirie, South Australia. Bungama Solar is a 280 MW (AC) utility scale solar photovoltaic plant with battery storage to feed into the National Electricity Market through a 275kV connection to ElectraNet's Bungama Substation.

Bungama Solar is to be developed on approximately 500 hectares of existing cleared land in the suburbs of Bungama, Napperby and Warnertown, South Australia.

South Australian energy consumers will benefit from Bungama Solar's proposed large scale renewable energy project through reduced energy costs and a reduction in emissions. The project will offer employment opportunities, diversify the region's energy mix and create potential education and tourism opportunities. The project will also directly contribute to the local community through a community fund.

Bungama Solar is committed to a genuine and early community and stakeholder engagement process. As part of this process, Bungama Solar is seeking a cooperative approach with the local community, key stakeholders and the Council, and also seeks to identify opportunities for local employment during construction and operation.

Bungama Solar will be hosting community information sessions over two days at the Napperby Tennis and Community Club, 33 Second Street, Napperby, South Australia 5540. The session times are:

- Thursday 31st May 2018: 11.00am – 1.00pm and 5.00pm – 7.00pm; and
- Friday 1st June 2018: 10.30am – 12.30pm.

For more information please see the Bungama Solar website at www.bungamasolar.com.au

APPENDIX 7

Visual Impact Assessment

BUNGAMA SOLAR

VISUAL IMPACT ASSESSMENT

Prepared for Bungama Solar

EPS ENERGY

Reference No. 11297 November 18

BUNGAMA SOLAR
www.bungamasolar.com.au

QUALITY ASSURANCE AND DECLARATION

Quality Assurance and Version Control Table		
Project:	Bungama Solar	
Client:	Bungama Solar 1 Pty Ltd and Bungama Solar 2 Pty Ltd	
Rev:	**Date:**	**Reference:**
V01	29.11.2018	11297_Bungama Solar – Visual Impact Assessment
Checked by:	L. Bryson	
Approved by:	S. McCall/ J. Burns	
Declaration:	*The opinions and declarations in this document are ascribed to EPS Energy and are made in good faith and trust that such statements are neither false nor misleading.* *In preparing this document, EPS Energy has considered and relied upon information obtained from the public domain, supplemented by discussions between key EPS Energy staff, representatives from governing agencies and independents, including the client and specialist consultants.*	
Applicant:	EPS Energy PO Box 195 Charlestown NSW 2290 (02) 9258 1362	
Prepared By:	M. Budisavljevic	
Reviewed By:	S. McCall	
Project land:	CT 6037/29 – A20 DP80628 CT 6127/5 – A558 FP188690 CT 5954/187 – A52 DP25903 CT 5949/272 – A4 DP24997 CT 5390/999 – A559 FP188691 CT 5360/334 – A551 FP188683 CT 5972/304 – A1 DP24255 CT 5776/531 – A501 DP52803 CT 5776/532 – A502 DP52803 CT 5978/766 – A55 DP71831	

CONTENTS

TABLE OF FIGURES

LIST OF TABLES

This page has intentionally been left blank.

1. INTRODUCTION

This Visual Impact Assessment (VIA) has been prepared by EPS Energy for Bungama Solar an integrated but separately operated grid connected Photovoltaic Energy Generation System (PVS) of approximately 280MW (AC) generation capacity and a 140MW capacity Battery Energy Storage System (BESS) with 560MWh of storage that will feed into the National Electricity Market via ElectraNet's Bungama Substation. The PVS element, the BESS element and associated infrastructure, together are "the Project".

The Project land currently supports grazing and cropping agricultural activities, consistent with the surrounding land use. Various forms of existing infrastructure are present within the area including SA Power Networks (SAPN) and ElectraNet's Bungama Substation, and numerous high voltage transmission lines both crossing and surrounding the Project area.

The Project land is zoned Primary Production under the Port Pirie Regional Council Development Plan 2017. The Development Plan provisions contemplates that Renewable Energy Projects such as Bungama Solar will be established in the Port Pirie Council area on land within the Primary Production Zone subject to implementation of management techniques set out in the Development Plan.

This VIA has been prepared to support a Development Application for the Project. The intent of this VIA is to provide an assessment of the existing landscape within the Project area, as well as the surrounding area, to determine the potential visual impact of the Project to the landscape and visual receptors during construction and operational phases. EPS Energy understand that the assessment of visual impact is subjective, and the individual consideration of visual and landscape effects and the significance of these effects may differ between receptors depending on personal values attached to the landscape.

1.1. OBJECTIVES

The objectives of this VIA are to:

- Identify and analyse the landscape character within and around the surrounding Project area;
- Identify and assess potential visual receptors and viewpoints from which the Project may have a visual effect, within the Visual Catchment;
- Assess the visual significance of the viewpoints and the sensitivity of the potential visual receptors;
- Assess the suitability of the Project within its location; and
- Recommend mitigation measures where appropriate.

1.2. KEY TERMS

Key terms used throughout this VIA are defined in Table 1-1 below:

Table 1-1: Key Terms

Term	Definition
Background	Defined by exceeding the extent of the Visual Catchment and/or features and elements in the horizon.
Effect	The landscape or visual outcome of a proposed change. It may be the combined result of sensitivity together with the magnitude of the change.
Foreground	Within 100m of the Visual Catchment where details are easily discernible and/or the occupy a large proportion of the field of view.
Impact	The effect of a proposal, which can be adverse or beneficial, when measured against an existing condition.
Landscape Values	The relative value that is attached to different landscapes by present or future generations. Landscape values may include biodiversity, geo-diversity, historic, and aesthetic values, as well as more personal values such as a person's associations, memories, knowledge or experiences of that landscape.
Landscape Character	A distinct, recognisable and consistent pattern of elements in the landscape that makes one landscape different from another, rather than better or worse.
Landscape Effect	A change to landscape values as a result of development, which can be either positive or negative.
Landscape Receptors	Defined aspects of the landscape resource that have the potential to be affected by a proposal.
Midground	Within the 1-2km Visual Catchment, where details are less distinguishable but the features occupy a moderate proportion of the field of view.
Perception	Combines the sensory (that we receive through our senses) with the cognitive (our knowledge and understanding gained from many sources and experiences).
Sensitivity	A term applied to specific receptors, combining judgements of the susceptibility of the receptor to the specific type of change or development proposed and the value related to that receptor.
Significance	A measure of the importance or gravity of the environmental effect, defined by significance criteria specific to the environmental topic.
Surrounding Area	Those areas outside the Project area that have been identified as relevant for investigation of landscape values and potential effects.

Term	Definition
View	Any sight, prospect or field of vision as seen from a place, and may be wide or narrow, partial or full, pleasant or unattractive, distinctive or nondescript, and may include background, midground and/or foreground elements or features.
Visual Amenity	The overall pleasantness of the views people enjoy of their surroundings, which provides an attractive visual setting or backdrop for the enjoyment of activities of the people living, working, recreating, visiting or travelling through an area.
Visual Catchment	Areas visible from a combination of locations within a defined setting (may be modelled or field-validated).
Visual Effect	Effects on specific views and on the general visual amenity experienced by people.
Visual Receptors	Individuals and/or defined groups of people who have the potential to be affected by a proposal.
Visual Significance	Used in this instance to describe the weighting that is given to the relative importance of identified landscape values. The landscape values of an area likely to be significant are those that help understand the past, enrich the present, and which will be of value to future generations.
Zone of Theoretical Visibility (ZTV)	A map, usually digitally produced, showing areas of land within which, a development is theoretically visible. The ZTV does not account for any vegetation or built environment. Therefore, the actual view of the project is likely to be less than indicated on the ZTV plan.

(Landscape Institute and IEMA, 2013; Australian Institution of Landscape Architects, 2018; Roads and Maritime Services, 2013)

2. METHODOLOGY

The Project's potential visual impact on the landscape and visual receptors is derived from changes in the landscape, its character and how this is experienced. Effects may arise at different scales (local, regional and national) and have different levels of significance (high, moderate and low) depending on the sensitivity of the visual receptors and the magnitude of change. Changes to the landscape are more than visual and include a range of physical and perceptual factors. Determining the overall visual impact therefore requires a combination of qualitative and quantitative assessment measures and acknowledgement of limitations.

2.1. ASSESSMENT FRAMEWORK & CRITERIA

It is noted that specific guidelines for assessing the visual impact of utility-scale solar projects in South Australia are unavailable. This is a recognised limitation to this VIA. To mitigate this, the methodology used throughout this VIA is based on a number of existing national and international landscape and VIA guidelines. These resources are consistently used for VIAs across Australia, in place of available specific guidelines, and are generally considered industry standard and appropriate. The key resources this methodology is based on includes:

- *Guidelines for Landscape and Visual Impact Assessment* (Landscape Institute and Institute of Environmental Management & Assessment (IEMA), 2013);
- *Guidance Note for Landscape and Visual Assessment* (Australian Institute of Landscape Architects (AILA), 2018);
- *Environmental Impact Assessment Practice Note: Guidelines for Landscape Character and Visual Impact Assessment* (Roads and Maritime Services (RMS), 2013); and
- *Visual Landscape Planning in Western Australia: a manual for evaluation, assessment, siting and design* (Department for Planning and Infrastructure, 2007).

Further to the above-mentioned resources, the 'Objectives' and 'Principles of Development Control' related to the visual impact of proposed developments from the Port Pirie Regional Council Development Plan (Consolidated – 31 October 2017) (Development Plan) are also considered as part of this methodology.

The methodology, and therefore the subsequent Sections of this VIA, follows the process outlined in below.

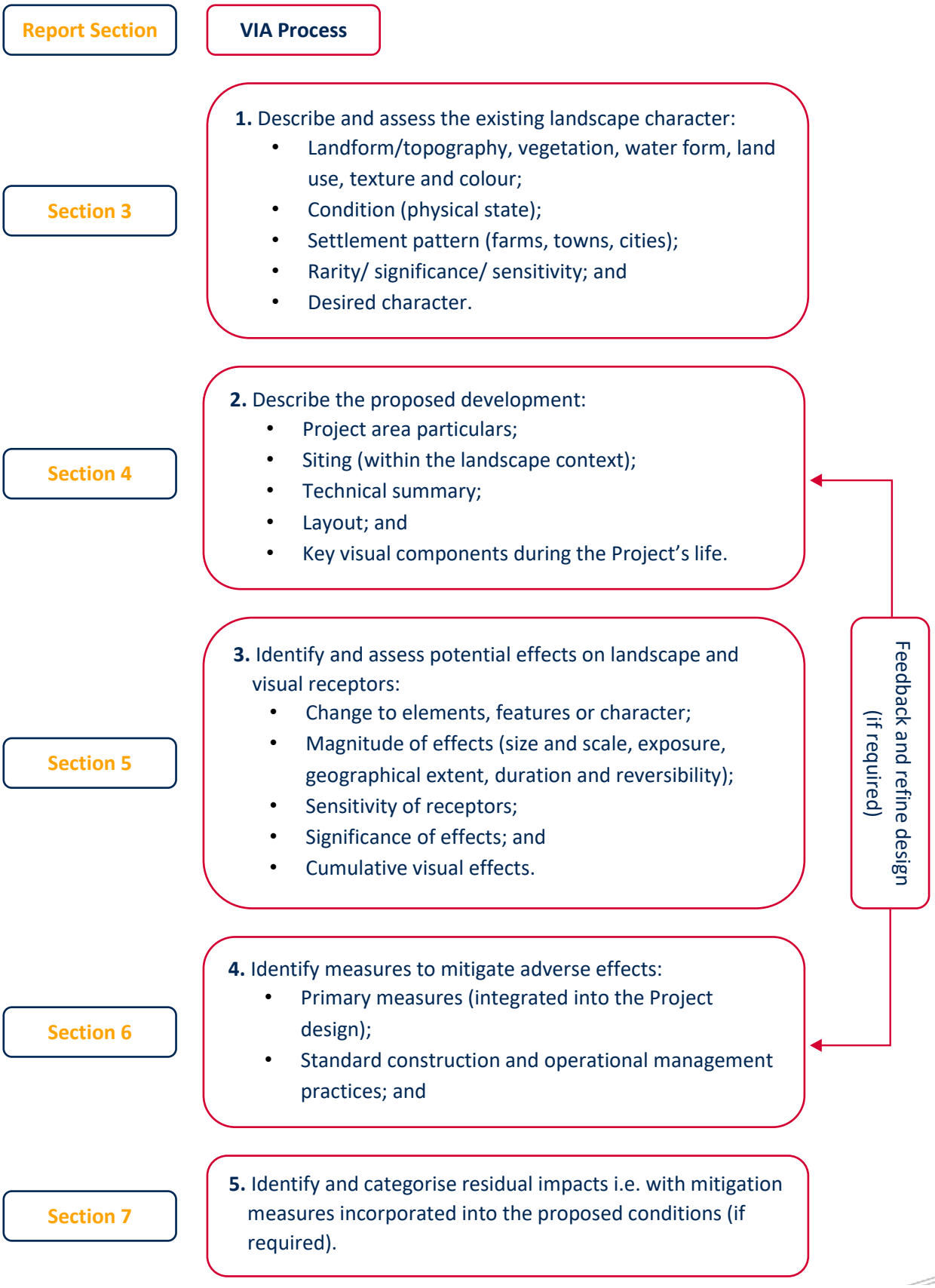


Figure 2-1: Visual Impact Assessment Process and Report Structure

2.1.1. Landscape Character Assessment Criteria

Landscape character is determined by the way the physical, natural and cultural components within a landscape interact, which together create a distinctive area, or character (Landscape Institute & IEMA, 2013). Although some of these components are relatively objective and are able to be assessed against a standardised set of criteria, landscape character is also defined by aesthetic, perceptual and experiential aspects (landscape values), which are subjective, and based on personal associations and opinions which are different between individuals.

This is a recognised limitation affecting many components of this VIA. To mitigate the subjectivity concerning perceptions and values, this VIA utilises commonly accepted landscape characteristics for various landscape characters that are generally preferred and valued. These will underpin the landscape character assessment criteria outlined in Table 2-1 as well as other assessments throughout this VIA.

It is noted that preferences and values will also differ depending on the context of the landscape (i.e. urban landscape, rural landscape, natural landscape) (Landscape Institute and IEMA, 2013; Department for Planning and Infrastructure, 2007). To ensure the criteria is appropriate to the local context in which the Project is proposed to be located, the general planning designation (i.e. land zoning) has been used as the indicator to the general landscape type.

Pursuant to the Port Pirie Regional Council Development Plan the Project land is zoned 'Primary Production' and therefore key elements of the 'Desired Character' for the Primary Production Zone have been included in the landscape character assessment criteria (Table 2-1). Additionally, Table 2-1 includes the most and least preferred (generally) landscape characteristics indicated by the literature specifically regarding rural landscapes.

Notably, renewable energy is envisioned for this zone in the Development Plan, in the form of solar farms and ancillary developments such as substations, maintenance sheds, access roads and connecting power-lines. The Plan details that these facilities will need to be located in areas where they can take advantage of the natural resource upon which they rely.

The Desired Character section for the Primary Production Zone also sets out that, subject to the implementation of management techniques by council wide policy regarding renewable energy facilities, visual impacts are to be accepted in pursuit of benefits derived from increased generation of renewable energy.

Nonetheless, this VIA provides a comprehensive assessment of the potential landscape and visual effects in accordance with the process outlined in above. Accordingly, once the existing landscape character has been identified, this will be reviewed alongside the description of the Project to identify the potential landscape and visual receptors and effects. The method for identifying and assessing these are outlined in Section 2.1.2.

Table 2-1: Landscape Character Assessment Criteria

Landscape Characteristic	Higher preference/value	Lower preference/value
Landform/topography	• Topographic variety and ruggedness • Significant landscape features (trees, tree stands, historic relics, windmills)	• Uniform or flat with little to no vertical relief • Absence of landscape features • Eroded areas • Unmanaged roads and access tracks
Landcover/vegetation	• Areas or sites frequently prone to ephemeral features (presence of fauna, distinctive crop rotations, water conditions and climatic conditions) • Distinctive remnant vegetation located along streamsides, roadsides and in paddocks	• Areas of soil salinity/salt scalds or dead, dying or diseased vegetation • Areas of extensive weed infestation • Recently harvested areas (stumps, debris, abandoned off-cuts)
Water form	• Presence of water bodies (dams, lakes, inundated areas)	• Absence of or eutrophied water bodies
Land use	• Gradual transition zones between agricultural land and natural landscape • Historic features and land use patterns that strengthen local rural character (historic farm machinery, old shearing sheds, windmills and historic buildings) • Well maintained buildings and/or structures that support the rural character (including building materials/finishes)	• Tips, dumps and landfill areas • Land use areas that contrast significantly from local rural landscape characteristics (plantations, mines, housing, utility towers, roads and fencing) • Abandoned structures (including farm structures) in a state of disrepair or destruction
Texture and colour	• Diverse colour and contrast or species diversity of cropping • Agricultural patterns, colours and textures that complement natural features	• Lack of diversity in colour and texture • Difficult to distinguish details in the midground • No discernible focal points on the horizon
Settlement pattern	• Scattered settlement pattern and individual structures (silos, windmills, water tanks, historic buildings, bridges, hay bales and dams) • Large allotments	• Concentrated settlements with uncharacteristic structures (industrial structures; modern housing) • Subdivided allotments
Rarity	• Presence of rare elements or features in the landscape or presence of a rare landscape character type	• Common elements or features within the region

(Landscape Institute & IEMA, 2013, Department for Planning and Infrastructure, 2007; AILA, 2018; RMS, 2013; Department of Planning, Transport and Infrastructure, 2016 (Port Pirie Regional Council Development Plan 2017)).

2.1.2. Landscape and Visual Effects Assessment Criteria

The overall visual impact of a proposed development is determined by combining the separate assessments of landscape and visual effects as perceived by receptors. Landscape effects are changes within or to the landscape as a result of interactions between a proposed development and elements within the landscape or the landscape character itself (landscape receptors), while visual effects are the changes of views or visual amenity of the landscape as perceived by people (visual receptors) (Landscape Institute & IEMA, 2013).

As discussed in Section 2.1.1, the significance of landscape and visual effects are also perceived differently by individuals based on personal preferences and values associated to the landscape and views. As with landscape character, these values and the perceived significance of changes can be difficult to quantify and is a recognised limitation of this VIA. In accordance with the landscape character assessment, the landscape and visual effects assessment will also utilise the preferred and valued landscape characteristics identified in the literature (Table 2-1) when assessing value-based criteria. The remaining criteria used in the landscape and visual effects assessment are outlined in Table 2-2 along with specifications of the category scale (high, moderate, and low) used for measuring each criterion.

It is recognised that relationships can exist between criteria (i.e. the size and scale, distance and visibility of the effect all influence the susceptibility of the receptor) and must be considered concurrently when determining the most appropriate category scale for the effect being assessed. Similarly, some of the specifications of category scales for landscape and visual effects can overlap (i.e. the defined measurable distance in metres or kilometres between an effect and the receptor), while others are specific to either landscape or visual effects (i.e. a change to a view does not consequentially change the overall landscape character). These distinctions are clearly defined in Table 2-2 to ensure transparency in the assessment, as far as practicable. Any necessary explanation of influences between criteria will be discussed in Section 5.

Although the criteria for assessing landscape and visual effects can differ, the process is inherently the same; using the predetermined landscape character alongside the description of a proposed development to identify potential receptors and effects. Subsequently, assessing each effect against the established criteria to determine the ***sensitivity*** of the receptor and the ***magnitude*** of the effect. This is an iterative process that is undertaken for each effect and is depicted in Figure 2-2 below. Finally, the sensitivity of the receptors and the magnitude of the effects are successively combined to determine the overall ***significance*** of the effect, depicted in Table 2-3.

Although considerable efforts have been made to avoid subjectivity within this assessment process, it is important to note that a level of professional judgement must still be utilised (Landscape Institute & IEMA, 2013). For example, a receptor may collectively score a "Moderate" level of sensitivity and a "Moderate" level for the magnitude of the effect, which according to Table 2-3 should result in an overall "Moderate" significance of the effect. However, if the constructed Project is not visible or does not change the view from the receptor, logical reasoning should indicate a "Low" or negligible significance of the effect as there is no change to the landscape in this instance. Where this professional judgement has been employed it is clearly disclosed during the associated assessment.

Table 2-2: Category Scale to Assess Landscape and Visual Effect Criteria (Landscape Institute & IEMA, 2013)

Criteria	High	Moderate	Low
Sensitivity of Receptors			
Susceptibility			
Landscape effect	The degree to which the landscape may accommodate the Project would potentially result in a number of perceived uncharacteristic and significant changes.	The degree to which the landscape may accommodate the Project would potentially result in the introduction of prominent elements but may be accommodated to some degree.	The degree to which the landscape may accommodate the Project would not significantly alter existing landscape character.
Visual effect	Residents at home in high proximity and visibility to the Project; visitors to heritage assets or other areas where the views are an important factor to the experience (i.e. lookouts).	People engaged in activities whose attention is likely to be focused on the landscape and on particular views (i.e. scouts/camping groups); people at their place of work whose attention is not focused on their surroundings and where the setting is not important to the quality of working life.	Pedestrians and motorists that would typically have less vested interest and emotional connection to the landscape i.e. view the Project infrequently, intermittently and/or over a short timeframe.
***Value* *(also refer to Table 2-1)**			
Landscape effect	The effect may compromise the specific basis for the value attached to the landscape, for example if the landscape character is valued on an international, national or local scale (i.e. World Heritage Sites, National Parks).	The effect does not compromise the specific basis for the value attached to the landscape.	The existing landscape characteristics are not considered to be generally preferred or valued and therefore the effect does not negatively affect the value attached to the landscape.
Visual effect	The view appears in guidebooks or on tourist maps, there is a provision of facilities for visitor's enjoyment of the view (i.e. parking places, sign boards and interpretive material); or the local planning designations restrict the introduction of effects that compromise the value of a particular view.	The effect does not compromise the specific basis for the value attached to the particular view.	The view is not considered to be generally preferred or valued and therefore the effect does not negatively affect the value attached to the view.

Criteria	High	Moderate	Low
Magnitude of Effects			
Size and scale			
Landscape effect	Key characteristics of the landscape character may be adversely impacted by the Project and may result in major alterations to perceived characteristics of the landscape character.	Some characteristics of the landscape character may be altered by the Project, although the landscape has the capability to absorb these changes without compromising the overall landscape character.	The characteristics of the landscape character are generally robust (evidenced by the existence of artificial elements) and would be minimally affected by the Project.
Visual effect	Large proportion of the view occupied by the Project; high degree of contrast or integration of new features/ changes in terms of form, scale and mass, height, colour and texture.	Some change to the view due to loss of existing features and addition of new features in the view without significant change in its composition.	No obvious change to the view due to loss of existing features or addition of new features.
Frequency of use			
Landscape effect	Frequently visited or populated areas often used for appreciating the view of the landscape for prolonged periods of time (e.g. residences, lookouts, townships).	Less visited areas with intermittent visitation (e.g. major/secondary roads) with partial visibility from the receptor (i.e. unobstructed features of the Project from a vehicle while passing within the Visual Catchment of the Project).	Infrequent visitation brief glimpses of the Project not in the direct line of sight. (e.g. secondary/local roads, screened visibility).
Visual effect	As above.	As above.	As above.
Distance/ Geographical extent			
Landscape effect	The Project is a very prominent element in the view from the receptor (i.e. in the foreground or within the 100m Visual Catchment) in the receptor's direct line of sight.	The Project is a noticeable element in the view from the receptor (i.e. in the midground or within the 1-2km Visual Catchment) but not in the direct line of sight.	The Project is difficult to distinguish from the receptor (i.e. in the background or beyond the 2km Visual Catchment) not in the direct line of sight.
Visual effect	As above.	As above.	As above.

Criteria	High	Moderate	Low
Duration			
Landscape effect	The effect is a permanent feature or lasting over a generation (excess of 30 years).	The effect is a temporary but lasting a significant period of time (i.e. 5 to 30 years).	The effect is temporary lasting a short period of time (i.e. less than 5 years).
Visual effect	As above.	As above.	As above.
Reversibility			
Landscape effect	The effect has irreversible changes to the landscape character or view.	The effect is reversible but may result in some lasting changes to the Landscape character or view.	The effect is reversible, and the landscape or view can be returned to the state prior to introduction of the effect.
Visual effect	As above.	As above.	As above.

Table 2-3: Matrix of Significance of Effects (Landscape Institute & IEMA, 2002)

		Magnitude of Effects		
		High	**Moderate**	**Low**
Sensitivity of Receptors	**High**	High Significance	High-Moderate Significance	Moderate Significance
	Moderate	High-Moderate Significance	Moderate Significance	Moderate-Low Significance
	Low	Moderate Significance	Moderate-Low Significance	Low Significance

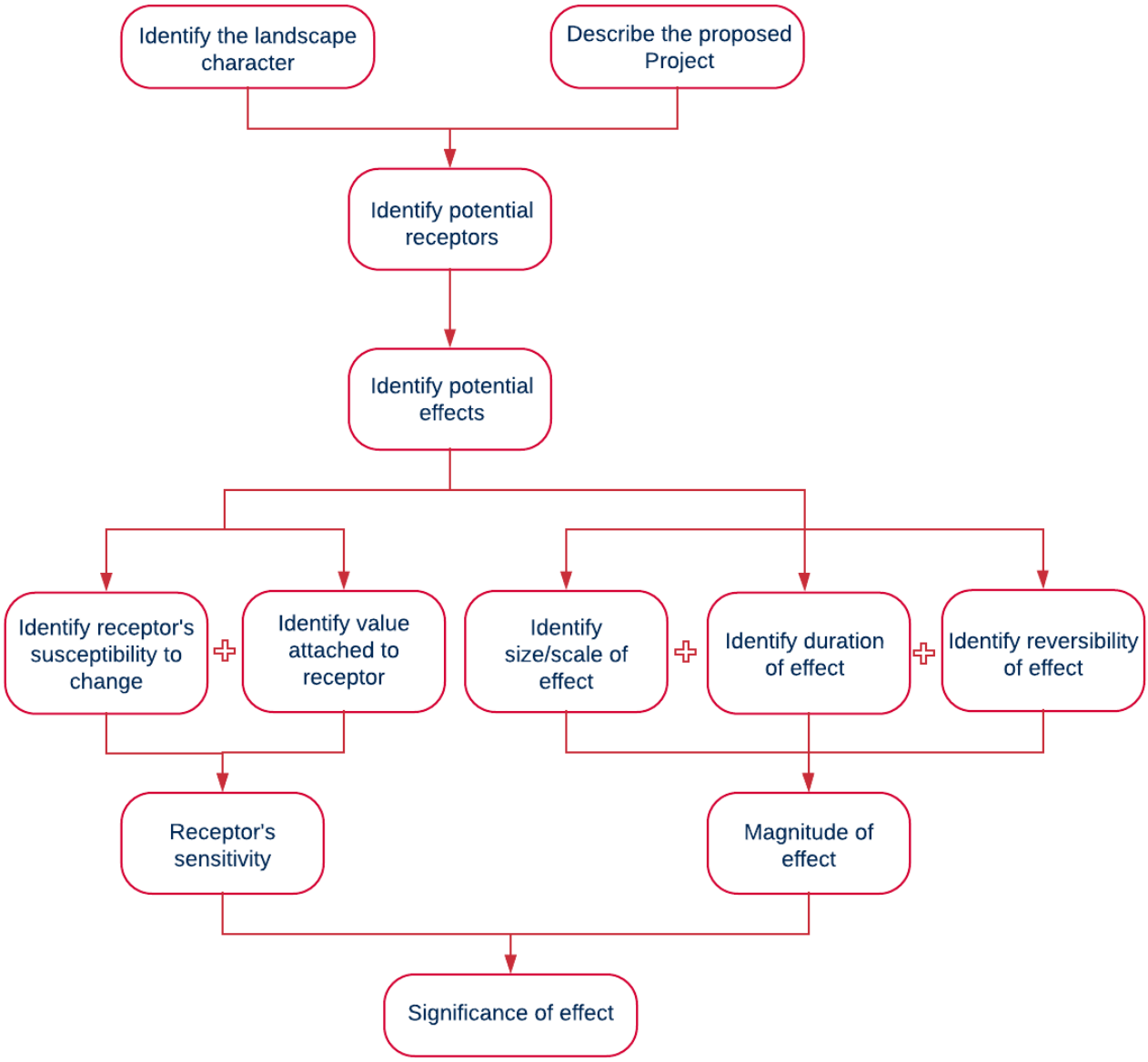


Figure 2-2: Process for Assessing Landscape and Visual Effects (Landscape Institute & IEMA, 2013)

2.2. SCOPE OF VIA

In defining the scope of this VIA, a 100m, one (1) km and two (2) km varied distance buffer of the Project area was created using Geographical Information System (GIS) technology. These buffers are referred to as Visual Catchments throughout this VIA and are used to define the extent of the assessments on both the landscape character and the landscape and visual receptors/effects.

2.3. DATA COLLECTION

The following specific data has been collected and relied upon for this VIA:

- Photographs and associated data provided/sourced by EPS Energy;
- Preliminary concept plans of the Project;
- Survey data including contours of the existing site;
- Topographic maps and aerial photographs;
- Computer-generated (GIS) areas of theoretical visibility; and
- Other investigations undertaken for the Project, including a glint and glare assessment, and heritage and environmental studies.

In preparing this VIA, key EPS Energy personnel attended the Project land on five (5) separate occasions to photograph and record the existing landscape, liaise with relevant landowners, and collect other data pertinent to the VIA. Data collected on the following dates has been included in this VIA:

- 8 June 2017;
- 19 December 2017;
- 13 March 2018;
- 31 May – 01 June 2018; and
- 24-25 July 2018.

2.4. RENEWABLE ENERGY AND LANDSCAPE CHARACTER

Landscapes are an important consideration because of the value that individuals, communities and public bodies attach to them. Landscapes are a shared resource which are as important in their own right as they are as a public good. Certain landscapes also provide economic benefits, either directly such as through agriculture or indirectly through health and wellbeing improvements.

Landscapes are not static but continue to evolve and change with communities. Landscape changes are driven by changing requirements for development to meet the needs of a growing population and economy. This includes new forms of energy generation, such as renewable energy.

Emerging modern perspectives are placing increasing emphasis on the importance of sustainable development. Sustainable development is development which is able to meet the needs of the present generation without compromising the ability of future generations to meet their own needs. A key component of sustainable development is that this type of development balances economic, social and environmental matters. Sustainable developments do not rely upon depleting, limited or finite resources. Renewable energy is an example of a type of sustainable development, compared with traditional energy-generation methods. In considering our shift towards more sustainable developments, authorities must balance big-picture policy considerations against small-scale local impacts, including visual impacts.

2.4.1. Australian Context

As a signatory to the Paris Agreement, Australia has international obligations in response to climate change to reduce greenhouse gas emissions. Australia's goal is to reduce emissions by 26-28 per cent below 2005 levels by 2030. In order to meet this goal, Australia has set a Renewable Energy Target aiming towards a doubling to more than 23 per cent of Australia's electricity to be from renewable sources by 2020. This target sees energy production move away from the development of traditional fossil fuels, to low carbon technologies. Whilst traditional fossil fuel energy sources tended to be large and centralised, renewable energy technologies are available at different scales with different distribution models. Renewable energy developments can produce energy close to the point of use, with different ownership models that depend upon the scale of the development.

The transition to renewable energies will have a profound shift on our landscapes, places, communities and economies. Renewable energies offer an opportunity to consider how these new technologies will best fit into our existing environment. A potential challenge for new renewable energy developments is the competition for land use with existing land uses. A balance needs to be struck against the production of both food and energy. Treasured landscapes, unique biodiversity and valuable heritage assets need to be respected and preserved. Site selection for renewable energy developments presents a unique challenge to minimise impacts on existing environments, with the opportunity to create positive change in communities with untapped potential.

Appropriate site selection is vital to the success or failure of any renewable energy project, including solar farms. Availability of solar resources, land use for both the site and the surrounding area, environmental constraints of the site, community attitudes towards the development and the ability to provide unconstrained energy into the electrical grid are all important considerations for any solar energy project. Examples of existing renewable energy infrastructure throughout Australia is shown in Figure 2-3.

Figure 2-3: Existing Renewable Energy Infrastructure in Australia

2.4.2. South Australian Context

Investment in solar energy projects has been rapidly increasing in recent years throughout South Australia. South Australia is currently on track to have three quarters of its electricity generated from renewable sources by 2025. South Australia's Department for Energy and Mining is committed to facilitating investment into renewable energy and energy storage projects to meet the state's future energy needs as well as Australia's Paris climate emission agreements. South Australia is a world leader in renewable energy production, with the state currently undergoing a renewable energy boom. South Australia is home to the world's largest Lithium-Ion Battery now operating in Jamestown and is the leading producer of wind power in Australia.

The impact of this rapid uptake of renewable energy projects results in an ever-changing landscape to accommodate this infrastructure. Despite the fast-paced changing landscape, adequate consideration of appropriate bulk and scale within the existing landscape is an important consideration for renewable energy developers. Examples of existing renewable energy infrastructure in South Australia is shown in Figure 2-4.

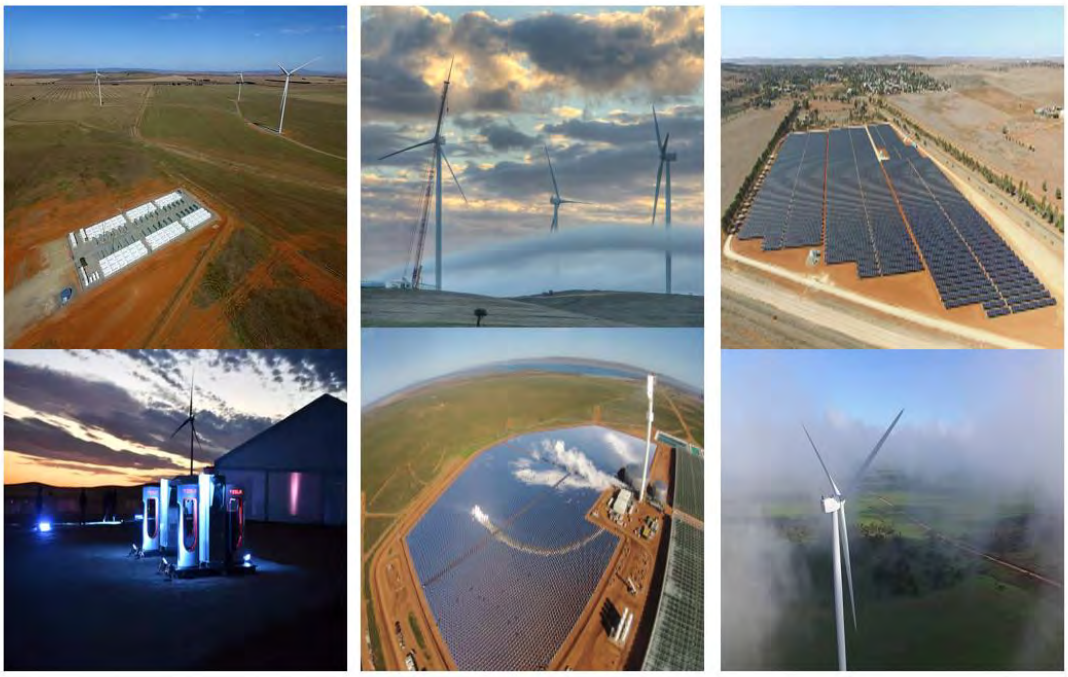


Figure 2-4: Existing Renewable Energy Infrastructure in South Australia

2.4.3. Local Character

Local Character is what makes a neighbourhood distinct. Local Character contributes to the identity of an area, and is created by the landscape, both private and public places as well as natural and human elements. In considering the appropriateness of locating a proposed development, attention is needed to be paid to the distinctive character of the area. An important component of this is how the community sees the insertion of specific development types, such as renewable energy developments, into their existing landscape.

The Port Pirie Regional Council Development Plan 2017 is the on-ground development assessment document which sets out the rules about what can be done on any piece of land in the Regional Council of Port Pirie and the detailed criteria against which development applications will be assessed.

This Plan outlines the Desired Character for land zones, including the Primary Production Zone, where the Project is proposed. Renewable energy is envisioned for this zone in the form of solar farms and ancillary developments. The Development Plan details that these facilities will need to be located in areas where they can take advantage of the natural resource upon which they rely.

The Desired Character section for Primary Production Zone sets out that, subject to the implementation of management techniques by council wide policy regarding renewable energy facilities, visual impacts are to be accepted in pursuit of benefits derived from increased generation of renewable energy.

One of the key design elements in determining whether or not a development proposal is in accordance with the Desired Character, is considering the visual impact on the character of a landscape. The visual impact on the character of rural landscapes is considered in the section below.

2.4.4. Visual Impact on Rural Landscapes

Rural landscapes have historically been the preferred location for large electrical infrastructure. Electrical infrastructure, including substations and transmission lines are already prevalent in rural landscapes across Australia. Examples of electrical infrastructure in rural Australian landscapes are shown in Figure 2-5.

Figure 2-5: Existing Electrical Infrastructure in Australia

Rural landscapes are the preferred landscape type for the development of new electrical infrastructure, including renewable energy developments for a number of reasons including:

- **Proximity to Electrical Infrastructure** - Rural land use is typically the land use surrounding existing electrical infrastructure. Proximity to substations and 275kV transmission lines are key requirements for utility-scale solar projects;
- **Large Land Areas** - Rural land offers large areas which can satisfy the requirements for economically viable renewable energy projects. An area of about two hectares is required in order to generate 1MW of utility-scale solar, with projects typically requiring between 200-2,000 hectares of land;

- **Large Allotments and Land Tenure** - Rural landholdings typically have large allotments and land tenure, which ease project inception, as far less allotments are required than in urban environments;
- **Regional Economic Benefits** - New infrastructure in a regional area, including rural landscapes has the positive flow on effect of stimulating local business;
- **Income Diversification** - Co-benefits can be produced where agricultural land is used for renewable energy production, as rural landowners can diversify their income. Energy production offers an excellent alternative source of revenue where land is of variable productivity potential. Rural landowners can generate a passive income from renewable energy developments, which can be supplemented in some cases with co-location of agricultural activities; and
- **Fewer Receptors** - Rural landscapes typically have minimum receptors nearby, compared with urban environments. Rural areas are less built-up, meaning that the number of individuals to be exposed to a change in the visual landscape is far less than in an urban environment.

2.4.5. Character of the Project Area

The location of the Project is within a rural setting. The Project area and the surrounding land is currently used for agricultural purposes. However electrical infrastructure already forms part of the character of the Project area.

The Project area has existing surrounding electrical infrastructure. Bungama Substation is located to the west of the Project area, on the corner of Warnertown Road and Pirie Blocks Road. Transmission lines (both 132kV and 275kV) as well as their associated easements transect and surround the Project area. The existing electrical infrastructure in and around the Project area is shown in Figure 2-6. The visual impact of the existing electrical infrastructure is important contextually for considering both the existing character of the Project area, and how the Project is likely to impact upon the visual landscape of the local area.

Figure 2-6: Existing Electrical Infrastructure in and Around the Project Area

2.4.6. Visual Interpretation of Utility-Scale Solar

Utility-scale solar projects share similar visual characteristics to existing rural landscapes. This is important in understanding how solar projects are visually interpreted in their contexts. The following section examines the comparison between the proposed indicative technology of the Project to examples of agricultural uses and rural infrastructure.

The technology currently proposed for the Project is a single axis tracking system with an approximate 5m or 10m separation between rows, with ancillary infrastructure such as battery storage sheds. The modules will generally be aligned on the tracking system in a north/south row and rotate in position from east to west.

Further site layout assessments and detailed engineering will define the preferred configuration of panels to ensure:

- Maximum exposure to sun;
- Efficient layout of solar panels across the Project area;
- Efficient connection to the substation;
- Ease of construction;
- Efficient access for maintenance and long-term operation; and
- Technology advances can be incorporated.

Generally, however, the configuration will demonstrate lineal geometric repetition consistent with typical utility-scale solar farms.

As shown below in Figure 2-7, Figure 2-8 and Figure 2-9 a project of this scale provides uniformity within rural landscapes, not dissimilar to the lineal patterns of vineyard or orchard rows, or the geometric form of monocultural fields.

Figure 2-7: Lineal Repetition of Vineyards and Solar Farm Panels

Figure 2-8: Comparison of Monoculture to the Geometric Landscape of Solar Farms

Figure 2-9: Viewpoints Articulating the Repetition and Lineal Sight Lines

The design of the Project's ancillary infrastructure including battery storage, are also reflective of existing rural landscapes. Solar infrastructure can be compared to the form of metal clad shedding and storage typically found in rural settings (See Figure 2-10 below).

Figure 2-10: Comparison of Typical Battery Infrastructure to Farming Structures

Utility-scale battery storage structures are typically constructed according to two design methodologies; modular systems and building-based systems. A number of technologies are being assessed to provide the optimum solution for the project and integration in the South Australian transmission electricity network. Although the BESS footprint and storage structure is subject to the final technology decision, it could cover up to approximately 12ha of the 530ha Project land.

At this stage the storage of the BESS could include a combination of solid structures representative either of typical agricultural style storage buildings e.g. intensive animal keeping sheds used in the Primary Production Zone (See Figure 2-11 below) or Tesla style battery units (See Figure 2-10 above) or 40-foot shipping containers. The specific height of storage structures within the battery storage area is yet to be determined.

Figure 2-11: Typical Sheds Used at a Chicken Farm

3. LANDSCAPE CHARACTER

The scope of this assessment of landscape character includes the identification of Landscape Character Zones and description of the general landscape characteristics of the Project land and surrounding area within the 2km Visual Catchment.

3.1. PROJECT LOCATION

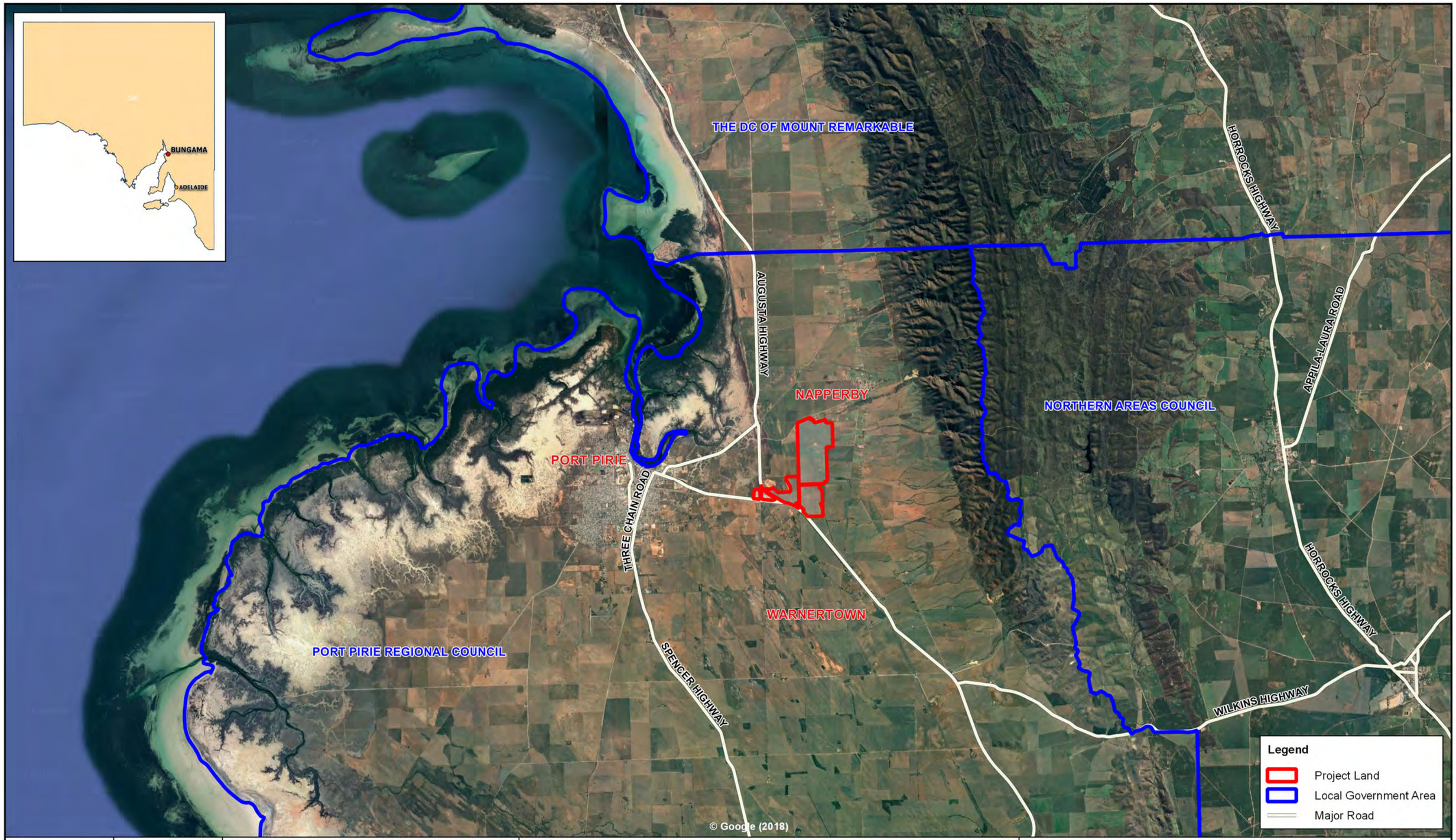
The Project land is approximately 530ha and is shown on the location plan in Figure 3-1.

The Project land is located in the suburbs of Bungama, Napperby and Warnertown, approximately six (6) km east of Port Pirie and 128 km north of Adelaide. The Project land is within the Local Government Area of the Port Pirie Regional Council.

The Project land incorporates the Project area on which the PVS, BESS, Project's substation, Operations and Maintenance buildings and associated infrastructure will be built and operated.

The following features characterise the Project area with further details outlined in Section 3.3 below.

- Adjacent to the existing Electricity Substation and Gas Substation;
- Bound by Gulf View Road (north), Bungama North Road (west), Locks Road (running west-east) through the centre of the Project site, and Augusta Highway (south);
- 275kV and 132kV transmission lines and associated easements crossing and surrounding the Project area; and
- Mostly cleared, flat land that has been historically used for cereal cropping and grazing activities.



Author:	SW
Reviewer:	SMC/ JB
A3 Scale:	1:150,000
Job Ref/Version:	11297/ V04

0 2.5 5 7.5 10 km

Map Projection: GDA 1994 MGA Zone 54

Figure 3-1

Bungama Solar Location

Bungama Solar | Bungama SA Australia

21/11/2018

BUNGAMA SOLAR

11297_VIA_Locality Map.qgs

3.2. LANDSCAPE CHARACTER ZONES

Landscape Character Zones are described as having strongly defined spatial qualities and/or features, distinct from areas immediately adjacent (RMS, 2013; Landscape Institute & IEMA, 2013). Although these are separate from Development Plan Zoning, there is typically a high degree of correlation between these planning designations and the landscape characteristics that define the Landscape Character Zones. Development Plan Zoning may place specific planning controls over a single parcel of land, while Landscape Character Zones are more general and can encompass multiple Development Plan Zones if there are shared spatial qualities or features across the landscape.

Within the 2km Visual Catchment, there are five (5) Development Plan Zones:

- Primary Production;
- Rural Living;
- Residential;
- Industrial; and
- Commercial.

However, the landscape within the 2km Visual Catchment can be separated into two (2) distinct Landscape Character Zones:

- Rural-Agricultural Characteristics; and
- Rural-Residential Characteristics.

These are discussed in turn below and depicted within Figure 3-2.

3.2.1. Rural-Agricultural Characteristics

This zone characteristic is identified as being the most prominent landscape surrounding the Project area. The rural agricultural landscape is large and open, with flat terrain, simple uniform and linear patterns with little variation. Views are often interrupted by scattered vegetation, the Morgan-Whyalla Pipeline, and high-voltage transmission lines.

Key features of this zone characteristic include large allotments, typically larger than 10 hectares, ancillary structures (i.e. sheds), rudimentary fencing, unsealed road networks and scattered rural residential structures. Although some rural residential structures are present throughout this zone characteristic, they are scattered/wide-spread and remain distinctly separate from the density of the rural residences that define the Rural-Residential Characteristic.

The Project area is located within the Rural-Agricultural Characteristic zone.

3.2.2. Rural-Residential Characteristics

This zone characteristic is identified by clusters of higher-density rural residential structures. The allotments are typically smaller than 10 hectares. This zone characteristic includes part of the township of Napperby, residences along Scenic Drive, part of Gulf View Road, Oaks Road and a group of residences located south of Railway Terrace.

Legend

- Project Land
- Bungama Substation
- 1km Visual Catchment
- 2km Visual Catchment
- Allotment Boundary
- Railway
- Existing Overhead Transmission Line

Potential Visual Receptors

- Scenic Drive Study Area
- Project Landowner
- Service Station
- Caravan Park
- Potential Residential Receptor

Landscape Character

- Rural-Agricultural
- Rural-Residential

NELSHABY ROAD
OAKS ROAD
GULF VIEW ROAD
SENTOSA ROAD
HISTORIC DRIVE
BUNGAMA NORTH ROAD
GUM ROAD
MUSTER DRIVE
AUGUSTA HIGHWAY
HILLVIEW ROAD
SUNNYVILLE ROAD
WARNERTOWN ROAD
RAILWAY TERRACE
PIRIE BLOCKS ROAD
CHURCH ROAD
WAITS ROAD
SCENIC DRIVE
SANDY TERRACE
DROVERS ROAD

© Google (2018)

Author:	MB
Reviewer:	SMC/ JB
A3 Scale:	1:28,000
Job Ref/Version:	11297/ V04

0 0.25 0.5 0.75 1 km

Map Projection: GDA 1994 MGA Zone 54

Figure 3-2

Landscape Character

Bungama Solar | Bungama SA Australia

21/11/2018

BUNGAMA SOLAR

11297_VIA_Landscape_Character.qgs

3.3. LANDSCAPE DESCRIPTION

The existing landscape character within the 2km Visual Catchment is described in the following subsections which align with the landscape characteristics described in Section 2.1.1 and Table 2-1.

As described in Section 2, once the existing landscape character has been identified, this will be reviewed alongside the description of the Project to identify the potential landscape and visual receptors and effects.

3.3.1. Landform/topography

The Project area and surrounding landscape is characterised by mostly flat, smooth and open land (Plate 1). The Project area is approximately 24 metres above sea level.

There are little to no natural landscape features aside from scattered vegetation (discussed in Section 3.3.2) evident within the 2km Visual Catchment, however a number of artificial features are dominant (Plate 2) and discussed in Section 3.3.4.

Although there is no vertical relief to the landform within the Project area or 2km Visual Catchment, the Southern Flinders Ranges are located approximately 5km to the east and provide vertical relief in the background.

Plate 1: Flat Terrain on Project Area, Southern Flinders Ranges Visible in Background

Plate 2: Flat Terrain on Project Area, Morgan-Whyalla Pipeline Along Gulf View Road

3.3.2. Landcover/vegetation

The Project area and surrounding landscape consists of mostly cleared land due to historic cropping and grazing activities (Plate 3).

There are scattered trees surrounding the Project area and a small amount of Acacia shrubland present, however the majority of existing vegetation is located within the road reserves. There is medium-high density vegetation along Bungama North Road (west), and medium density along Locks Road (west-east through the centre of the Project site), Gulf View Road (north-east) and along the Augusta Highway (south).

Existing vegetation also mostly obscures some residences to the north of the Project area (Plate 4). It is not intended to remove the existing vegetation where practicable.

3.3.3. Water Form

There is no presence of waterbodies or inundated areas within the Project area or surrounding landscape.

Plate 3: Crop on Project Area, Vegetation Within Road Reserves Along Locks Road

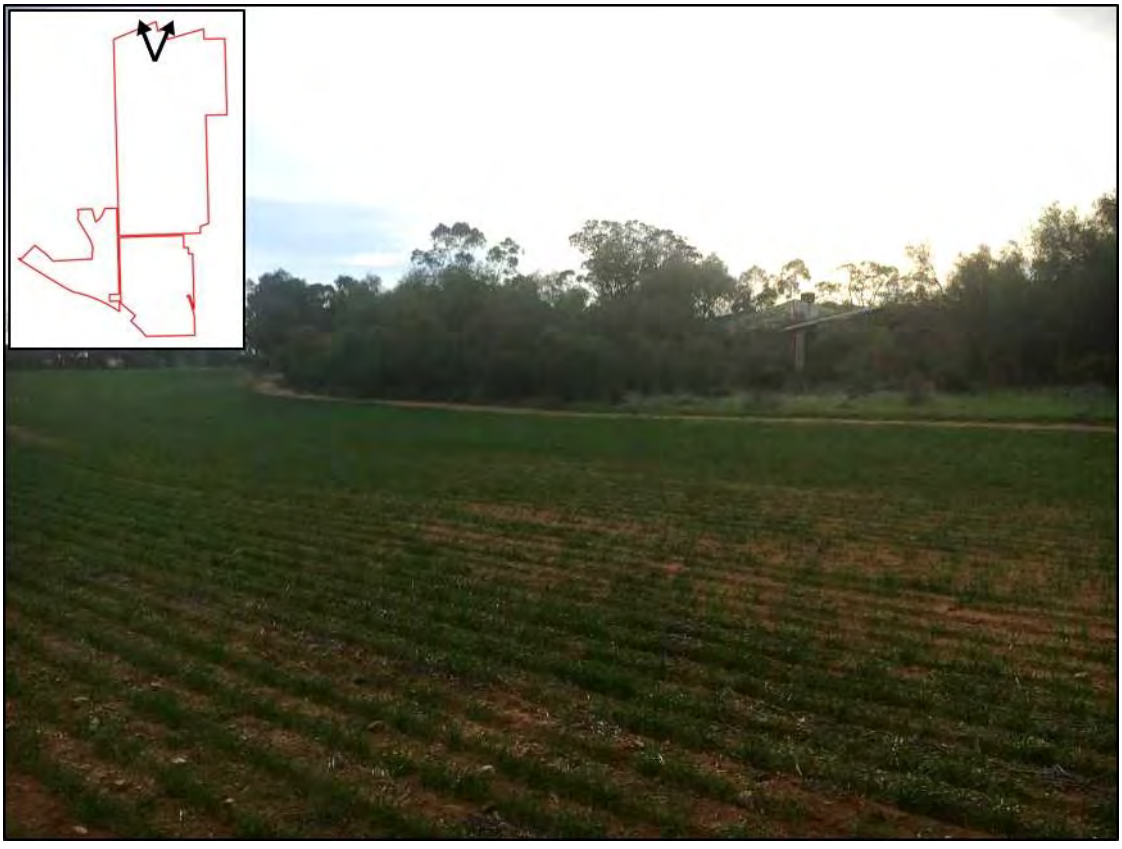


Plate 4: Mostly Concealed Residence Adjoining Northern Boundary of the Project Area

3.3.4. Land Use

The Project area and immediately surrounding landscape contains prominent areas of farmland. Further from the Project area is clusters of rural-residential structures.

The Bungama Substation (Plate 5) is located to the south west of the Project area, on the corner of Warnertown Road and Pirie Blocks Road, which is visible from several surrounding roads and viewpoints. The associated high-voltage transmission lines are located across the allotments within the Project area and are spread throughout the surrounding landscape (Plate 6 and Plate 7).

A mining operation adjoins the west of the Project area. Further, the large silos and the Port Pirie Nyrstar Smelter are prominent features in the landscape located in the background to the west (Plate 6 and Plate 7).

A gas substation (Plate 8) and a roadhouse service station exist in the centre of the southern portion of the Project area, on either side of Locks Road. Further, an auto-wreckers car yard exists between the Project area and the Bungama Substation.

The Augusta Highway is located along the southern boundary of the Project area and nearby the western boundary. A railway also runs parallel to the Augusta Highway.

Plate 5: Bungama Substation

Plate 6: Transmission Towers Across the Project Area, Large Silos and Nyrstar Smelter Stack Prominent in Background

Plate 7: Transmission Lines and Towers as Seen From Scenic Drive, Large Silos and Nyrstar Smelter Prominent in Background

Plate 8: Gas Substation

3.3.5. Texture and Colour

The Project area and surrounding landscape may present a variety of colours and textures which is largely influenced by seasons and cropping cycles of the farmland. As demonstrated in the Plates above, the Project area and surrounding landscape can at times lack diversity in colour tones and texture.

3.3.6. Settlement Pattern

As described in Section 3.2, the settlement pattern includes a combination of scattered individual structures and concentrated settlements with a combination of both large and smaller subdivided allotments.

3.3.7. Rarity

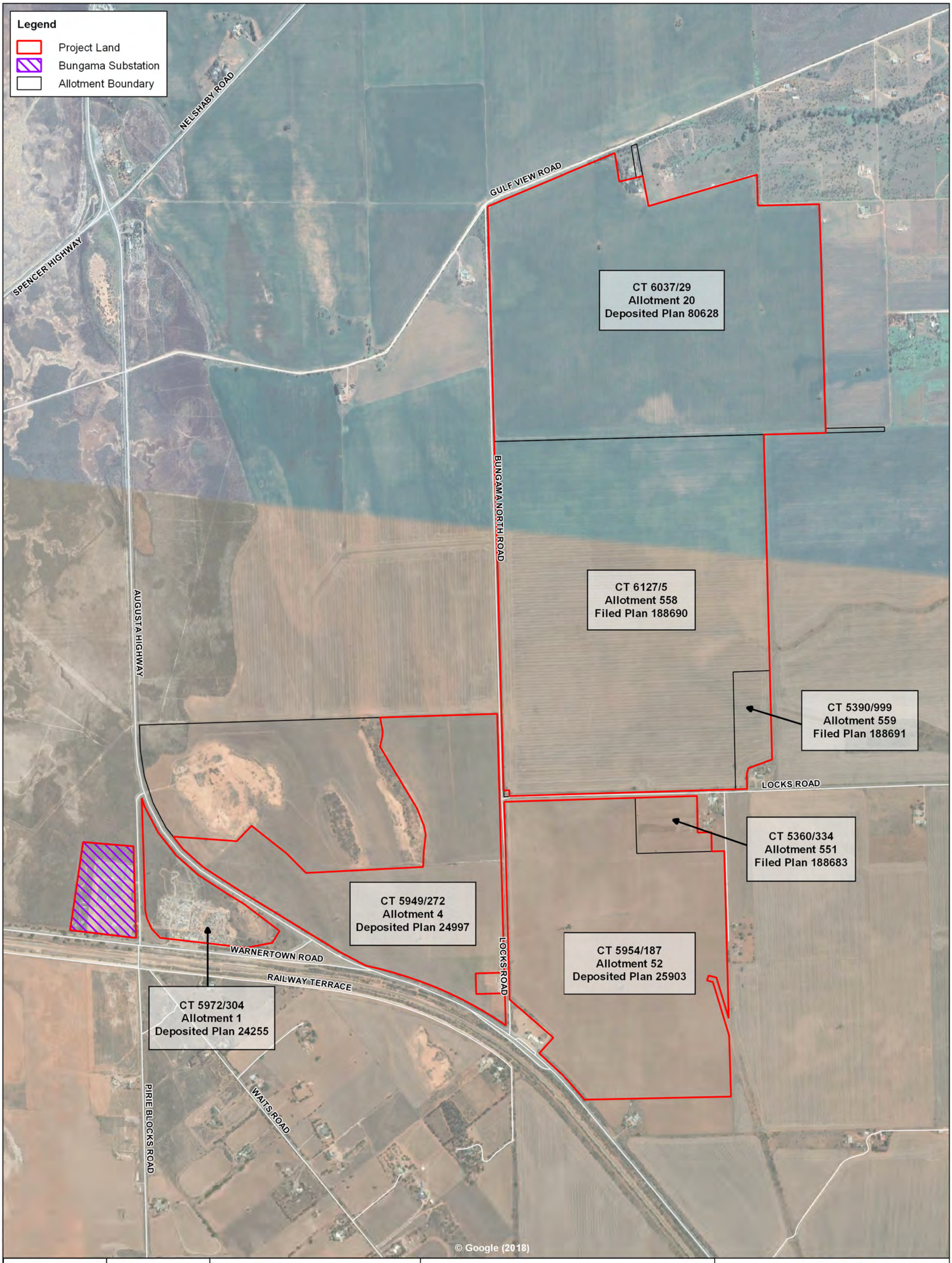
The existing landscape elements within the Project area and surrounding landscape are common within the region and other rural landscapes.

Plate 9: Transmission Line Towers on CT 5949/272 and Over the Aboriginal Cultural Heritage Site Adjoining the Project Area

4. BUNGAMA SOLAR PROJECT

4.1. PROJECT LAND PARTICULARS

The Project land and title particulars are detailed in Figure 4-1 below.



Author:	MB
Reviewer:	SMC/JB
A3 Scale:	1:15,000
Job Ref/Version:	11297/ V04

0 100 200 300 400 500 m

Map Projection: GDA 1994 MGA Zone 54

Figure 4-1

Project Land Title Particulars

Bungama Solar | Bungama SA Australia

21/11/2018

BUNGAMA SOLAR

11297_VIA_Project_Land_Particulars.qgs

4.2. TECHNICAL DESCRIPTION

Bungama Solar is an integrated but separately operated grid connected Photovoltaic Energy Generation System (PVS) of approximately 280MW (AC) generation capacity and a 140MW capacity Battery Energy Storage System (BESS) with 560MWh of storage that will feed into the National Electricity Market via ElectraNet's Bungama Substation. The PVS element, the BESS element and associated infrastructure together are "the Project".

The Project will comprise of a series of mounted PV modules set out in arrays using a single axis tracking system. The arrays will be connected to inverters and voltage step-up transformers. The Project will be connected to the adjacent Bungama Substation via a dedicated 275kV double circuit overhead or underground transmission line.

The Project components includes but is not limited to:

- A PVS of approximately 280MW (AC) generation capacity and associated infrastructure;
- A 140MW capacity BESS with 560MWh of storage and associated infrastructure;
- Permanent operations components of the PVS element include (but are not limited to) the series of mounted photovoltaic modules set out in arrays, inverter/ transformer stations, interconnector substations, switching station, all overhead transmission and underground cabling and operational, maintenance and control buildings;
- Permanent operations components of the BESS element including (but not limited to) the BESS area, sheds and all overhead transmission and underground cabling;
- Any synchronous condensers if included in the Project; and
- Permanent operations ancillary components of the Project including (but not limited to) all internal roads, car parking areas, fencing, and access points to the road network, and any other relevant matter.

4.3. LAYOUT AND KEY VISUAL COMPONENTS

The indicative layout and indicative key visual components of the Project considered in this assessment include:

- Solar modules – mounted on single axis tracking racks;
  - Approximately 800,000 solar panels installed in rows orientated north;
  - Solar panels of approximately 2 x 1.2m mounted on steel frames approximately 1m (at 5m row spacing and panel tilt height of ~1.6m) or 3m (at 10m row spacing and panel tilt height of ~4.5m) above the ground (dependent on the final technology selection);
  - Panels are specifically designed to absorb light and should not produce any significant reflectivity or glare;
- Inverter stations (~3m high);
- Transformers;

- Switching substation;
- One or more synchronous condensers (subject to requirement); and
- Utility-scale battery facility (either 3-4m high containerised system or possible rural sheds up to ~8 or 9m high).

Typical examples of the proposed mounted solar panels are shown in below. Panels can tilt on the one axis. There are wide distances between the rows of panels which provides for greater access during construction and operation and eliminates overshadowing from adjacent panels. Panels are attached to the racking in different formations, which can range from four panels to one panel and be orientated either landscape or portrait.

Figure 4-2: Examples of Typical Single-axis Tracking Solar Modules

Groups of solar panels are connected to an inverter, typically via underground cabling and the inverters are linked together to collect the total energy being produced. Step-up transformers, that increase the voltage are housed in the inverter containers. An example of a typical utility-scale inverter is shown in Figure 4-3 below.

Figure 4-3: Example of an Indicative Inverter

Examples of utility-scale battery technology configurations are shown in Figure 4-4. A battery facility is scalable to the space, power and energy requirements of the site. It can be configured in various arrangements, offering a high amount of modularity. Alternate battery technology such as flow batteries may be used which may either be laid out in container similar to shipping containers or located in multiple rural style sheds (up to 8-9m in height) over a larger footprint area than lithium ion type batteries.

Figure 4-4: Examples of Utility-scale battery Technology Options

Connection infrastructure includes:

- Associated underground cables connecting groups of solar panels to inverter stations and underground and/or overhead transmission lines from inverter stations to the Project's switching substation; and
- A switching substation comprising typical electrical infrastructure to that which is found within the existing Bungama Substation, depicted in below. The switching substation will contain any synchronous condenser if required and will be fenced for safety and security purposes.

Plate 10: Bungama Substation

Administration and controls area including:

- Control room and site office with amenities (typical demountable style building);
- Maintenance and spare parts building;
- Other buildings;
- Car parking sufficient for employees and contractors during operation;
- Laydown/compound area and battery storage area; and
- Internal access roads.

Ancillary infrastructure includes:

- Drainage works, including stormwater management systems;
- Areas not to be developed e.g. native vegetation areas, heritage areas;
- Security fencing and CCTV will be installed;

- Low-level night time lighting; and
- Lightning protection.

Examples of indicative development components are shown below for a typical Office and Maintenance (O&M) buildings (Figure 4-5), a typical Switch Room (Figure 4-6), a typical staff room (Figure 4-7), how these buildings typically appear alongside each other (Figure 4-8), and security fencing (Figure 4-9).

Figure 4-5: Example of a Typical O&M Building

Figure 4-6: Example of a Typical Switch Room

Figure 4-7: Example of a Typical Staff Room

Figure 4-8: Example of a Typical Switch Room-Alongside O&M Building

Figure 4-9: Indicative View of Security Fencing Surrounding a Solar Farm

In the event that the Project is connected to the Bungama Substation via an overhead transmission line, the associated tower and lines will visually appear as a duplicate of the existing connection (Figure 4-10) and be situated alongside it. Should the connection be via an underground cable this will not be visible.

Figure 4-10: Existing Transmission Lines and Tower Connecting to the Bungama Substation

4.3.1. Construction and Decommissioning

The Project has three phases; construction, operation and decommission. Each phase is anticipated to have a varying degree of visual impact and duration. Each phase involves various activities, machinery, equipment and structures detailed below.

The key construction works required for the construction phase include (but are not limited to):

- Construction of internal access tracks and laydown areas;
- Installation of site office, maintenance sheds and other buildings;
- Site preparation earthworks for installation of panel supports;
- Installation of panel supports;
- Solar panel erection;
- Installation of the battery system/technology and battery storage structures;
- Electrical connection between solar panels and central inverters, substation and battery storage;
- Provision of other utility services (electricity, communications, etc.) as required;
- Overhead or underground electrical connections to the Bungama Substation;
- Installation of the remaining system components (including synchronous condensers if included);
- Landscaping (if required), fencing and signage; and
- Commissioning.

The operational period will run for approximately 30 years and includes:

- Solar panel washing;
- General PVS and BESS equipment maintenance;
- Fence and landscape maintenance; and
- Land management.

During the decommissioning phase all Project related infrastructure would be removed from the Project area, and the land restituted to its original use.

5. ASSESSMENT OF POTENTIAL RECEPTORS AND EFFECTS

The following assessment of potential effects is based primarily on the PVS component of the Project and does not include an assessment of the ancillary structures (described in Section 4.3). This is primarily due to the horizontal spread of the PVS spanning a large area of the landscape, subsequently posing a higher potential for visual change to the landscape. Whereas the ancillary structures are not uncommon structures in the landscape (as described in Section 4.3) and are also proposed to be located immediately adjacent to the existing Bungama Substation along Pirie Blocks Road. Similarly, as described above, should the Project connect to the Bungama Substation vis an overhead transmission line, this will visually appear as a duplicate of the existing infrastructure. These are therefore not anticipated to pose a visual change requiring detailed assessment.

5.1. POTENTIAL LANDSCAPE RECEPTORS

Landscape receptors can include the constituent elements of the landscape, its specific aesthetic or perceptual qualities and the landscape character itself (Landscape Institute & IEMA, 2013). As such, the landscape characteristics described in Section 3.2 are considered landscape receptors, as well as the identified rural landscape character.

As indicated in Section 2.1.2, this assessment will be guided by the most and least preferred characteristics identified in the literature (Table 2-1) and considered against the specifications of the assessment criteria (Table 2-2). The category scales (high, moderate, low) are referred to with either H, M, L for the assessment of potential landscape effects in Table 5-1 below.

Notably, the Desired Character of the Primary Production Zone as stated in the Development Plan envisages solar and ancillary development as a land use in this Zone.

Further, the Development Plan describes that wind farms, which pose a significantly greater visual impact than solar farms primarily due to scale, but nonetheless have similar requirements regarding natural resources, need to be located in areas where they can take advantage of these natural resources and as a consequence may need to be:

- *"located in visually prominent locations such as ridgelines*
- *visible from scenic routes and valuable scenic and environmental areas*
- *located closer to roads than envisaged by generic setback policy."*

The Development Plan further states that:

> *"This, coupled with the large scale of these facilities (in terms of both height and spread of components), renders it difficult to mitigate the visual impacts of wind farms to the degree expected of other types of development. Subject to implementation of management techniques set out by general / council wide policy regarding renewable energy facilities, these visual impacts are to be accepted in pursuit of benefits derived from increased generation of renewable energy."*

Additionally, the Development Plan includes Landscape Protection Policy Areas, which aim to preserve and/or enhance the characteristics and values of the of the Policy Areas.

Although the Project area is situated between National Highway 1 (Augusta Highway) and the Landscape Protection Policy Areas 11 and 12, it does not fall within these Policy Areas and is therefore not constrained by the associated Policies. Notwithstanding, it is notable that due to the Project's low profile and the implementation of any standard and/or necessary mitigation measures, the Project will not impair or compromise the natural view of the ranges or the Landscape Protection Policy Areas.

Table 5-1: Assessment of Landscape Effects

	Sensitivity of Receptor		Magnitude of effect						
Landscape Receptor	Susceptibility	Value	Size and scale	Frequency of Use	Distance/ Geographical extent	Duration	Reversibility	Description	Significance of Effect
Landform/ topography	L	L	L	L	M	M	L	As Project does not involve excavation of the land, it will not result in a change to the existing landform or topography of the Project area or surrounding landscape.	Low
Landcover/ vegetation	M	M	L	L	M	M	L	Although limited vegetation clearance will be undertaken as part of this Project, the Project area and surrounding landscape has relatively distinct crop rotations and climatic conditions, which are generally more preferred characteristics within the rural landscape. None the less, the Project would result in a small reduction of cropping land for the duration of operation.	Moderate-Low
Water form	L	L	L	L	L	M	L	No water forms evident within the Project area or the surrounding landscape.	Low
Land use	L	L	L	L	M	M	L	Although the addition of the Project would be a noticeable change to the existing land use of the Project area, the co-location of the existing Bungama Substation, other electrical infrastructure the Project area render the proposed use of the site appropriate within the landscape.	Low

	Sensitivity of Receptor		Magnitude of effect						
Landscape Receptor	Susceptibility	Value	Size and scale	Frequency of Use	Distance/ Geographical extent	Duration	Reversibility	Description	Significance of Effect
Texture and colour	M	L	L	L	M	M	L	The introduction of PV solar panels will introduce a new scale of colour and texture to the Project area, however, these textures and colours are common place in the landscape from machinery sheds, silos, storage sheds, etc.	Moderate-Low
Settlement pattern	L	L	L	L	M	M	L	As described, the settlement pattern includes a combination of scattered individual structures and concentrated settlements with a combination of both large and small subdivided allotments. The Project does not require further subdivisions of land or introduction of additional settlements within the landscape.	Low
Rarity	L	L	L	L	M	M	L	The existing landscape elements within the Project area and surrounding landscape are common within the region and other rural landscapes.	Low
Rural landscape character	L	L	L	L	M	M	L	Renewable energy developments are a type of desired character for the Primary Production Zone. Further, developments of this nature are not considered a significant change in rural landscapes, generally. Changes are negligible in this regard.	Low

5.2. VIEWSHED ANALYSIS

Viewshed analysis is a GIS tool used to identify the theoretical visibility of the Project within a defined study area. As stated, the results of the analysis are theoretical only and recognising the limitations of its use can assist with understanding the results of the analysis.

It is important to note that the Project in its entirety cannot be viewed from one single viewpoint.

The viewshed analysis completed for this VIA (Figure 5-1) is based on digital elevation model (DEM) information derived from Geoscience Australia. This data has a resolution of approximately 30m, where 90% of tested elevations were within 6m of reference heights, and in flatter areas height errors are less than 3m (Gallant, et. al., 2011). Although smoothing has been applied, and after vegetation removal random noise is still present. The noise typically alters elevations by 2 to 3m, but in some cases by as much as 10m (Gallant, et. al., 2011). Considering the Project area and surrounding area is mostly flat and sparsely vegetated the accuracy is considered to be manageable over a larger area.

It is not common practice to include other land use or topographical data when processing the viewshed, therefore the results do not account for features or "obstructions" (i.e. buildings/structures, vegetation, and ridgelines) that have potential screening abilities. Accordingly, false-positives are a common occurrence. The earth curvature can also have an influence on screening potential, however given the size and scale of the Project in relation to the earth curvature this is not considered necessary to include in the viewshed. Lastly, the heights of the viewer/receptors and the Project are also integral to the analysis. In this instance, the receptor height is set at 1.6m, which is considered average, and the PVS height is set at 4m, which is the maximum height of the PVS technology options being considered for the Project. Although the PVS technology options being considered range from 1m to 4m in height, EPS Energy has taken a conservative approach and based the viewshed analysis on the maximum potential height of the PVS technology options.

Using the viewshed analysis, a total of 36 viewpoints scattered throughout the surrounding landscape were selected. These viewpoints underwent assessment during numerous site visits to "ground-truth" the degree of visibility and effects of the Project. This revealed a significant amount of false-positives within the viewshed output and confirmed the limitations of this type of analysis and that the results are theoretical only.

An assessment of the visual effects from the 36 viewpoints are also depicted in Figure 5-1 and discussed in Section 5.3.5.

Legend

- Project Land
- Bungama Substation
- 2km Visual Catchment
- Indicative Solar Array Area
- Township
- Railway
- Road significant to the Project
- Other Road

Viewshed (4m Array)

Indicative Degree of Visibility of Array

- 0 - 10%
- 10 - 20%
- 20 - 30%
- 30 - 40%
- 40 - 50%
- 50 - 60%
- 60 - 70%
- 70 - 80%
- 80 - 90%
- 90 - 100%

Photograph Viewpoints

Indicative Degree of Visibility of Array

- Nil
- Low
- Moderate
- High

NELSHABY ROAD
OAKS ROAD
NAPPERBY
GULF VIEW ROAD
HISTORIC DRIVE
AUGUSTA HIGHWAY
BUNGAMA NORTH ROAD
MUSTER DRIVE
HILLVIEW ROAD
LOCKS ROAD
SUNNYVILLE ROAD
WARNERTOWN ROAD
PIRIE BLOCKS ROAD
RAILWAY TERRACE
CHURCH ROAD
WAITS ROAD
SCENIC DRIVE
SANDY TERRACE
AUGUSTA HIGHWAY

Note: The Zone of Theoretical Visibility does not account for vegetation and built environment. Therefore the actual view of the project is likely to be less than indicated on the plan.
Please refer to Plates 1-36 for further information.

© Google (2018)

Author:	SW
Reviewer:	SMC/ JB
A3 Scale:	1:27,000
Job Ref/Version:	11297/ V04

0 0.25 0.5 0.75 1 km

Map Projection: GDA 1994 MGA Zone 54

Figure 5-1

Zones of Theoretical Visibility (4m Array)

Bungama Solar | Bungama SA Australia

21/11/2018

BUNGAMA SOLAR

11297_VIA_Viewshed_Analysis.qgs

5.3. POTENTIAL VISUAL RECEPTORS

Visual receptors are defined as individuals and/or groups of people who are affected by changes to views or visual amenity of the landscape as a result of the Project (Landscape Institute & IEMA, 2013). It follows that the key visual receptors to consider in this assessment are the potential "residential receptors" and the "viewpoint receptors". These have been assessed separately in the following sections.

The potential *residential* receptors identified within a 100m, 1km and 2km Visual Catchment of the Project area are shown in Figure 5-2. This figure identifies 231 potential visual receptors, three (3) of which are owned by Project landowners. The Project landowners are exempt from this VIA as EPS Energy will liaise with them directly on any potential visual mitigation measures. Further, two (2) of the potential visual receptors are service stations, and one (1) is a caravan park. Accordingly, an approximate total of 225 potential visual receptors are considered to be residential buildings.

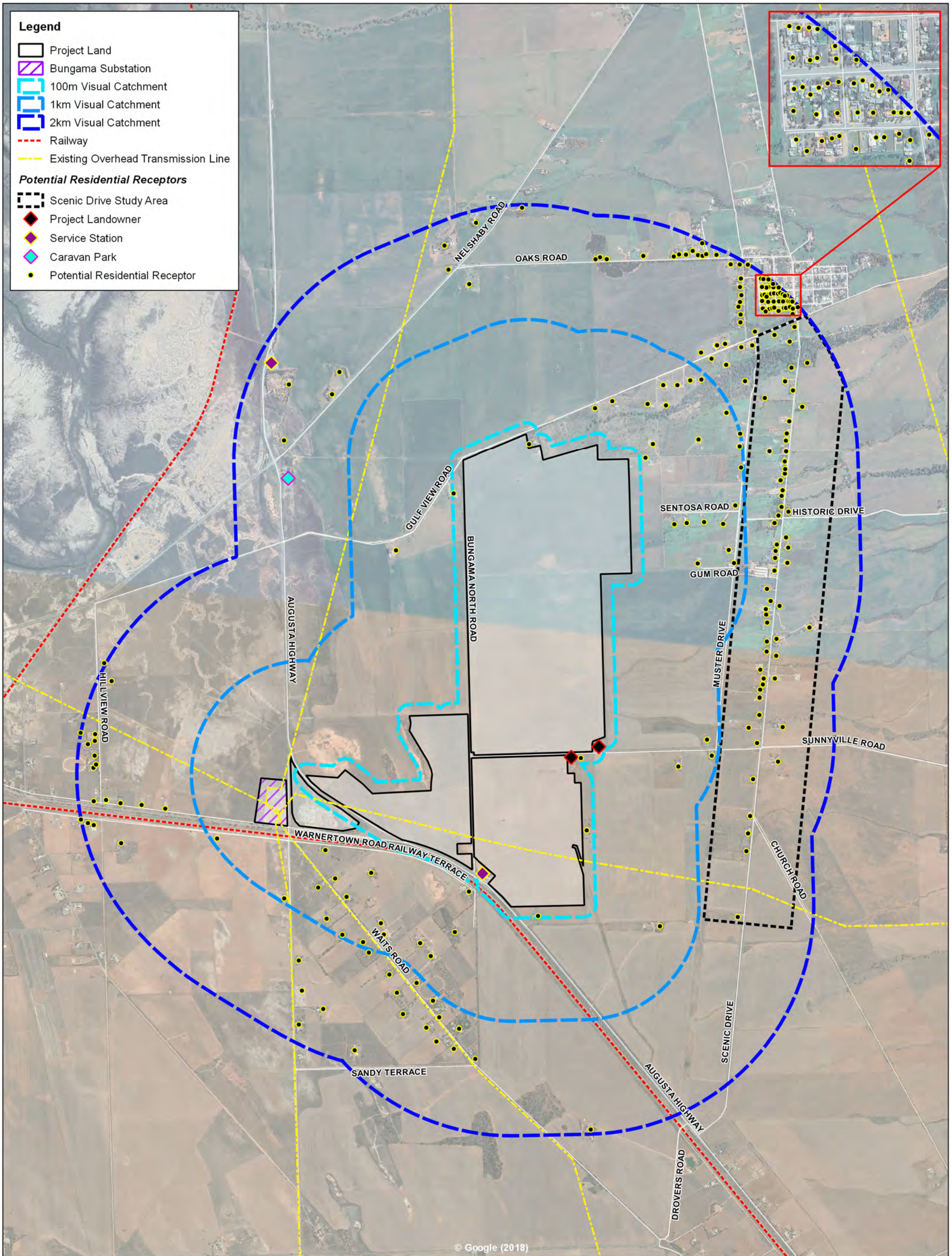
It is noted that at the time of this assessment some of these residential receptors were unable to be distinguished between residences or ancillary structures such as sheds. EPS Energy has taken a conservative approach to this and has treated each as if it were a residence.

Due to the number of potential residential receptors, the following assessment of visual effects is undertaken in groups correlating with the individual Visual Catchments that the potential receptors are located, being 100m Visual Catchment (Table 5-2,Figure 5-3), 1km Visual Catchment (Table 5-3, Figure 5-4), 2km Visual Catchment (Table 5-4, Figure 5-5) and Scenic Drive Study Area (Table 5-5, Figure 5-6).

The potential *viewpoint* receptors are those identified in the viewshed analysis in Section 5.2. Again, it is important to note that the Project in its entirety cannot be viewed from one single viewpoint. The potential degree of visibility of the Project from each visual receptor has been depicted in within the associated figures. Further to this, Figure 5-7 demonstrates the indicative degree of visibility of the Project along the roads within the extent of the 2km Visual Catchment and Figure 5-8 demonstrates the indicative frequency of use of these roads. Where the Project is expected to be visible, it is indicated in Plates 13-48 as blue shading.

The assessment of visual effects on both the potential residential receptors and potential viewpoint receptors is undertaken in accordance with the assessment criteria outlined in Table 2-2. As with the assessment of landscape effects, the category scales (high, moderate, low) are referred to with either H, M, L in the following assessment tables.

It is noted that in the following assessment of visual effects all potential residential receptors are assigned a “High” level of ‘susceptibility’, as they are considered residences. Similarly, ‘duration’ and ‘reversibility’ criteria for all potential residential receptors score “Moderate” and “Low” respectively. This is due to the nature of the Project as a utility-scale solar development, which is a temporary feature lasting up to 30 years, is non-invasive to install, and the associated infrastructure can be removed upon decommissioning and the landscape and associated views restored to their condition and use prior to the introduction of the Project. Similarly, the ‘value’ for all viewpoint receptors is assigned “Low” in accordance with the value results from the assessment of rural landscape character (Table 5-1).



Author:	SW
Reviewer:	SMC/ JB
A3 Scale:	1:30,000
Job Ref/Version:	11297/ V08

0 0.25 0.5 0.75 1 km

Map Projection: GDA 1994 MGA Zone 54

Figure 5-2

Potential Residential Receptors

Bungama Solar | Bungama SA Australia

21/11/2018

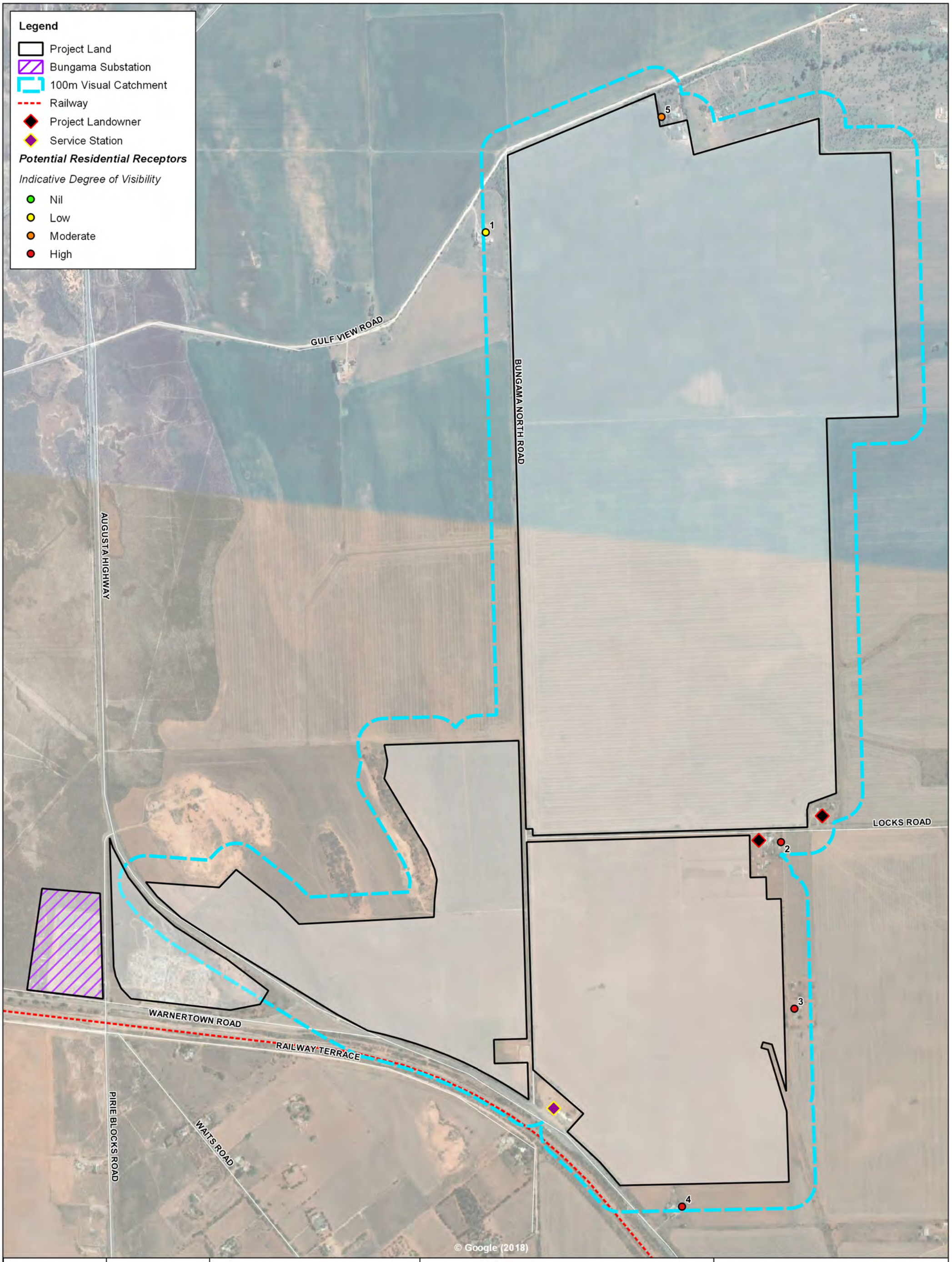
BUNGAMA SOLAR

11297_VIA_Potential Residential Receptors.qgs

5.3.1. Potential Residential Receptors – 100m Visual Catchment

The potential residential receptors within the 100m Visual Catchment are numerically identified in Figure 5-3 below, and the assessment of visual effects outlined in Table 5-2.

As the Project area is located within the foreground for these potential residential receptors, they are each assigned a “High” level of distance/geographical extent in addition to their susceptibility.



Author:	SW
Reviewer:	SMC/ JB
A3 Scale:	1:13,000
Job Ref/Version:	11297/ V07

0 100 200 300 400 500 m

Map Projection: GDA 1994 MGA Zone 54

Figure 5-3

Potential Residential Receptors – 100m Visual Catchment

Bungama Solar | Bungama SA Australia

21/11/2018

BUNGAMA SOLAR

11297_VIA_Potential_Residential_100m.qgs

Table 5-2: Assessment of Visual Effects on Potential Residential Receptors – 100m Visual Catchment

	Sensitivity of Receptor		Magnitude of effect						
Receptor Identifier	Susceptibility	Value	Size and scale	Frequency of Use	Distance/ Geographical	Duration	Reversibility	Description	Significance of Effect
1	H	M	M	H	H	M	L	It is noted that Bungama North Road separates this receptor from the Project, which has substantial vegetation within the road reserves as depicted in Plate 11. It is recognised that this receptor is oriented north and not in the direction of the Project (east). Further, much visibility of the Project from this receptor is screened by the existing moderate-dense vegetation along Bungama North Road, resulting in low visibility of the Project. This factor has a substantial influence over the significance of the effect as there is no anticipated change to the view from this receptor and is therefore downgraded to "Low".	Low
2	H	M	L	L	H	M	L	Views toward the Project from this receptor include the expanse of existing transmission lines and towers along Locks Road. It is recognised that this receptor has existing vegetation screening within their property to Locks Road and toward the Project site as shown in Plate 12. This, along with the existing vegetation within the road reserve of Locks Road obstructs the visibility of the Project. This existing vegetation will not be removed as a result of the Project.	Moderate-Low
3	H	M	M	H	H	M	L	This receptor is proximate to the large 275kV transmission lines and associated towers and has prominent views of the large silos and Nyrstar Smelter stack in the background, detracting from the otherwise typical rural landscape. Despite the presence of artificial elements, the Project,	Moderate-High

	Sensitivity of Receptor		Magnitude of effect						
Receptor Identifier	Susceptibility	Value	Size and scale	Frequency of Use	Distance/ Geographical	Duration	Reversibility	Description	Significance of Effect
								without mitigation measures, would likely result in a prominent physical change to the view from this receptor and portions of the Project will be due to the close distance.	
4	H	M	M	H	H	M	L	This receptor is proximate to the Augusta Highway and railway to the south and has prominent views of the large 275kV transmission lines and towers to the north. Despite the presence of artificial elements, the Project, without mitigation measures, would likely result in a prominent physical change to the view from this receptor and portions of the Project will be visible due to the close distance.	Moderate-High
5	H	M	M	H	H	M	L	Views from this receptor include a significant amount of existing vegetation both within their property and the Project area, a fence and a number of sheds with Low to Nil visibility of the Project area in a southerly direction (Plate 13). Despite the presence of artificial elements, the Project, without mitigation measures, would likely result in a physical change to the view from a south-westerly direction from this receptor and portions of the Project will be visible due to the close distance (Plate 14).	Moderate
Service Station	L	L	L	L	H	M	L	The views from this receptor present significant disturbance and has artificial elements, particularly due to its location on the Augusta Highway. The active use of the site is toward the Augusta Highway, not the Project. Visibility of the Project from this receptor is likely to be from behind the service station.	Low

Plate 11: Indicative View of the Project From Receptor #1

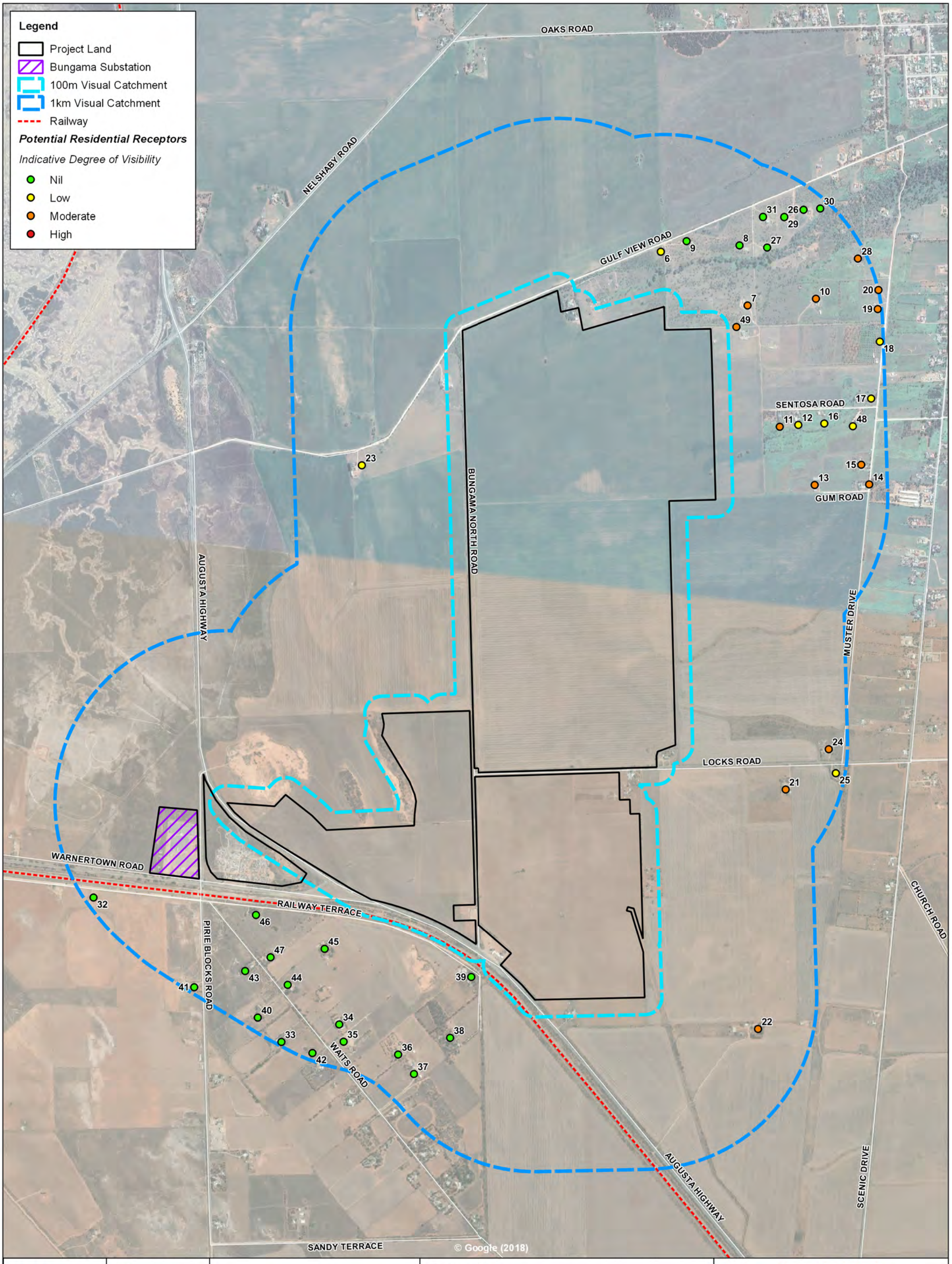
Plate 12: Vegetation Within Road Reserve of Locks Road and in Front of Receptor #2 (left)

Plate 13: Southerly View From Receptor #5

Plate 14: South-westerly View From Receptor #5

5.3.2. Potential Residential Receptors – 1km Visual Catchment

The potential residential receptors within the 1km Visual Catchment are numerically identified in Figure 5-4 below, and the assessment of visual effects outlined in Table 5-3.



Author:	SW
Reviewer:	SMC/ JB
A3 Scale:	1:20,000
Job Ref/Version:	11297/ V06

Map Projection: GDA 1994 MGA Zone 54

Figure 5-4

Potential Residential Receptors – 1km Visual Catchment

Bungama Solar | Bungama SA Australia

21/11/2018

BUNGAMA SOLAR

11297_VIA_Potential_Residential_1km.qgs

Table 5-3: Assessment of Visual Effects on Potential Residential Receptors – 1km Visual Catchment

	Sensitivity of Receptor		Magnitude of effect						
Receptor Identifier	Susceptibility	Value	Size and scale	Frequency of Use	Distance/ Geographical extent	Duration	Reversibility	Description	Significance of Effect
6	H	M	L	L	M	M	L	It is noted that this receptor is surrounded by a considerable amount of existing vegetation. The view from this receptor is not anticipated to change as a result of the Project. The overall significance of effect is therefore considered to be downgraded to “Low”.	Low
7 & 49	H	M	M	M	M	M	L	Without mitigation measures, the constructed Project would likely result in a noticeable change to the view.	Moderate
8, 9, 26, 27, 29-31	H	M	L	L	M	M	L	These receptors are proximate to a number of other rural residential dwellings, ancillary structures and the township of Napperby. A substantial amount of vegetation separates these receptors from the Project area. Due to this vegetation the Project would not likely be visible from these receptors. The overall significance of effect is therefore considered to be downgraded to “Low”.	Low
10-20, 28 & 48	H	M	M	L	M	M	L	The view from these receptors toward the Project is obstructed by other rural residences and scattered vegetation. Further, these receptors are situated close to/along the 1km Visual Buffer. Views from these receptors are not anticipated to be significantly affected by the Project. The overall significance of effect is therefore considered to be downgraded to “Moderate-Low”.	Moderate-Low

	Sensitivity of Receptor		Magnitude of effect						
Receptor Identifier	Susceptibility	Value	Size and scale	Frequency of Use	Distance/ Geographical extent	Duration	Reversibility	Description	Significance of Effect
21, 22, 24 & 25	H	L	L	L	L	M	L	These receptors are proximate to the existing 275kV transmission lines and towers spanning the surrounding properties and along Locks Road (Plate 24). There is a considerable amount of existing scattered vegetation between Receptors 21, 24 & 25 and the Project area, providing natural screening. The views from Receptor 22 not only includes the transmission lines and towers but also the large silos in Port Pirie and the Nyrstar Smelter in the background.	Low
23	H	L	M	L	M	M	L	This receptor is exposed to the Morgan-Whyalla Pipeline that runs parallel to Gulf View Road. As with Receptor #1, this receptor is also separated from the Project by Bungama North Road, which has substantial vegetation within the road reserves providing natural screening. Further, the dominant view from this receptor toward the Project is the Southern Flinders Ranges in the background. When observing the view in its entirety the low profile of the constructed Project does not constitute a substantial change to this view.	Moderate-Low
32-47	H	L	L	L	L	M	L	These receptors are on the southern side of the Augusta Highway and Railway Terrace. The Project is not likely to be visible from these receptors due to the substantial vegetative screening along the railway and Augusta Highway (Plate 47 and Plate 48).	Low

5.3.3. Potential Residential Receptors – 2km Visual Catchment

The potential residential receptors within the 2km Visual Catchment are numerically identified in Figure 5-5 below, and the assessment of visual effects outlined in Table 5-4.

The distance of these potential residential receptors to the Project is considered “Low”, where the Project area is situated within the midground and, once constructed, unlikely to result in a prominent change to the views of the landscape and may be difficult to distinguish from existing elements from certain receptors.

Concentrations or groups of potential residential receptors exist in the township of Napperby, south of Railway Terrace and along Scenic Drive. The groups within Napperby and south of Railway Terrace are not likely to have any visibility of the Project and are therefore discussed as a collective. The group of potential residential receptors along Scenic Drive have various degrees of visibility that are able to be further grouped. The Scenic Drive sub-groups are depicted in Figure 5-6 and discussed as Groups 1, 2 and 3 in Table 5-5.

Legend

- Project Land
- Bungama Substation
- 1km Visual Catchment
- 2km Visual Catchment
- Railway

Potential Residential Receptors

- Scenic Drive Study Area
- Service Station
- Caravan Park
- Scenic Drive Residence

Indicative Degree of Visibility

- Nil
- Low
- Moderate
- High

OAKS ROAD
GULF VIEW ROAD
AUGUSTA HIGHWAY
BUNGAMA NORTH ROAD
SENTOSA ROAD
HISTORIC DRIVE
GUM ROAD
MUSTER DRIVE
SUNNYVILLE ROAD
CHURCH ROAD
WARNERTOWN ROAD RAILWAY TERRACE
HILLVIEW ROAD
WAITS ROAD
SCENIC DRIVE
SANDY TERRACE

© Google (2018)

Author:	SW
Reviewer:	SMC/ JB
A3 Scale:	1:30,000
Job Ref/Version:	11297/ V06

0 0.25 0.5 0.75 1 km

Map Projection: GDA 1994 MGA Zone 54

Figure 5-5

Potential Residential Receptors – 2km Visual Catchment

Bungama Solar | Bungama SA Australia

21/11/2018

BUNGAMA SOLAR

11297_VIA_Potential_Residential_2km.qgs

Table 5-4: Assessment of Visual Effects on Potential Residential Receptors – 2km Visual Catchment

	Sensitivity of Receptor		Magnitude of effect						
Receptor Identifier	Susceptibility	Value	Size and scale	Frequency of Use	Distance/ Geographical extent	Duration	Reversibility	Description	Significance of Effect
59	H	M	L	L	L	M	L	This potential receptor is located on the boundary of the 2km Visual Catchment and is proximate to the Augusta Highway, railway line and the township of Warnertown. The Project is not anticipated to be visible from this receptor. The overall significance of effect is therefore considered to be downgraded to "Low".	Low
62-68, 161-164, 166 & 169	H	L	L	L	L	M	L	Views from these receptors toward the Project are interrupted by both the Bungama Substation and the Augusta Highway. The visual effect of the Project is not considered to affect the overall views from these potential receptors.	Low
165	H	L	L	L	L	M	L	This potential receptor is set behind potential receptors 164 and 169. Views toward the Project are impeded by existing vegetation within these properties in addition to vegetation scattered across the 2kms between this receptor and the Project.	Low
69-77	H	M	L	L	L	M	L	Although views toward the Project are mostly typical of the rural landscape, the Project is not anticipated to be distinguishable from these receptors. The overall significance of effect is therefore considered to be downgraded to "Low".	Low

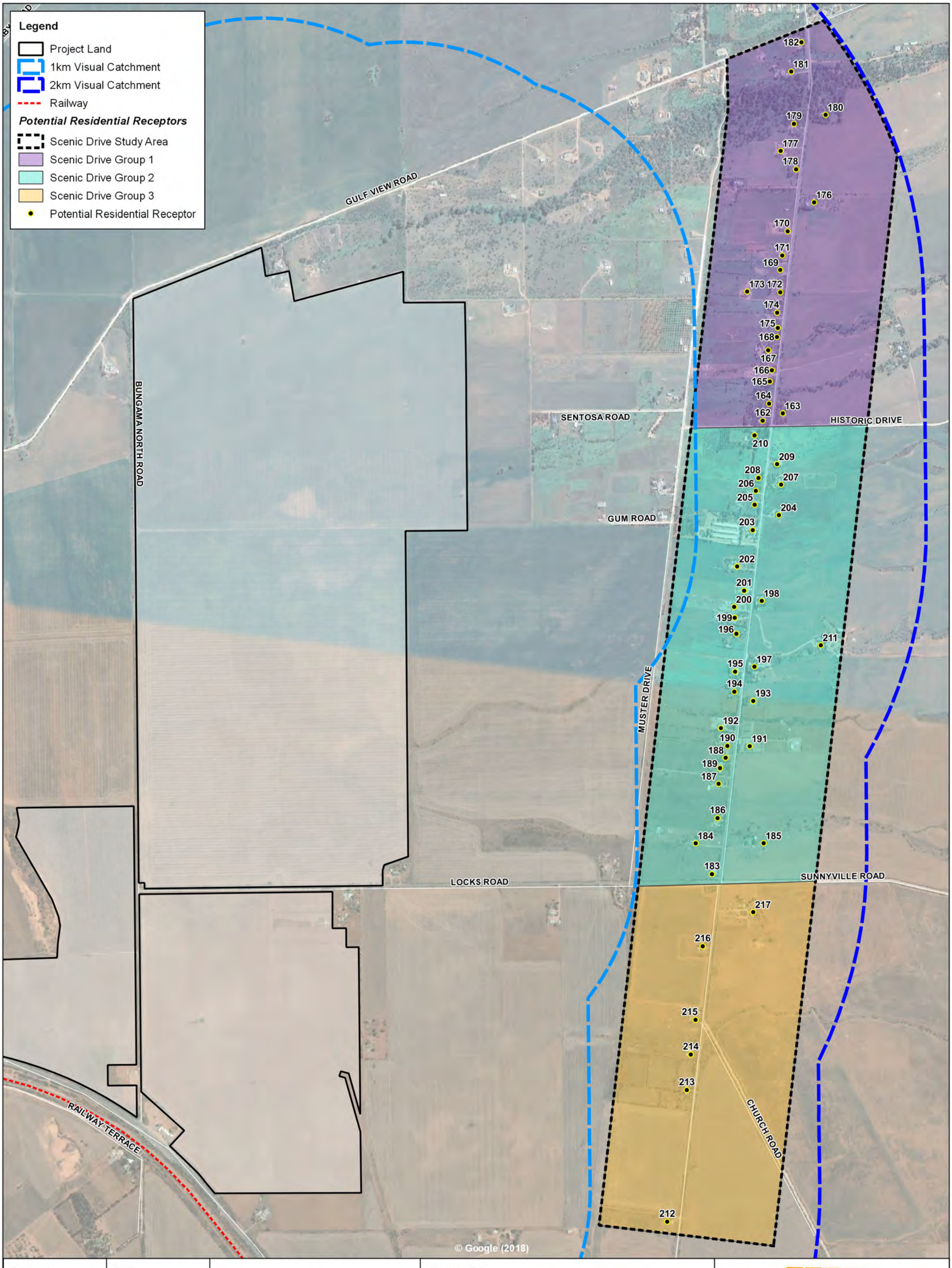
	Sensitivity of Receptor		Magnitude of effect						
Receptor Identifier	Susceptibility	Value	Size and scale	Frequency of Use	Distance/ Geographical extent	Duration	Reversibility	Description	Significance of Effect
79-91 *(Oaks Rd inset box)*	H	M	L	L	L	M	L	As above.	Low
85, 87, 112 & 157	H	L	L	L	L	M	L	These receptors are proximate to the township of Napperby and views toward the Project are significantly screened by the existing vegetation along Gulf View Road.	Low
50-58, 92 & 93	H	L	L	L	L	M	L	These receptors are also proximate to the township of Napperby and views toward the Project also significantly screened by the existing vegetation along Gulf View Road and the residences and scattered vegetation between the receptors and the Project.	Low
Service Station	L	L	L	L	L	M	L	The views from this receptor present significant disturbance and have artificial elements, particularly due to its location on the Augusta Highway. The active use of the site is toward the Augusta Highway, not the Project. The Project is in the midground from this receptor and may be difficult to distinguish.	Low
Caravan Park	L	L	L	L	L	M	L	As above. Further, the caravan park itself is well vegetated, providing vegetated screening toward both the Augusta Highway and the Project area.	Low

	Sensitivity of Receptor		Magnitude of effect						
Receptor Identifier	Susceptibility	Value	Size and scale	Frequency of Use	Distance/ Geographical extent	Duration	Reversibility	Description	Significance of Effect
South of Railway Terrace									
95-111	H	L	L	L	L	M	L	Although these receptors are further removed from the railway and Augusta Highway, the views are still modified with prominent artificial elements evident, particularly the neighbouring residential properties. The constructed Project is not likely to be visible from these receptors.	Low
60-61 & 167-168	H	L	L	L	L	M	L	This group of potential receptors are also located on the southern side of Railway Terrace but to the west. Views toward the Project are obscured by the existing vegetation on either side of the railway line and Warnertown Road. The Project is not anticipated to be visible from these receptors.	Low
Township of Napperby									
94, 113-156, 158-160 *(Napperby inset box)*	H	L	L	L	L	M	L	These receptors are located within the township of Napperby, which has views of other residential properties in a higher-density than the other receptors in this assessment. The Project is not anticipated to be visible from these receptors.	Low

5.3.4. Potential Residential Receptors – Scenic Drive

The potential residential receptors within the Scenic Drive Study Area are numerically identified in Figure 5-6 below, and the assessment of visual effects outlined in Table 5-5.

As stated, the group of potential residential receptors along Scenic Drive have various degrees of visibility that are able to be further grouped into three (3) groups based on similar views of the landscape toward the Project site. Details of which are outlined in Table 5-5 below.



Author:	SW
Reviewer:	SMC/ JB
A3 Scale:	1:15,000
Job Ref/Version:	11297/ V04

0 100 200 300 400 500 m

Map Projection: GDA 1994 MGA Zone 54

Figure 5-6

Potential Residential Receptors – Scenic Drive

Bungama Solar | Bungama SA Australia

21/11/2018

BUNGAMA SOLAR

11297_VIA_Potential_Residential_SD.qgs

Table 5-5: Assessment of Visual Effects on Potential Residential Receptors – Scenic Drive

	Sensitivity of Receptor		Magnitude of effect						
Receptor Identifier	Susceptibility	Value	Size and scale	Frequency of Use	Distance/ Geographical extent	Duration	Reversibility	Description	Significance of Effect
162-182 *(Group 1)*	H	L	L	L	L	M	L	The views toward the Project from these receptors are significantly more screened by a significant amount of vegetation, residential development and associated ancillary structures. than Group 2 or 3. These receptors are not likely to experience noticeable changes to their views as a result of the Project. In many cases, it is unlikely that the Project will be visible from most of these receptors. Further, it is recognised that many of these receptors are orientated east, away from the Project area with views of the Southern Flinders Ranges.	Low
183-211 *(Group 2)*	H	L	M	L	L	M	L	Although these receptors are further removed from the township of Napperby, the views are still significantly modified with considerable artificial elements visible including the large silos and the Nyrstar Smelter in Port Pirie, and other residences with associated ancillary structures. As there is less development separating these receptors and the Project, there is likely to be a higher degree of visibility than Group 1. However, it is recognised that any visibility of the Project would be limited to small sections only and be from a considerable distance. As stated above, it is recognised that many of these receptors are orientated east, away from the Project and toward the Southern Flinders Ranges.	Moderate-Low

	Sensitivity of Receptor		Magnitude of effect						
Receptor Identifier	Susceptibility	Value	Size and scale	Frequency of Use	Distance/ Geographical extent	Duration	Reversibility	Description	Significance of Effect
212-217 *(Group 3)*	H	L	M	L	L	M	L	Although the views of the landscape from this viewpoint are predominantly rural, these receptors are proximate to the existing 275kV transmission lines and towers spanning the surrounding properties and along Locks Road. Other significant artificial elements visible from these receptors include the large silos and the Nyrstar Smelter in Port Pirie. Again, many of these receptors are oriented east, away from the Project area. Although there is the least amount of development separating these receptors and the Project, the large 275kV transmission lines and towers are a prominent element in the foreground and midground and are situated proximate to these receptors.	Moderate-Low

5.3.5. Potential Viewpoint Receptors

The potential viewpoint receptors are those identified in the viewshed analysis in Section 5.2. Again, it is important to note that the Project in its entirety cannot be viewed from one single viewpoint. The potential degree of visibility of the Project from each viewpoint receptor has been depicted in both Figure 5-1 and Figure 5-7. Further to this, Figure 5-7 also demonstrates the degree of visibility of the Project along the roads within the extent of the 2km Visual Catchment.

The assessment of visual effects on the potential viewpoint receptors is undertaken in accordance with the assessment criteria outlined in Table 2-2. As with the assessment of landscape effects and potential residential receptors, the category scales (high, moderate, low) are referred to with either H, M, L in the following assessment table.

Further, as with the assessment of the potential residential receptors, the 'duration' and 'reversibility' criteria for all potential viewpoint receptors also score "Moderate" and "Low" respectively. Again, this is due to the nature of the Project as a utility-scale solar development, which is a temporary feature lasting up to 30 years, is non-invasive to install, and the associated infrastructure can be removed upon decommissioning and the landscape and associated views restored to the condition and use prior to the introduction of the Project. Similarly, the 'value' for all potential viewpoint receptors is assigned "Low" in accordance with the value results from the assessment of rural landscape character (Table 5-1).

It is also important to consider that the visual receptors from these viewpoints would likely be passengers travelling in vehicles. It follows that the receptors would only be exposed to potential views of the Project for a certain amount of time based on the speed they are travelling. The following table details the view times for the roads surrounding the Project area that have visibility of the Project (Figure 5-7), calculated based on the following formula:

$$time = \frac{distance}{velocity}$$

For example, passengers travelling either north or southbound along the Augusta Highway at a speed of 100km/hr where the Project is visible for approximately 3km, their view time of the Project would be approximately 1 minute 48 seconds, where:

$$time = \frac{3km}{100km/hr}$$

$$time = 0.03\ hours\ x\ 60$$

$$time = 1.8\ minutes\ x\ 60$$

$$time = 108\ seconds\ \text{i.e.}\ 1\ minute\ 48\ seconds$$

Table 5-6: Approximate Viewing Times of the Project From Surrounding Roads

Road Name	Distance (km)	Max Speed limit (km/h)	Time (minutes:seconds)
Augusta Highway north/southbound	~3.0	100	1:48
Augusta Highway north-west/south-eastbound	~1.8	100	1:05
Warnertown Road	~2.5	100	1:30
Scenic Drive	~2.2	100	1:19
Oaks Road	~1.2	80	0:54
Nelshaby Road	~2.3	110	1:15
Gulf View Road	~2.4	100	1:26
Bungama North Road	~2.6	100	1:33
Locks Road (east-west)	~2.5	100	1:30
Locks Road (north-south)	~1.0	100	0:36
Muster Drive	~3.1	100	1:51

In addition to the view times, it is also important to consider the frequency of use of these roads (Figure 5-8) when determining the overall significance of the effect. For example, when simultaneously viewing Figure 5-7 and Figure 5-8 it can be determined that although the Augusta Highway is considered to have a High frequency of use (Figure 5-8), it has relatively Low degree of visibility of the Project (Figure 5-7). Similarly, although Bungama North Road has a High degree of visibility of the Project (Figure 5-7), it has relatively Low frequency of use (Figure 5-8). Therefore, when determining the significance of effect, a level of professional judgement must be used to combine the above-mentioned factors into the assessment.

Table 5-7: Assessment of Visual Effects on Potential Viewpoint Receptors

	Sensitivity of Receptor		Magnitude of effect						
Viewpoint Identifier	Susceptibility	Value	Size and scale	Frequency of Use	Distance/ Geographical	Duration	Reversibility	Description	Significance of Effect
1	L	L	L	M	L	M	L	The Project area is >1km from this viewpoint. Due to the significant disturbance that exists along the Augusta Highway, the landscape has the potential to accommodate the Project. The flat terrain and low profile of the Project would result in overall low visibility of the Project, which is located in the midground. The Project will not result in a significant change to the landscape from this viewpoint. Refer to Plate 15.	Low
2	L	L	L	M	L	M	L	As above. Refer to Plate 16.	Low
3	L	L	L	M	M	M	L	The Project area is <1km from this viewpoint. Due to the significant disturbance that exists along the Augusta Highway, including the Bungama Substation, a mining operation and an auto-wreckers car yard, the landscape has the potential to accommodate the Project. The flat terrain and low profile of the Project would result in overall low visibility of the Project, which is located in the midground. The Project will not result in a significant change to the landscape from this viewpoint. Refer to Plate 17.	Low
4	L	L	L	M	L	M	L	The Project area is ~1km from this viewpoint. Significant disturbance is evident, particularly the Bungama Substation. The flat terrain and low profile of the Project would result in low visibility of the Project, which is located in the midground. Further, the Bungama Substation	Low

	Sensitivity of Receptor		Magnitude of effect						
Viewpoint Identifier	Susceptibility	Value	Size and scale	Frequency of Use	Distance/ Geographical	Duration	Reversibility	Description	Significance of Effect
								obscures a significant amount of the southern portion of the Project. The constructed Project is not likely to result in a significant change to the landscape from this viewpoint. Refer to Plate 18.	
5	L	L	L	L	H	M	L	The Project area is <1km from this viewpoint. Significant disturbance is evident, particularly the railway line and transmission lines and towers. The Project area is not visible from the viewpoint. Refer to Plate 19.	Low
6	L	L	M	M	H	M	L	The Project area is <100m from this viewpoint. Significant disturbance is evident, particularly the railway line and transmission lines and towers. There are unobstructed sections of the Project area visible from a close distance but not a complete vista. Without mitigation measures, the Project may result in a noticeable physical change to the landscape. Refer to Plate 20.	Moderate-Low
7	L	L	L	L	H	M	L	The Project area is <100m from this viewpoint. A significant amount of disturbance is evident, particularly the transmission lines and towers and the highway itself. The Project is not likely to be visible from this viewpoint due to the existing vegetation within the road reserve. Refer to Plate 21.	Moderate-Low
8	L	L	H	M	H	M	L	The Project area is <100m from this viewpoint. A significant amount of disturbance is evident, particularly the transmission lines and towers and the highway itself. The Project	Moderate

	Sensitivity of Receptor		Magnitude of effect						
Viewpoint Identifier	Susceptibility	Value	Size and scale	Frequency of Use	Distance/ Geographical	Duration	Reversibility	Description	Significance of Effect
								will appear in the midground. Without mitigation measures the Project may result in a noticeable change to the view. Refer to Plate 22.	
9	L	L	M	M	L	M	L	The Project area is ~1km from this viewpoint. A significant amount of disturbance is evident, particularly the transmission lines and towers and the highway itself. The Project is not likely to be visible from this viewpoint due to the existing vegetation within the road reserve. Refer to Plate 23.	Moderate-Low
10	L	L	L	L	L	M	L	The Project area is ~2km from this viewpoint. Artificial elements are prominent from this viewpoint, particularly the transmission lines and towers and the highway itself. The Project is not likely to be visible from this viewpoint due to the existing vegetation between this viewpoint and the Project. Refer to Plate 24.	Low
11	L	L	L	L	L	M	L	The Project area is >1km from this viewpoint. The existing transmission lines are proximate to this viewpoint and are a prominent feature in the foreground and midground. Further the large silos and Nyrstar Smelter are prominent features in the background. The landscape is therefore considered able to accommodate the Project. Refer to Plate 25.	Low
12	L	L	L	L	L	M	L	The Project area is >1km from this viewpoint. Some glimpses of the Project area (north of Locks Road) may be visible from this viewpoint however most views would likely be difficult to distinguish in the midground. Refer to Plate 26.	Low

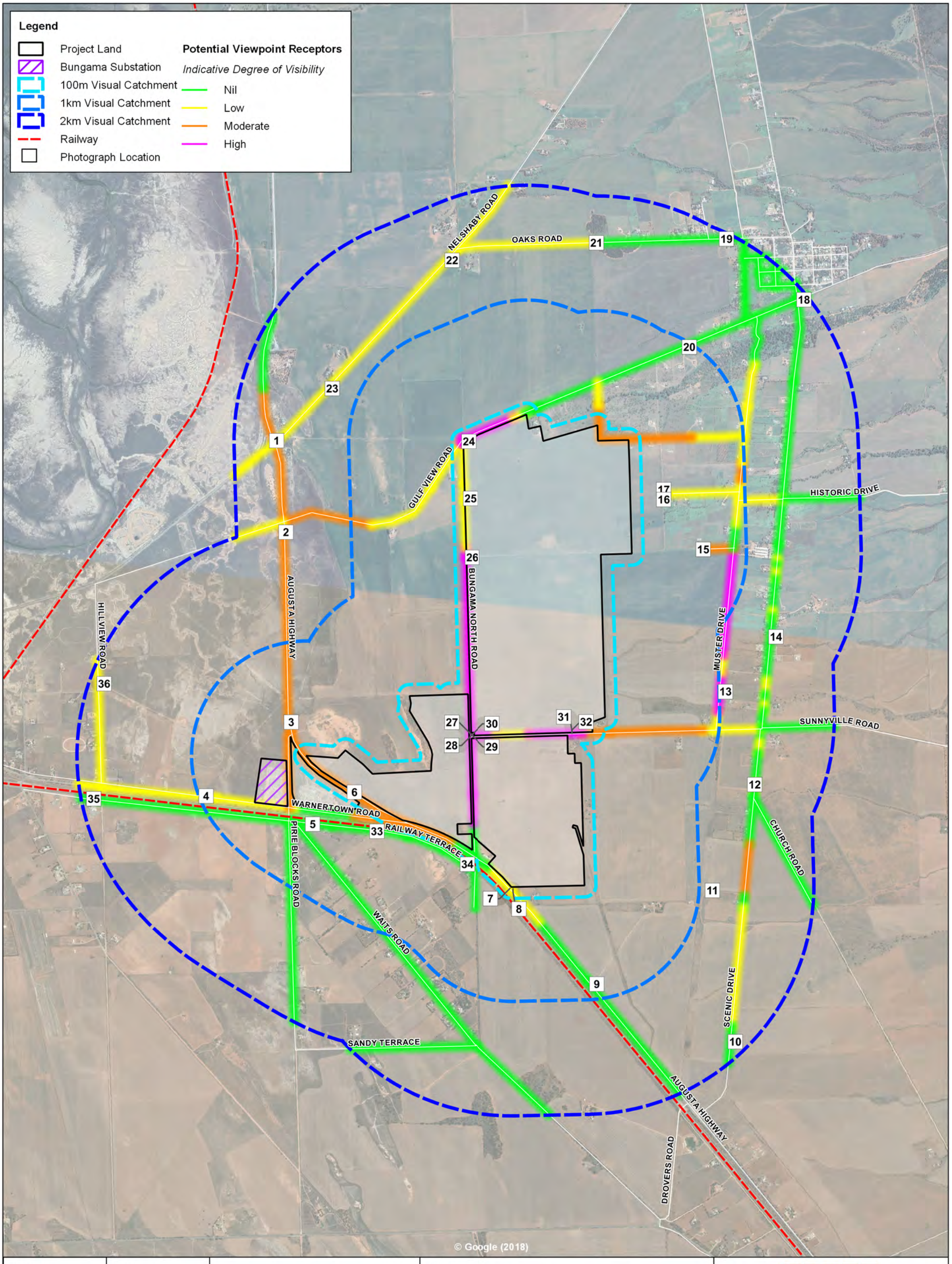
	Sensitivity of Receptor		Magnitude of effect						
Viewpoint Identifier	Susceptibility	Value	Size and scale	Frequency of Use	Distance/ Geographical	Duration	Reversibility	Description	Significance of Effect
13	L	L	L	L	L	M	L	The Project area is ~1km from this viewpoint. It is unlikely that the Project area south of Locks Road would be visible from this viewpoint due to the existing vegetation providing natural screening. Views of the Project from this viewpoint would be in the midground and unlikely to result in a significant change to the landscape. Refer to Plate 27.	Low
14	L	L	L	L	L	M	L	The Project area is >1km from this viewpoint. Visibility of the Project is likely to be glimpses only due to the existing residences and structures along Scenic Drive. The Project is unlikely to result in a change to the landscape from this viewpoint. Refer to Plate 28.	Low
15	L	L	M	L	M	M	L	The Project area is <1km from this viewpoint. Although there are artificial elements evident in the view, including the large silos in Port Pirie, the Nyrstar Smelter and general development in the midground and background, the Project may result in a change to the view without mitigation measures. Refer to Plate 29.	Moderate-Low
16	L	L	M	L	H	M	L	The Project area is <500m from this viewpoint. Some prominent areas of the Project are likely to be visible without mitigation measures. Refer to Plate 30.	Moderate-Low
17	L	L	M	L	H	M	L	As above. Refer to Plate 31.	Moderate-Low
18	L	L	L	L	L	M	L	The Project area is ~2km from this viewpoint. This viewpoint is adjacent to the township of Napperby and is exposed to a high degree of artificial elements. The Project is not visible	Low

	Sensitivity of Receptor		Magnitude of effect						
Viewpoint Identifier	Susceptibility	Value	Size and scale	Frequency of Use	Distance/ Geographical [illegible]	Duration	Reversibility	Description	Significance of Effect
								from this viewpoint due to the existing vegetation between this viewpoint and the Project. Refer to Plate 32.	
19	L	L	L	L	L	M	L	As above. Refer to Plate 33.	Low
20	L	L	L	L	L	M	L	The Project area is ~1km from this viewpoint. The Project is not visible from this viewpoint due to existing vegetation between this viewpoint and the Project. Refer to Plate 34.	Low
21	L	L	L	L	L	M	L	The Project area is >1km from this viewpoint. A glimpse of the northern most portion of the Project may be visible from this viewpoint, located in the midground. This is unlikely to result in a negative effect on the view. Refer to Plate 35.	Low
22	L	L	L	L	L	M	L	As above. Refer to Plate 36.	Low
23	L	L	L	L	L	M	L	The Project area is >1km from this viewpoint. Some glimpses of the Project area (north of Locks Road) may be visible from this viewpoint however most views would likely be difficult to distinguish in the midground. Refer to Plate 37.	Low
24	L	L	H	M	H	M	L	The Project area is <100m from this viewpoint. Without mitigation measures, there are likely to be unobstructed views of the Project in the foreground from this viewpoint and the constructed Project would result in a very prominent physical change to the landscape. Refer to Plate 38.	Moderate-High

	Sensitivity of Receptor		Magnitude of effect						
Viewpoint Identifier	Susceptibility	Value	Size and scale	Frequency of Use	Distance/ Geographical	Duration	Reversibility	Description	Significance of Effect
25	L	L	H	L	H	M	L	The Project area is <100m from this viewpoint. A substantial amount of vegetation exists in the road reserve of Bungama North Road, providing natural screening. This vegetation is not proposed to be cleared for the project, therefore the result of the effect is minor. Refer to Plate 39.	Moderate-Low
26	L	L	H	H	H	M	L	The Project area is <100m from this viewpoint. Without mitigation measures the Project would appear in the foreground as a significant change to the view. Refer to Plate 40	Moderate
27	L	L	M	M	H	M	L	The Project area is <100m from this viewpoint. There may be glimpses of the Project from this viewpoint, however it is noted that the existing Telstra caveat exists in the foreground, obstructing some visibility of the Project. Refer to Plate 41	Moderate-Low
28	L	L	M	M	H	M	L	The Project area is <100m from this viewpoint. The Project would appear in the foreground from this viewpoint, as well as the existing transmission lines and towers that spread through to the midground toward the Bungama Substation. The effect is not considered significant from this viewpoint. Refer to Plate 42	Moderate-Low
29	L	L	M	M	H	M	L	The Project area is <100m from this viewpoint. The Project would appear in the foreground from this viewpoint, as well as the existing gas substation, transmission lines and towers and the entry to the Augusta Highway. The effect is not considered significant from this viewpoint. Refer to Plate 43	Moderate-Low

	Sensitivity of Receptor		Magnitude of effect						
Viewpoint Identifier	Susceptibility	Value	Size and scale	Frequency of Use	Distance/ Geographical	Duration	Reversibility	Description	Significance of Effect
30	L	L	M	M	H	M	L	The Project area is <100m from this viewpoint. The Project would appear in the foreground and some of the midground from this viewpoint, with the Southern Flinders Ranges a prominent element and viewpoint in the background. A substantial amount of vegetation exists within the road reserve of Locks Road, which has some screening potential. Refer to Plate 44.	Moderate-Low
31	L	L	L	M	H	M	L	The Project area is <100m from this viewpoint. A substantial amount of vegetation exists within the road reserve of Locks Road, which has some screening potential. The effect is not considered significant from this viewpoint. Refer to Plate 45.	Moderate-Low
32	L	L	M	H	H	M	L	The Project area is <100m from this viewpoint. Without mitigation measures the Project would appear in the foreground as a significant change to the view. Refer to Plate 46.	Moderate
33	L	L	L	L	H	M	L	The Project area is ~100m from this viewpoint. The Project is unlikely to be visible from this viewpoint due to the existing vegetation within the road reserve of Railway Terrace, both sides of the railway line and the Augusta Highway. The Project is therefore unlikely to result in a change to the landscape from this viewpoint. Refer to Plate 47.	Low
34	L	L	L	L	H	M	L	As above. Refer to Plate 48.	Low
35	L	L	L	L	L	M	L	This viewpoint is ~2km from the Project. The Project is not visible from this viewpoint due to the existing vegetation between this viewpoint and the Project. Refer to Plate 49.	Low

	Sensitivity of Receptor		Magnitude of effect						
Viewpoint Identifier	Susceptibility	Value	Size and scale	Frequency of Use	Distance/ Geographical	Duration	Reversibility	Description	Significance of Effect
36	L	L	L	L	L	M	L	This viewpoint is also ~2km from the Project. Views toward the Project are disrupted by some existing vegetation and the Augusta Highway. Further, this viewpoint observes the existing electricity substation and associated infrastructure. Views from this viewpoint are therefore considered low. Refer to Plate 50.	Low



Author:	SW
Reviewer:	SMC/ JB
A3 Scale:	1:30,000
Job Ref/Version:	11297/ V08

0 0.25 0.5 0.75 1 km

Map Projection: GDA 1994 MGA Zone 54

Figure 5-7

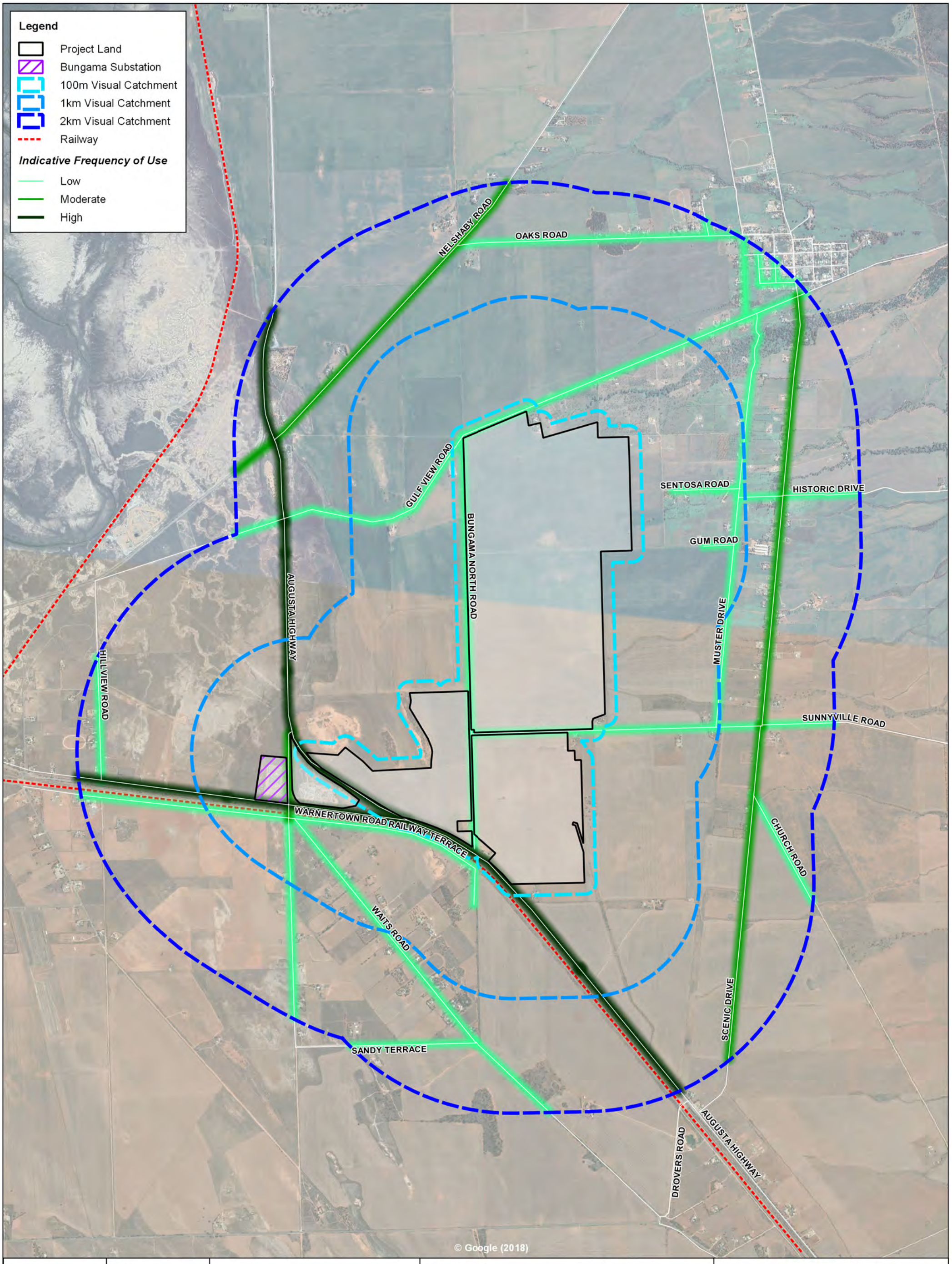
Indicative Visibility from Viewpoints within Landscape

Bungama Solar | Bungama SA Australia

21/11/2018

BUNGAMA SOLAR

11297_VIA_Viewpoint_Receptors.qgs



Author:	SW
Reviewer:	SMC/ JB
A3 Scale:	1:30,000
Job Ref/Version:	11297/ V08

0 0.25 0.5 0.75 1 km

Map Projection: GDA 1994 MGA Zone 54

Figure 5-8

Indicative Frequency of Use of Transport Corridors

Bungama Solar | Bungama SA Australia

21/11/2018

BUNGAMA SOLAR

11297_VIA_Indicative_Frequency.qgs

Plate 15: Viewpoint 1 – Augusta Highway/Nelshaby Road (view direction: east-south-east)

Plate 16: Viewpoint 2 – Augusta Highway/Gulf View Road (view direction: east)

Plate 17: Viewpoint 3 –Augusta Highway (view direction: north-east)

Plate 18: Viewpoint 4 - Warnertown Road (view direction: east-north-east)

Plate 19: Viewpoint 5 -Railway Terrace (view direction: north-east)

Plate 20: Viewpoint 6 – Augusta Highway (view direction: south-east)

Plate 21: Viewpoint 7 – Augusta Highway (view direction: north-west)

Plate 22: Viewpoint 8 – Augusta Highway (view direction: north)

Plate 23: Viewpoint 9 – Augusta Highway (view direction: north-north-west)

Plate 24: Viewpoint 10 – Scenic Drive (viewpoint direction: north-west)

Plate 25: Viewpoint 11 – Scenic Drive (viewpoint direction: west-north-west)

Plate 26: Viewpoint 12 – Scenic Drive (viewpoint direction: west-north-west)

Plate 27: Viewpoint 13 – Muster Drive (viewpoint direction: west-south-west)

Plate 28: Viewpoint 14 – Scenic Drive (viewpoint direction: west)

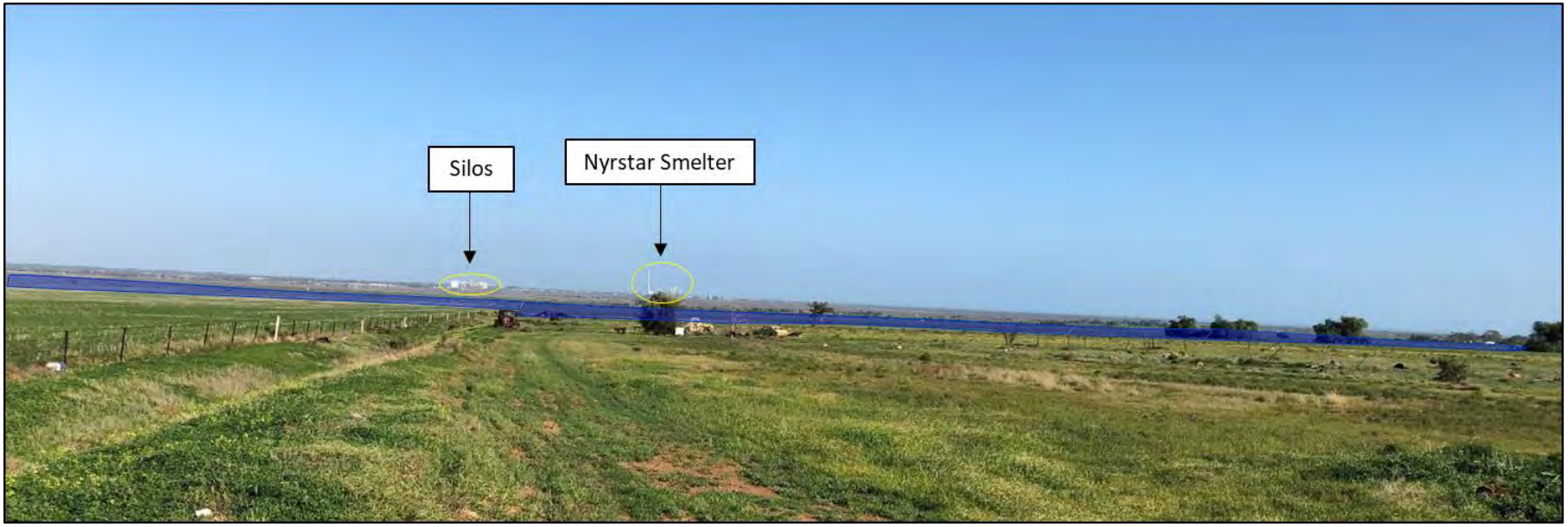


Plate 29: Viewpoint 15- Gum Road (viewpoint direction: west)

Plate 30: Viewpoint 16 – Sentosa Road (viewpoint direction: south-west)

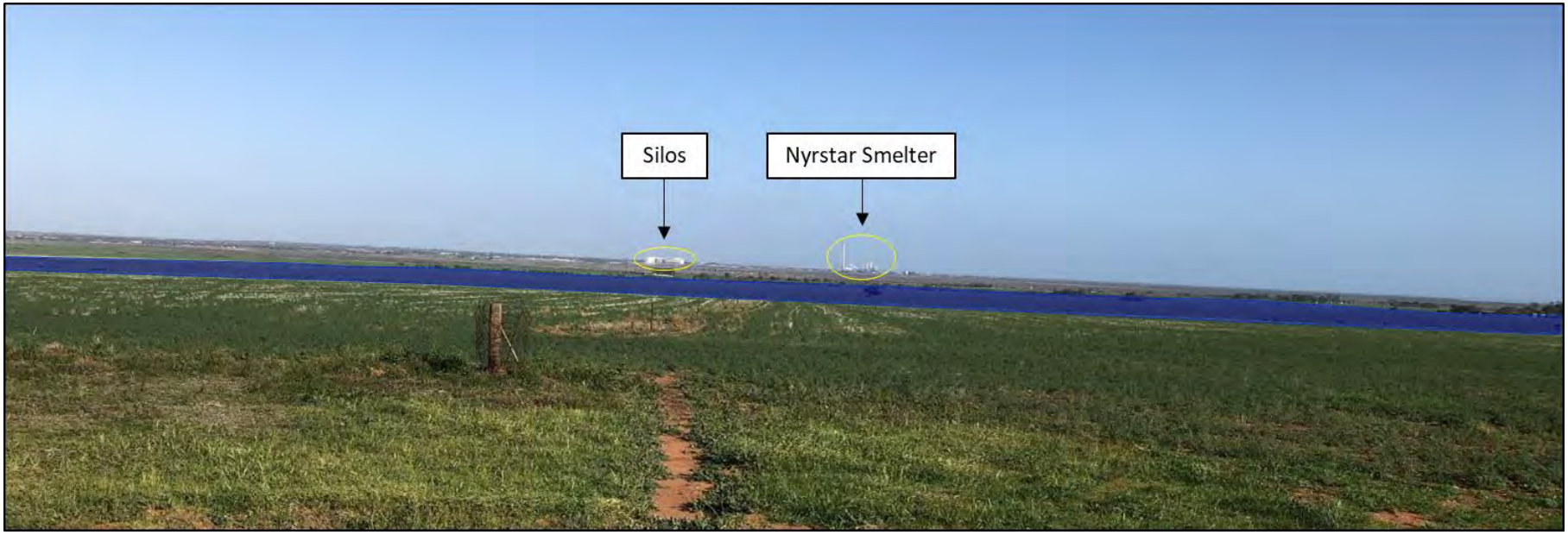


Plate 31: Viewpoint 17 – Sentosa Road (viewpoint direction: west)

Plate 32: Viewpoint 18 – Gulf View Road/Scenic Drive (viewpoint direction: south-west)

Plate 33: Viewpoint 19 – Oaks Road (viewpoint direction: south-west)

Plate 34: Viewpoint 20 - Gulf View Road (viewpoint direction: west-south-west)

Plate 35: Viewpoint 21 – Oaks Road (viewpoint direction: south-south-west)

Plate 36: Viewpoint 22 – Nelshaby Road (viewpoint direction: south)

Plate 37: Viewpoint 23 - Nelshaby Road (viewpoint direction: south-east)

Plate 38: Viewpoint 24 - Bungama North Road (viewpoint direction: east)

Plate 39: Viewpoint 25 - Bungama North Road (viewpoint direction: south)

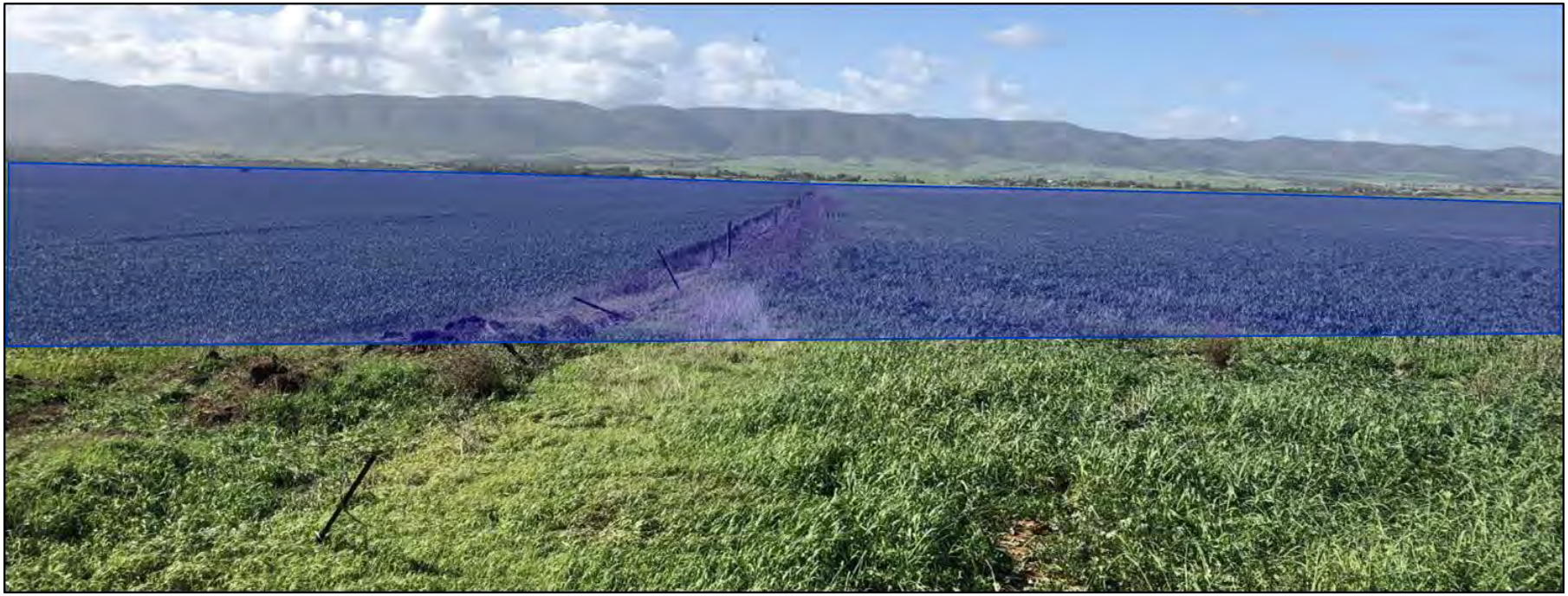


Plate 40: Viewpoint 26 - Bungama North Road (viewpoint direction: east)

Plate 41: Viewpoint 27 - Bungama North Road/ Locks Road (viewpoint direction: north)

Plate 42: Viewpoint 28 - Bungama North Road/ Locks Road (viewpoint direction: west)

Plate 43: Viewpoint 29 - Bungama North Road/ Locks Road (viewpoint direction: south)

Plate 44: Viewpoint 30 - Bungama North Road/ Locks Road (viewpoint direction: west)

Plate 45: Viewpoint 31 - Locks Road (viewpoint direction: south-west)

Plate 46: Viewpoint 32 - Locks Road (viewpoint direction: north-west)

Plate 47: Viewpoint 33 - Railway Terrace (viewpoint direction: north-east)

Plate 48: Viewpoint 34 - Railway Terrace (viewpoint direction: north)

Plate 49: Viewpoint 35 -Railway Terrace (viewpoint direction: north-west)

Plate 50: Viewpoint 36 - Hillview Road (viewpoint direction: east)

5.3.6. Summary of Potential Visual Receptors

As stated in Section 5.3, a total of 231 potential visual receptors were identified within a 2km Visual Catchment of the Project area, three (3) of which are owned by Project landowners, two (2) of the potential visual receptors are service stations, and one (1) is a caravan park.

The Project landowners are exempt from this VIA as EPS Energy will liaise with them directly on any potential visual mitigation measures. Therefore, a total of 225 potential residential receptors were assessed against the criteria outlined in Section 2.1.2 and the assessment results detailed in Table 5-2, Table 5-3, Table 5-4 and Table 5-5.

A summary of the significance of effects for the potential **residential** receptors is as follows:

Approximately 75% of potential residential receptors scored "Low", approximately 22% scored "Moderate-Low", while approximately 3% scored "Moderate" or higher.

No potential residential receptors scored "High".

These scores indicate an overall "Low" significance of effect to potential residential receptors.

A total of 36 potential viewpoint receptors identified in the viewshed analysis in Section 5.2. Again, it is important to note that the Project in its entirety cannot be viewed from one single viewpoint. The potential viewpoint receptors are assessed against the criteria outlined in Section 2.1.2 and the assessment results detailed in Table 5-7.

A summary of the significance of effects for the potential **viewpoint** receptors is as follows:

Approximately 42% of potential viewpoint receptors scored "Low", approximately 47% scored "Moderate-Low", while approximately 11% scored "Moderate" or higher.

No potential viewpoint receptors scored "High".

These scores indicate an overall "Moderate-Low" significance of effect to potential viewpoint receptors.

Lastly, the longest calculated view time of the Project from the roads surrounding the Project area is approximately 1 minute 48 seconds. Notably, this view is from passengers travelling north or southbound along the Augusta Highway, where most of this view is approximately 1-2km from the Project and the direction of view is east, for northbound receptors and west, for southbound receptors. Further, as these receptors are travelling at a speed of 100km/hr along a highway it is reasonable to assume the actual view time would be significantly less than 1 minute 48 seconds for drivers.

As such, mitigation measures are considered appropriate and are detailed in Section 6.

5.4. CUMULATIVE IMPACTS

Cumulative landscape and visual effects are the combined visual changes (both positive and negative) caused by a proposed development in conjunction with other similar developments. It is also important to consider both the existing and evolving contextual landscape in the region.

As stated, landscapes are not static, but continue to evolve and change, driven by factors such as government policy, the needs of a growing population, economy and climate change. This includes new forms of energy generation, such as renewable energy.

Rural landscapes have historically been the preferred location for large scale electrical infrastructure. Electrical infrastructure, including substations and transmission lines are already prevalent in rural landscapes, which is an important factor when considering cumulative landscape and visual effects of a proposed development. In the context of the Project, this is supported by the Port Pirie Regional Council Development Plan 2017, which lists renewable energy as an envisioned land use for the Primary Production Zone.

Accordingly, numerous renewable energy projects either in operation, approved or proposed are evident within the region where the Project is proposed.

This Section considers the potential cumulative landscape and visual effects that may result from interactions between the Project and both existing, and proposed similar developments within 50km of the Project (Table 5-8). The 50km radius is considered an appropriate scope for this assessment as visibility beyond this distance is impractical. This study area is demonstrated in Figure 5-9, along with the location of other renewable energy projects within the study area.

Table 5-8: Renewable Energy Projects in Operation, Under construction and Proposed Within 50km of the Project

Status	Developer/ Owner	Renewable	Project	Capacity	Expected Cost
In Operation	Infratech	Solar PV	Jamestown Floating Solar Station	3.5 MW	N/A
In Operation	Neoen	Wind	Hornsdale Wind Farm	315 MW	Unknown
In Operation	SSE Australia	Solar PV	Whyalla Solar Farm	4.9 MW	Unknown
Approved/ Under Construction	Adani	Solar PV	Whyalla Solar Farm	160 MW	~$200 M
Approved/ Under Construction	Renew Power Group	Solar PV	Pirie Solar Farm	4.9 MW	~$10 M

Status	Developer/ Owner	Renewable	Project	Capacity	Expected Cost
Proposed	Neoen	Hybrid	Crystal Brook Energy Park	300 MW solar/ 150 MW wind/ 50 MW hydrogen/ 400 MWh battery storage	~$600 M
Proposed	Zen Energy	Solar PV/ Battery	Liberty OneSteel Solar Farm	200 MW/ 120 MW, 140 MWh battery storage	Unknown
Proposed	Pacific Hydro	Wind	Carmody's Hill Wind Farm	140 MW	~$350 M
Proposed	Rise Renewables	Pumped Hydro	Baroota Reservoir Pumped Hydro	270 MW	~$700 M
Proposed	Bungama Solar 1	Solar PV/ Battery	Bungama Solar	280 MW/ 140 MW, 560 MWh battery storage	~$650 M

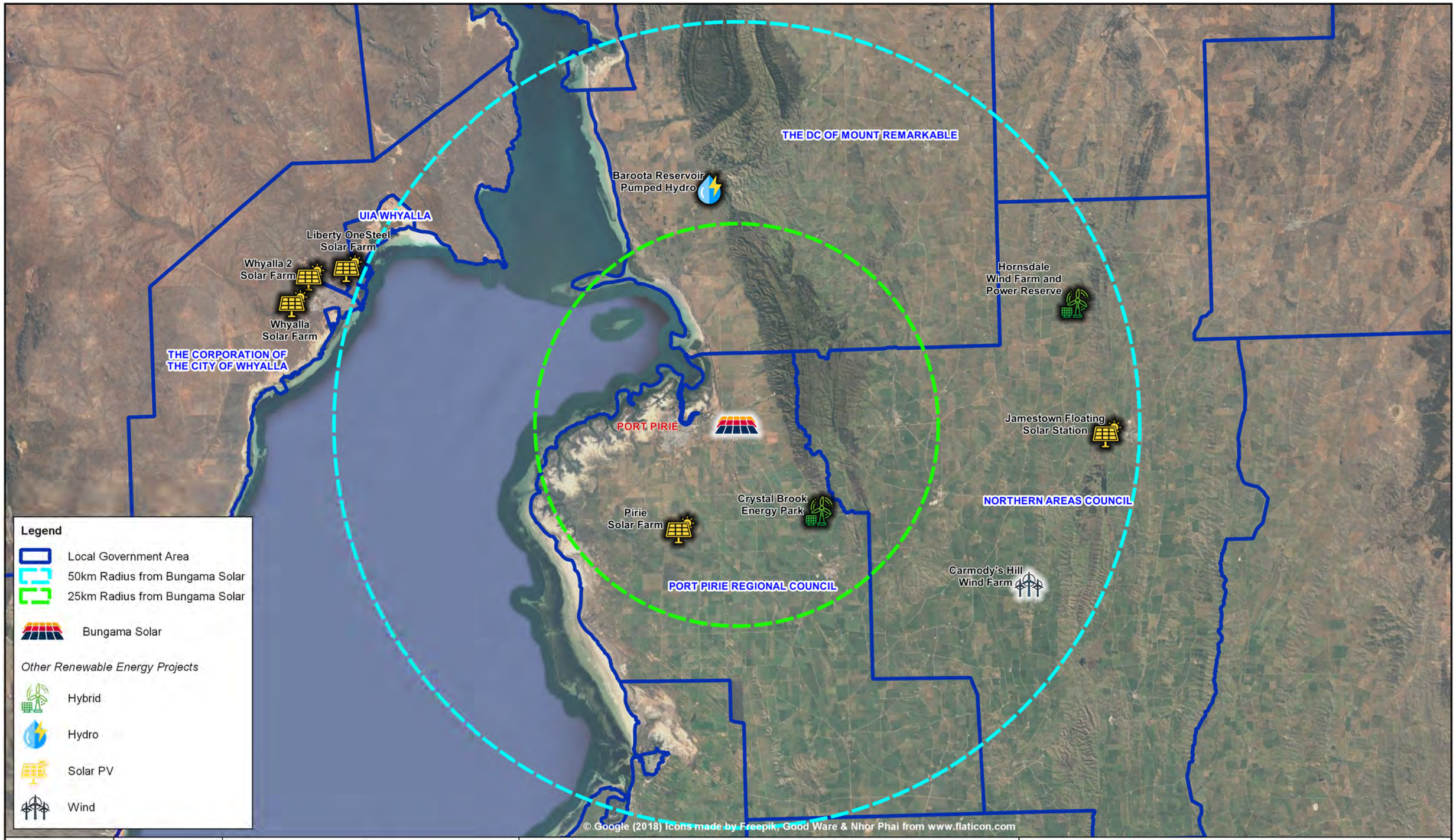
(Source: AltEnergy, 2018)

As demonstrated in Figure 5-9, the nearest other renewable energy development to the Project is in excess of 15km away. It is therefore reasonable to conclude that there will be no cumulative visual effects as these other projects cannot be viewed together from a single viewpoint and can be considered stand-alone visual elements within the landscape.

In the Port Pirie Regional Council Development Plan 2017 renewable energy development is listed as a land use under the Desired Character for the Primary Production Zone therefore it is also reasonable to conclude that the Project will not result in any negative cumulative landscape effects.

The renewable energy projects in operation, approved and proposed within 50km of the Project area support State and Local Government policy to have renewable energy projects, such as Bungama Solar, constructed and operating in South Australia, within rural Council areas and on land with a particular zone including land zoned Primary Production Zone.

As such, mitigation measures are considered suitable and are detailed in Section 6.



Author:	SW
Reviewer:	SMC/ JB
A3 Scale:	1:450,000
Job Ref:	11297/ V02

0 5 10 15 20 25 km

Map Projection: GDA 1994 MGA Zone 54

Figure 5-9

Renewable Energy Projects within 50km of Bungama Solar

Bungama Solar | Bungama SA Australia

21/11/2018

BUNGAMA SOLAR

11297_VIA_Potential_Cumulative_Effects.qgs

6. MITIGATION MEASURES

The assessments outlined in the above sections conclude that the overall visual impact rating to residential and viewpoint receptors is “Low” and “Moderate-Low” respectively.

Notwithstanding, the Community Consultation undertaken for the Project indicated that some residents living in close proximity to the Project were concerned about the visual impact of the Project, while others were impartial. This further demonstrates the variability of individual opinions and subjectivity of a matter such as visual effects. These concerned residents include existing residents and those who own land adjacent to the Project but do not reside on the land as there is no dwelling.

Accordingly, in direct response to the concerns raised by some residents, the Project has implemented an additional key mitigation measure for further ameliorating Project visibility from not only the adjacent existing residences, but also the potential future residences. The additional key mitigation measure is to include in excess of 7km of vegetation screening in the form of a “visual buffer zone” in targeted sections of the Project area to further screen the Project, as illustrated in Figure 6-1.

The visual buffer zone will provide for the following:

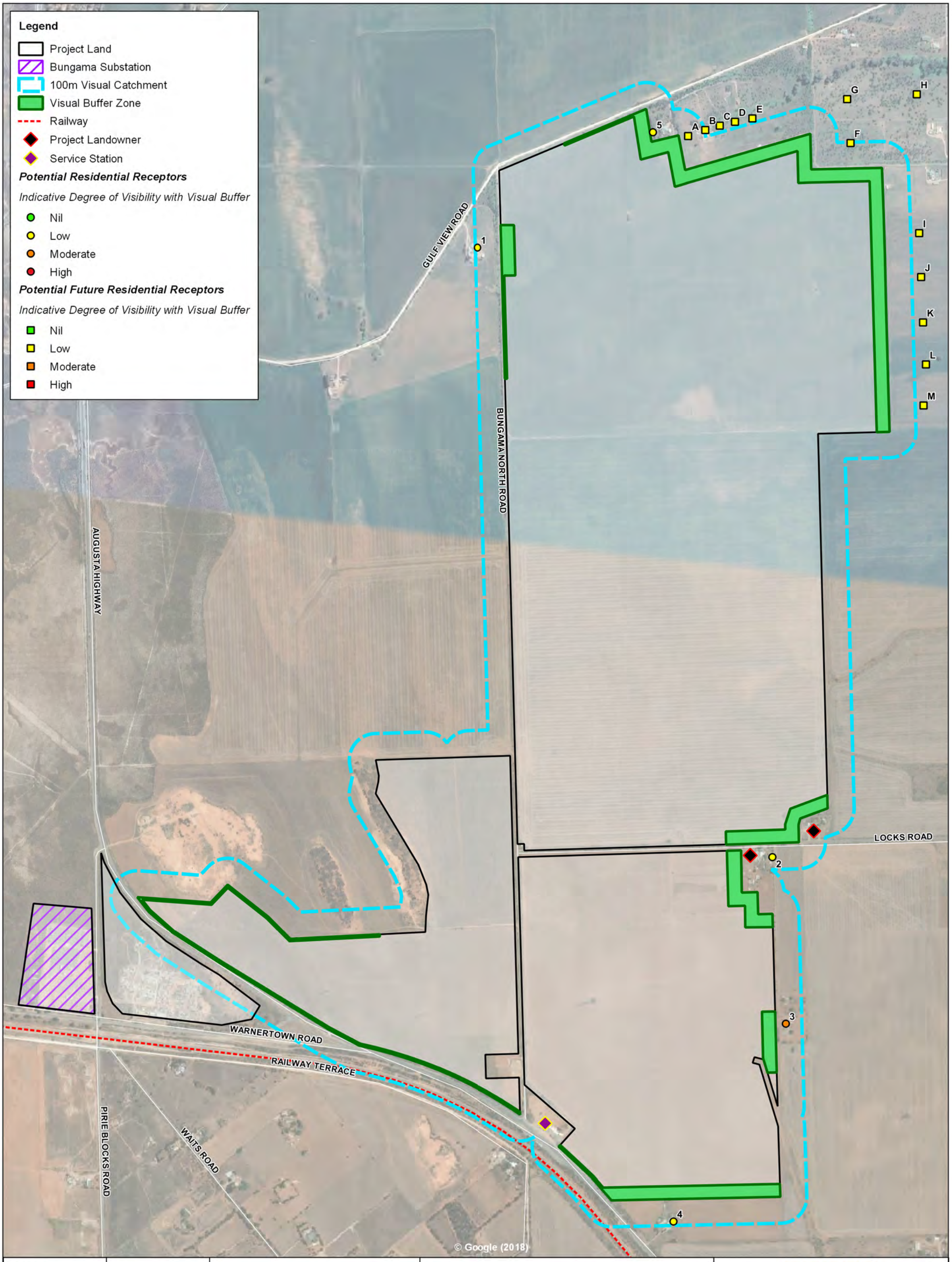
- Setback the PVS behind a 50m visual buffer zone from the Project boundary for existing residential receptors, including the potential future residences, and consequently, reduce the physical size/scale of Project, which also reduces the renewable energy production of the Project;
- Establish and maintain within the 50m visual buffer zone a 10m wide landscape screen of vegetation approximately 3-5m in height, further reducing views of the Project;
- As a result, the buffer zone and screening ameliorate the degrees of visibility of the Project from other receptors located further away from the Project; and
- Further ameliorate the potential for low level glare in accordance with the Glint and Glare assessment.

A Landscape Plan will be prepared and appended to the Development Application to address the details the proposed landscape screen within the visual buffer zones. As stated, the following standard mitigation measures are also proposed to be implemented during the construction and operation phases, where practicable:

- Stakeholder engagement activities will continue to be undertaken to understand relevant landowner and community relationships with visual aspects of the Project;
- The development will occur on land previously cleared of vegetation and which is disturbed;
- Utility buildings or structures will be sited together, away from residences and constructed of materials that are muted in colour;
- Any landscaping that is completed as part of the Project will be selected and designed so that it is complementary to the landscape and visual receptors;

- Any signage will be designed and located so it is sensitive to the landscape and visual receptors;
- Fencing will be sited and designed appropriately to blend with the facility; and
- Construction equipment and waste will be removed from the site in a timely manner.

Specific details relating to the above-mentioned mitigation matters will be considered as part of the construction and operation management plans.



Author:	SW
Reviewer:	SMC/ JB
A3 Scale:	1:13,000
Job Ref/Version:	11297/ V02

0 100 200 300 400 500 m

Map Projection: GDA 1994 MGA Zone 54

Figure 6-1

Potential Residential Receptors - Mitigation Measures

Bungama Solar | Bungama SA Australia

22/11/2018

BUNGAMA SOLAR

11297_VIA_Mitigation_Measures.qgs

7. RESIDUAL VISUAL IMPACTS

Residual visual impacts are the adverse effects remaining after all of the practical methods of mitigation have been implemented. The final stage of this VIA will assess the significance of the residual visual effects of the Project.

As stated throughout this VIA, the Port Pirie Regional Council's Development Plan 2017 details the Council's position on visual impacts from Renewable Energy Facilities. The Development Plan anticipates and encourages the introduction of solar farm infrastructure as new components of the landscape in the Primary Production Zone, accepting that it is difficult to mitigate the visual impacts and any potential visual impact needs to be considered alongside other relevant Development Plan provisions including the aim for an increase in renewable energy generation.

The assessments outlined in earlier sections of this VIA conclude that the overall visual impact rating to the potential residential receptors and landscape receptors is considered "Low" to "Moderate-Low" respectively. The inclusion of the mitigation measures outlined in the section above will further lower the residual visual effects on both potential residential receptors and viewpoint receptors. This is demonstrated in Figure 6-1 where the implementation of a visual buffer zone significantly reduces the previously "High" degree of visibility from residential receptors to "Low".

Considering the above, the residual visual impacts are therefore considered to be acceptable.

8. CONCLUSION

This VIA is intended to provide an assessment of the existing landscape character within the context of the Project's proposed location to determine the potential visual impacts of the Project during both construction and operational phases. It has been noted that the assessment of visual impact is subjective, and the individual consideration of qualitative factors such as scenic quality may differ between receptors as it is influenced by individual values, preferences and affiliations with the landscape and particular views.

The existing landscape and scenic quality of the Project area and surrounding area indicates that the site is appropriate for the Project for the following reasons:

- The bulk and scale of the Project is consistent with the existing electricity infrastructure;
- The uniform and linear layout of the Project is not considered out of character with the existing rural landscape;
- The Project will not be a dominant feature in the landscape; and
- The Project cannot be viewed in its entirety from one single viewpoint.

The assessment has concluded:

- The landscape within and surrounding the Project area can be described as predominantly rural, typified by flat terrain with scattered vegetation and the land is primarily utilised for agricultural purposes;
- Renewable energy and ancillary development is a type of development that is envisaged within the Primary Production Zone in the Port Pirie Regional Council area;
- Utility scale solar projects are becoming more common place in rural setting and are considered acceptable rurally located infrastructure;
- The significance of visual effects on potential residential receptors is categorised as "Low"; and
- The significance of visual effects on potential viewpoint receptors is categorised as "Moderate-Low".

Combined, these assessments form the basis to evaluate the magnitude and significance of the visual impact on the landscape and locality resulting from the Project, which is "Moderate-Low" overall.

While Port Pirie Regional Council's Development Plan 2017 anticipates and encourages the introduction of renewable energy infrastructure as new components of the landscape in the Primary Production Zone and accepts that it is difficult to mitigate the visual impacts of large scale renewable energy infrastructure the mitigation measures detailed in Section 6 are proposed to lower the impacts on landscape and residential receptors as far as practicable. The residual impacts are considered to be acceptable.

9. REFERENCES

AltEnergy. (2018). *Project Database*, <https://altenergy.com.au/>

Australian Institute of Landscape Architects. (2018). *Guidance Note for Landscape and Visual Assessment.* June 2018.

Department for Planning and Infrastructure. (2007). *Visual Landscape Planning in Western Australia: a manual for evaluation, assessment, siting and design.* West Australian Planning Commission. ISBN: 0-7309-9637-9.

Department of Planning, Transport and Infrastructure. (2017). *Port Pirie Council Development Plan 2016*. Government of South Australia.

Gallant, J.C., Dowling, T.I., Read, A.M., Wilson, N., Tickle, P., Inskeep, C. (2011). *1 second SRTM Derived Digital Elevation Models User Guide.* Geoscience Australia. Australian Government. www.ga.gov.au/topographic-mapping/digital-elevation-data.html

Landscape Institute and Institute of Environmental Management & Assessment. (2013). *Guidelines for Landscape and Visual Impact Assessment*. (3rd ed.). ISBN: 978-0-203-43629-5

Roads and Maritime Service. (2013). *Environmental Impact Assessment Practice Note: Guidelines for Landscape Character and Visual Impact Assessment*. Guideline No. 4. New South Wales Government.

APPENDIX 8

Desktop Ecological Assessment

BUNGAMA SOLAR

DESKTOP ECOLOGICAL ASSESSMENT

Prepared for Bungama Solar

Prepared by EBS Ecology

EPS ENERGY

Reference No. 11297

November 18

BUNGAMA SOLAR

www.bungamasolar.com.au

Bungama Solar

Desktop Ecological Assessment

Bungama Solar Desktop Ecological Assessment

14 May 2018

Version 2

Prepared by EBS Ecology for Bungama Solar 1 Pty Ltd

Document Control					
Revision No.	Date issued	Authors	Reviewed by	Date Reviewed	Revision type
1	30/04/2018	M. Laws, G. Oerman	Dr M. Louter	27/04/2018	Draft
2	14/05/2018	M. Laws, G. Oerman	Dr M. Louter	11/05/2018	Final

Distribution of Copies			
Revision No.	Date issued	Media	Issued to
1	30/04/2018	Electronic	Kate Tierney, EPS Energy
2	14/05/2018	Electronic	Kate Tierney, EPS Energy

EBS Ecology Project Number: G80401

COPYRIGHT: Use or copying of this document in whole or in part (including photographs) without the written permission of EBS Ecology's client and EBS Ecology constitutes an infringement of copyright. *Notwithstanding anything to the contrary Environmental and Biodiversity Services Pty Ltd (ACN: 105 535 822 trading as EBS Group) has prepared this document for the sole us of the client including their respective heirs, successors and assigns and vests copyright of all material produced by Environmental and Biodiversity Services Pty Ltd (ACN: 105 535 822 trading as EBS Group) (but excluding pre-existing material and material in which copyright is held by a third party) in the client including their respective heirs, successors and assigns.*

LIMITATION: This report has been prepared on behalf of and for the exclusive use of EBS Ecology's client, and is subject to and issued in connection with the provisions of the agreement between EBS Ecology and its client. EBS Ecology accepts no liability or responsibility whatsoever for or in respect of any use of or reliance upon this report by any third party.

CITATION: EBS Ecology (2018) Bungama Solar Desktop Ecological Assessment. Report to Bungama Solar 1 Pty Ltd. EBS Ecology, Adelaide.

Cover photograph: *Chenopod shrubland with Buffel Grass* (*Cenchrus ciliaris) along western boundary of the Project area*.

EBS Ecology
3/119 Hayward Avenue
Torrensville, South Australia 5031
t: 08 7127 5607
http://www.ebsecology.com.au
email: info@ebsecology.com.au

GLOSSARY AND ABBREVIATION OF TERMS

ALA	Atlas of Living Australia
BAM	Bushland Assessment Method
BDBSA	Biological Database of South Australia (maintained by DEW)
BS	Bungama Solar
DEW	Department of Environment and Water (formerly Department of Environment, Water and Natural Resources (DEWNR))
DotEE	Department of the Environment and Energy
EBS	EBS Ecology
EIS	Environmental Impact Statement
EPBC Act	*Environmental Protection and Biodiversity Conservation Act 1999*
IBRA	Interim Biogeographical Regionalisation of Australia
NPW Act	*National Parks and Wildlife Act 1972*
NV Act	*Native Vegetation Act 1991*
NVC	Native Vegetation Council
PMST	Protected Matters Search Tool (under the EPBC Act, maintained by DotEE)
Project	The proposed development of the solar farm at Bungama
Project area	The land where Bungama Solar is proposed to be constructed
PDI Act	*Planning, Development and Infrastructure Act 2016*
PSS	Point Scoring System – within the Scattered Tree Assessment Method
SEB	Significant Environmental Benefit
spp.	Species (plural)
ssp.	Subspecies
STAM	Scattered Tree Assessment Method
TEC	Threatened Ecological Community

Table of Contents

List of Tables

List of Figures

1 INTRODUCTION

EBS Ecology (EBS) was contracted by EPS Energy to conduct an ecological desktop assessment and field survey for the proposed development of the Bungama Solar (BS), South Australia. This report summarizes the findings of the ecological desktop assessment.

Any proposed clearance of native vegetation in South Australia (unless exempt under the *Native Vegetation Regulations 2017*) is to be assessed against the *Native Vegetation Act 1991* (NV Act) Principles of Clearance, and requires approval from the Native Vegetation Council (NVC). To ensure that EPS Energy is able to minimise environmental impacts and achieve legislative compliance requirements for the proposed works, a vegetation survey and fauna assessment is required to inform planning and development for the BS.

Initial investigations are necessary to determine if the proposed site is suitable for development and if the BS requires an application for clearance approvals, prepared by a NVC Accredited Consultant. Therefore, an ecological desktop assessment was conducted prior to the field survey.

The ecological desktop assessment involved searching Commonwealth and State databases to identify threatened flora and fauna species potentially occurring in the proposed BS development site, as well as relevant matters of national environmental significance and other matters protected under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) and the *National Parks and Wildlife Act 1972* (NPW Act).

The ecological field survey methods were also confirmed during the desktop assessment, based on aerial imagery and vegetation mapping.

1.1 Objectives

The specific objectives of the ecological desktop assessment were to:

- Identify and highlight areas of concern within the nominated Project area, where any threatened flora and fauna species and/or threatened ecological communities (TECs) listed under Commonwealth and State legislation occur or have been historically recorded in the vicinity of the Project area, and areas determined as potential habitat for threatened flora and fauna;
- Determine the likelihood of occurrence of any threatened species, identified in database searches, within the Project area;
- Determine if the proposed works will likely impact any Commonwealth and State listed species to inform decisions on vegetation clearance approval;
- Identify any ‘show-stoppers’ areas/trees that must be avoided from a vegetation or fauna perspective where the impacts of the proposed BS development to the vegetation/habitat would be considered to be particularly adverse or significant; and
- Identify any introduced flora and fauna species, including plant diseases, which potentially occur or have been historically recorded in the vicinity of the Project area and may require control

during the project. The report will provide recommendations to control the spread of any relevant plant or animal pests, which may have been identified during the survey.

1.2 Project area

The Project area is located near Bungama, South Australia, which is approximately 5 km east of Port Pirie and 200 km north of Adelaide. The proposed Project area is located the east and north-east of the existing substation, and consists of approximately 500 ha across four parcels of land with multiple land owners (Table 1). The proposed Project area for BS is provided in Figure 1.

The ecological desktop assessment was extended to the near surroundings of the proposed BS (the Project area) with a 5 km buffer zone.

Table 1. Land parcel details for the proposed Bungama Solar.

Lot Number	Address	Area of Interest (ha)
D25903 A52	Lot 52 Augusta Highway, Warnertown SA 5540	109
D24997 A4	Lot 4 Augusta Highway, Warnertown SA 5540	77
F188690 A558	Lot 558 Augusta Highway, Warnertown SA 5540	174
D28632 A1	Lot 20 Gulf View Road, Napperby SA 5540	158.1
Total		**518.1**

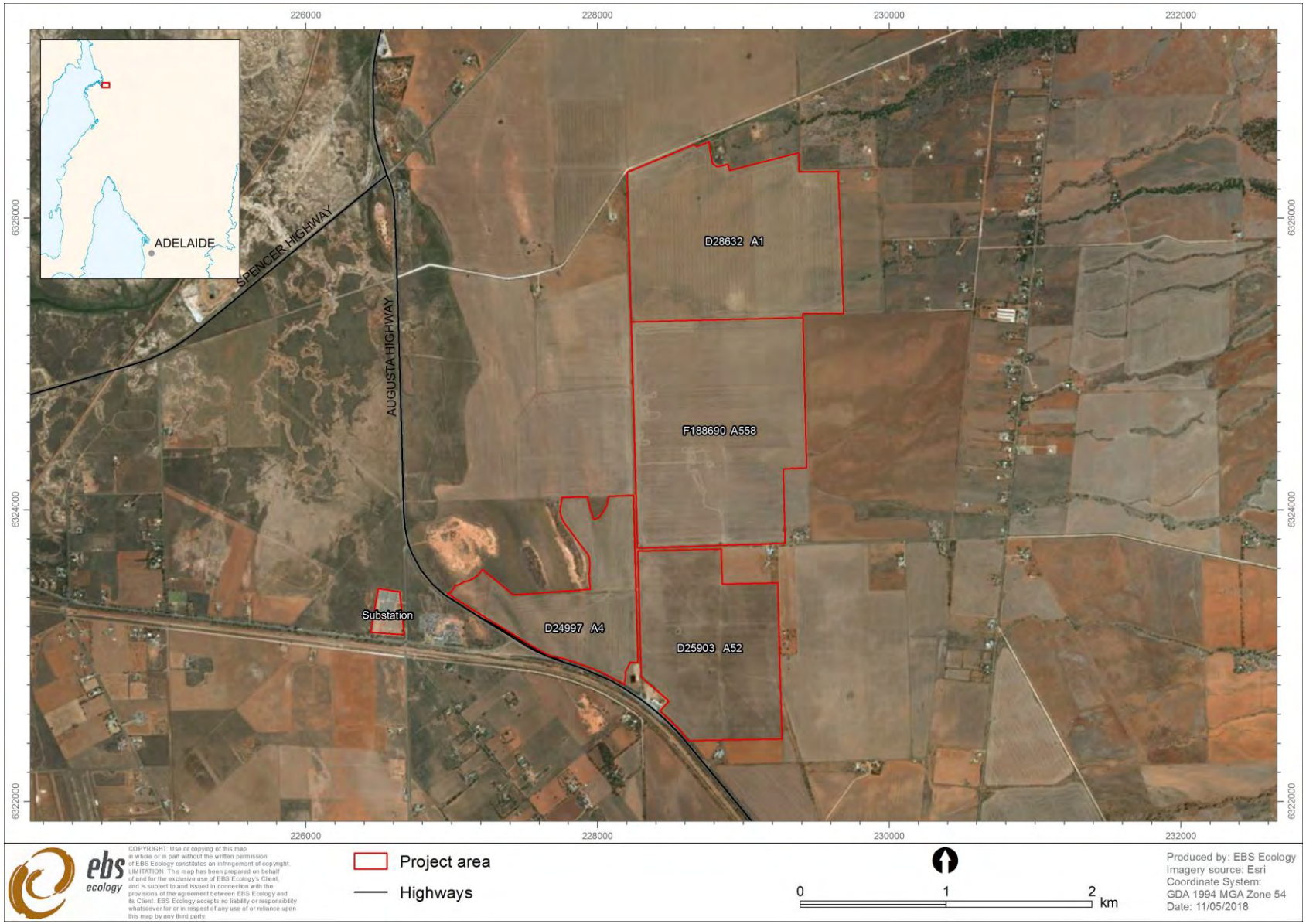


Figure 1. Location and design layout of the proposed Bungama Solar, South Australia.

2 COMPLIANCE AND LEGISLATIVE SUMMARY

2.1 Environment Protection and Biodiversity Conservation Act 1999

The *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) and the *Environment Protection and Biodiversity Conservation Regulations 2000* provide a legal framework to protect and manage nationally and internationally important flora, fauna, ecological communities and heritage places – defined in the Act as 'matters of national environmental significance'. The nine matters of national environmental significance protected under the Act are:

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

Matters 4 and 5 are relevant to the BS Project.

Any action that has, will have, or is likely to have a significant impact on matters of national environmental significance requires referral under the EPBC Act. Substantial penalties apply for undertaking an action that has, will have or is likely to have significant impact on a matter of national environmental significance without approval.

The EPBC Act Significant Impact Guidelines provide overarching guidance on determining whether an action is likely to have a significant impact on a matter of national environmental significance. In terms of nationally threatened species, the guidelines define an action as likely to have a significant impact if there is a real chance or possibility that it will:

- Lead to a long term decrease in the population
- Reduce the area of occupancy of the species
- Fragment an existing population
- Adversely affect critical habitat
- Disrupt breeding cycles
- Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline
- Result in the establishment of invasive species that are harmful to the species
- Introduce disease that may cause the species to decline
- Interfere with the recovery of the species.

2.2 Native Vegetation Act 1991

Native vegetation within the Project area is protected under the *Native Vegetation Act 1991* (NV Act) and *Native Vegetation Regulations 2017*. Any proposed clearance of native vegetation in South Australia (unless exempt under the *Native Vegetation Regulations 2017*) is to be assessed against the NV Act Principles of Clearance, and requires approval from the Native Vegetation Council (NVC). A net environmental benefit is generally conditional on an approval being granted.

Native vegetation refers to any naturally occurring local plant species that are indigenous to South Australia, from small ground covers and native grasses to large trees and water plants.

“Clearance", in relation to native vegetation, means:

- The killing or destruction of native vegetation
- The removal of native vegetation
- The severing of branches, limbs, stems or trunks of native vegetation
- The burning of native vegetation
- Any other substantial damage to native vegetation, and includes the draining or flooding of land, or any other act or activity, that causes the killing or destruction of native vegetation, the severing of branches, limbs, stems or trunks of native vegetation or any other substantial damage to native vegetation

Approval must be obtained before performing any activity that could cause substantial damage to native plants. This also applies to dead trees that may provide habitat for animals. These activities include but are not limited to:

- The cutting down, destruction or removal of whole plants
- The removal of branches, limbs, stems or trunks (including brush cutting and woodcutting)
- Burning
- Poisoning
- Slashing of understorey
- Drainage and reclamation of wetlands
- Grazing by animals (in some circumstances).

Under the NV Act, the NVC considers applications to clear native vegetation under ten principles. Native vegetation should not be cleared if it is significantly at odds with these principles:

- It contains a high level of diversity of plant species
- It is an important wildlife habitat
- It includes rare, vulnerable or endangered plant species
- The vegetation comprises a plant community that is rare, vulnerable or endangered
- It is a remnant of vegetation in an area which has been extensively cleared
- It is growing in, or association with, a wetland environment

- It contributes to the amenity of the area
- The clearance of vegetation is likely to contribute to soil erosion, salinity, or flooding
- The clearance of vegetation is likely to cause deterioration in the quality of surface or underground water
- After clearance, the land is to be used for a purpose which is unsustainable

The principles apply in all cases, except where the vegetation has been considered exempt under the *Native Vegetation Regulations 2017* or can be classified as an 'intact stratum'. 'Intact stratum' means that applications will usually be denied when the vegetation has not been seriously degraded by human activity within the last 20 years.

All approved vegetation clearance must also be conditional on achieving a SEB to offset the clearance. The requirement for a SEB also applies to several of the exemptions. Potential SEB offsets include:

- The establishment and management of a set-aside area to encourage the natural regeneration of native vegetation
- The protection and management of an established area of native vegetation
- Entering into a Heritage Agreement on land where native vegetation is already established to further preserve or enhance the area in perpetuity
- A payment to the Native Vegetation Fund

An assessment against the Native Vegetation Clearance Principles is not required as the clearance associated with the project complies with the following regulation:

Part 3—Permitted clearance of native vegetation

Division 5—Risk assessment

16—Clearance for other activities

(1) Clearance of native vegetation for the purposes of activities of a kind specified in Schedule 1 Part 6 is permitted only if it is undertaken in accordance with—

(a) the written approval of the Council; or

(b) a standard operating procedure determined or approved by the Council for the purposes of this provision.

(2) Authorisation to clear native vegetation under subregulation (1) is subject to—

(a) a condition—

(i) that the clearance of native vegetation is to be undertaken in accordance with a management plan, approved by the Council for implementation, that results in a significant environmental benefit; or

(ii) that the person undertaking the operations is to make a payment into the Fund of an amount considered by the Council to be sufficient to achieve a significant environmental benefit in the manner contemplated by section 21(6) or (6a) of the Act,

as determined by the Council; and

(b) such other conditions as the Council thinks fit.

(3) Clearance of native vegetation for the purposes of activities of a kind specified in Schedule 1 Part 6 is permitted only if any conditions that apply to the approval are complied with.

The requirements of the proponent to undertake clearance for other activities include:

- Application to the NVC in accordance with a NCV approved Standard Operating Procedure;
- Provision of sufficient information for the NVC to assess the level of risk to biodiversity;
- Development of a SEB Management Plan to be approved by the NVC; and
- Provision of a SEB in accordance with the Management Plan or payment into the Native Vegetation Fund.

2.3 National Parks and Wildlife Act 1972

Native plants and animals in South Australia are protected under the *National Parks and Wildlife Act 1972* (NPW Act). It is an offence to take a native plant or protected animal without approval. Threatened plant and animal species are listed in Schedules 7 (endangered species), 8 (vulnerable species) and 9 (rare species) of the Act. Persons must not:

- Take a native plant on a reserve, wilderness protection area, wilderness protection zone, land reserved for public purposes, a forest reserve or any other Crown land
- Take a native plant of a prescribed species on private land
- Take a native plant on private land without the consent of the owner (such plants may also be covered by the NV Act)
- Take a protected animal or the eggs of a protected animal without approval
- Keep protected animals unless authorised to do so
- Use poison to kill a protected animal without approval

Conservation rated flora and fauna species listed on Schedules 7, 8, or 9 of the NPW Act are known to or may occur within the Project area. Persons must comply with the conditions imposed upon permits and approvals.

2.4 Natural Resources Management Act 2004

Under the *Natural Resources Management Act 2004* (NRM Act) landholders have a legal responsibility to manage declared pest plants and animals and prevent land and water degradation.

Key components under the Act include the establishment of regional Natural Resource Management (NRM) Boards and development of regional NRM Plans; the ability to control water use through prescription, allocations and restrictions; requirement to control pest plants and animals and activities that might result in land degradation.

A ‘duty of care’ is a fundamental component of this Act, i.e. ensuring one’s environmental and civil obligation by taking reasonable steps to prevent land and water degradation. Persons can be prosecuted if they are considered negligent in meeting their obligations.

2.5 Planning, Development and Infrastructure Act 2016

The *Planning, Development and Infrastructure Act 2016* (PDI Act) provides for matters that are relevant to the use, development and management of land and buildings, including the provision of a planning system to regulate development within the State, rules with respect to the design, construction and use of buildings, and other initiatives to facilitate the development of infrastructure, facilities and environments that will benefit the community. The PDI Act repeals the *Development Act 1993* and will gradually come into operation over a five year period.

The State Planning Strategy establishes the broad vision for sustainable land use and the built development of South Australia. The Planning Strategy informs and guides local council development plans. No development can be undertaken without an appropriate Development Approval being obtained from the relevant authority after an application and assessment process.

The PDI Act and the *Development Regulations 2008* provide for the protection of ‘regulated’ and ‘significant’ trees; however, the Project falls outside the PDI Act boundaries.

3 BACKGROUND INFORMATION

3.1 Project details

EPS Energy provides relevant expertise for the planning and development of solar and wind projects in Australia. EPS Energy is currently investigating whether the proposed Project area at Bungama is suitable for the development of a solar farm and if an application for vegetation clearance approval is required to undertake the proposed works.

3.2 IBRA

The Interim Biogeographical Regionalisation of Australia (IBRA) identifies geographically distinct bioregions based on common climate, geology, landform, native vegetation and species information. The bioregions are further refined into subregions and environmental associations (DEWNR 2011). The Project area is located within the Eyre Yorke Block IBRA Bioregion, the St Vincent IBRA Subregion and the Nurom (to the southwest) and Glendella (to the northeast) IBRA Environmental Associations.

Native vegetation remnancy figures for IBRA subregions are useful for setting regional landscape targets. Approximately 8% (87,402 ha) of the St Vincent IBRA Subregion is mapped as remnant vegetation, of which less than 5% (4,732 ha) is formally conserved within National Parks and Wildlife reserves, and private Heritage Agreements under the NV Act. A full summary is provided below in Table 2

Table 2. IBRA bioregion, subregion, and environmental association environmental landscape summary.

Eyre Yorke Block IBRA Bioregion	
Archaean basement rocks and Proterozoic sandstones overlain by undulating to occasionally hilly calcarenite and calcrete plains and areas of Aeolian quartz sands, with Mallee Woodlands, Shrublands and Heaths on calcareous earths, duplex soils and calcareous to shallow sands, now largely cleared for agriculture.	
St Vincent IBRA Subregion	
Most of this region consists of with calcrete development and shallow reddish earths. The plain is mainly dune free but isolated areas are overlain by low indistinct sand dunes. Near the Mt Lofty Ranges the plains have a definite westerly gradient and merge eastwards with the alluvial fans from the Mt Lofty Ranges. Moderately deep Red Mallee / Yorrell (*Eucalyptus socialis, E. gracilis*) association occurs throughout the region with some woodland of *E. porosa* on the plains or *E. odorata* on the hills and footslopes. The subregion has been extensively cleared and sown to crops or exotic pastures so little of the natural vegetation remains. What does remain exists on road verges and a few isolated blocks.	
Remnant vegetation	Approximately 8% (87,402 ha) of the subregion is mapped as remnant native vegetation, of which 5% (4,732 ha) is formally conserved.
Landform	Alluvial and littoral plains with NW-SE longitudinal dunes mainly stabilized in isolated areas. Near the Mt Lofty Ranges the plains have a detritic westerly gradient and merge eastwards with the alluvial fans of the ranges.
Geology	Calcrete development; some variably oriented dunes in north west of unit beyond Port Augusta. Calcareous loams. Clay rich soils, both plastic & cracking varieties.
Soil	Cracking clays, brown calcareous earths, highly calcareous loamy earths, plastic saline clay soils, hard setting loamy soils with red clayey subsoils.
Vegetation	Mixed Chenopod, Samphire or Forblands.

Conservation significance	125 species of threatened fauna, 103 species of threatened flora. 5 wetlands of national significance.
Nurom IBRA Environmental Association	
Remnant vegetation	Approximately 5% (1,740 ha) of the association is mapped as remnant native vegetation, of which 0% (0 ha) is formally conserved.
Landform	Gently undulating calcrete plain with extensive sand sheets or longitudinal dunes.
Geology	Sand and calcrete.
Soil	Crusty red duplex soils and brown calcareous sands.
Vegetation	Open scrub of beaked Red Mallee and Yorrell and Chenopod Shrubland of Saltbush.
Conservation significance	2 species of threatened fauna, 1 species of threatened flora. 1 wetlands of national significance.
Glendella IBRA Environmental Association	
Remnant vegetation	Approximately 28% (12,641 ha) of the association is mapped as remnant native vegetation, of which 13% (1,702 ha) is formally conserved.
Landform	Coalescing alluvial fans, extending from low hills onto a narrow sandy plain with tidal flats on the coastal margin.
Geology	Gravelly alluvium, alluvium, sand and quartzite.
Soil	Hard pedal red duplex soils, red calcareous earths, red friable loams and black non-cracking plastic clays.
Vegetation	Open scrub of Beaked Red Mallee and Yorrell, Chenopod Shrubland of Saltbush and Bluebush, Chenopod Shrubland of Samphire and Low Woodland of Mangroves.
Conservation significance	28 species of threatened fauna, 25 species of threatened flora. 1 wetlands of national significance.

3.3 Administrative boundaries

The Project area is located in the in the Northern and Yorke NRM Region and Lower and Mid North NRM District. The Project area is also located within the County of Victoria and the Pirie (to the west) and Napperby (to the east) Hundreds.

3.4 Climate

The nearest long-term climate data was sourced from Georgetown weather station, which is approximately 34 km ESE of the Project area. Rainfall and temperature data are indicative that the region surrounding Bungama experiences a Mediterranean climate, with cool wet winters and hot dry summers. Changes of weather are generally associated with frontal systems from southwest in the Spencer Gulf. These frontal systems are most active in winter and spring and bring reliable and frequent light to moderate rainfall. Annual average rainfall is 474.7 mm. The majority of the rainfall occurs during winter with the highest falls in June (average 58.4 mm) and July (average 57.2 mm). The mean minimum temperature ranges from 4.2°C (July) to 15.2°C (February) and the mean maximum temperature ranges from 14.2°C (July) to 31.1°C (January) (Figure 2).

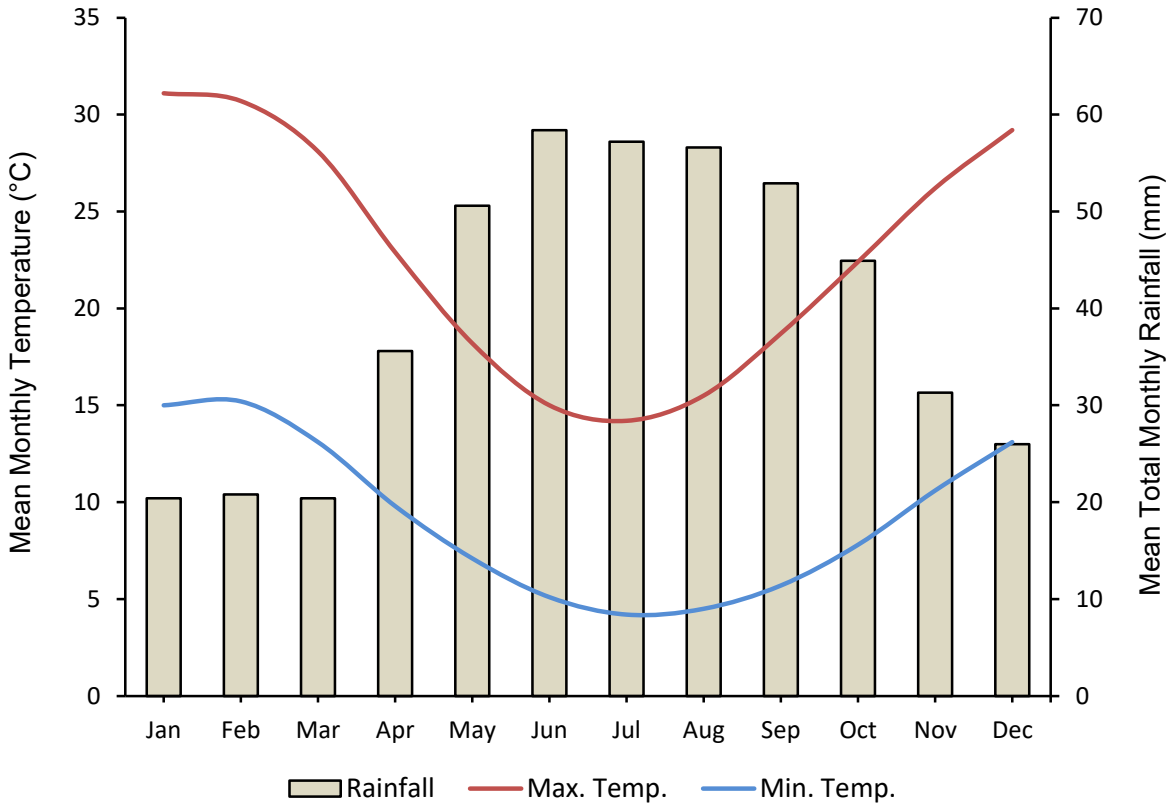


Figure 2. Mean total monthly rainfall and mean monthly maximum and minimum temperatures recorded at Georgetown (station no. 21020), located 33.9 km ESE of the Project area (BOM 2018).

4 METHODS

The ecological desktop assessment was conducted to assess the potential for any threatened species (both Commonwealth and State listed) to occur within the Project area.

4.1 Protected Matters Search Tool (PMST) – EPBC Act

A Protected Matters Search Tool (PMST) report was generated on 18 April 2018 to identify matters of national environmental significance under the EPBC Act (DotEE 2018). The PMST is maintained by the Department of the Environment and Energy (DotEE) and was used to identify flora and fauna species or ecological communities of national environmental significance that may occur or have suitable habitat within the Project area. A buffer of 5 km was applied for this search.

4.2 Biological Database of South Australia (BDBSA) – NPW Act

Threatened species listed under South Australia's NPW Act were assessed using the Biological Database of South Australia (BDBSA), which is maintained by the South Australian Department of Environment, and Water (DEW). The BDBSA is comprised of an integrated collection of corporate databases which meet DEW standards for data quality, integrity and maintenance. In addition to the DEW biological data, the BDBSA also includes data from partner organisations. This data is included under agreement with the partner organisation for ease of distribution but they remain owners of the data and should be contacted directly for further information. The dataset was obtained on 18 April 2018 (*Recordset number DEWNRBDBSA180418-1*) and used to identify threatened species that have been recorded within the 5 km buffer of the Project area (DEW 2018). Records of threatened and migratory species listed under the EPBC Act were also identified.

4.3 Assessment of the likelihood of occurrence

An assessment of the likelihood of each threatened flora and fauna species occurring within the 5 km buffer of the Project area was assessed. A likelihood of occurrence rating (Highly Likely/Known, Likely, Possible, Unlikely, Impossible) was assigned to each threatened species identified in the desktop database searches. The ratings take the following criteria into consideration:

- Date of the most recent record (taking into consideration the date of the last surveys conducted in the area) (ALA 2018; DEWNR 2018);
- Proximity of the records (i.e. distance to the Project area);
- Landscape, vegetation remnancy and vegetation type of the record location (taking into consideration the landscape, vegetation remnancy and vegetation type of the Project area, with higher likelihood assigned to species that were found in similar locations/condition/vegetation associations); and
- Knowledge of the species habitat preferences, causes of its decline, and local population trends.

A summary of the likelihood criteria is shown below in Table 3.

Table 3. Criteria for the likelihood of occurrence of threatened species within the Project area.

Likelihood	Criteria
Highly Likely/Known	• Records in the last 10 years, the species does not have highly specific needs, and the habitat is largely intact.
Likely	• Records in the last 10 years, the species does not have highly specific habitat needs and the habitat is largely intact, or • Records in the last 10 years, the species does have highly specific habitat needs and these needs occur in the area.
Possible	• No records, survey effort is considered not adequate, suitable habitat does occur (or isn't known if it does occur) and species of similar habitat needs have been recorded in the area, or • Records within the last 40 years, and the area is not largely intact, or • Records in the last 10 years, the species does not have highly specific needs, and habitat is largely intact.
Unlikely	• No records despite survey effort considered adequate, or • No records and survey effort is considered not adequate, and no suitable habitat is known to occur in the area, or • No records and survey effort is not considered adequate, and no suitable is known to occur in the area, and species of similar habitat needs have no records either.
Impossible	• Species cannot occur in Project area (e.g. it is impossible for a marine mammal to occur in a terrestrial Project area).

4.4 Additional searches

Additional searches included:

- Atlas of Living Australia (ALA) online resource, which provides records (including locations) for threatened flora and fauna; and
- NatureMaps to collect further SA Biological Survey flora site information (site descriptions), up-to-date and cross-referenced aerial photography, and spatial datasets, such as floristic mapping and protected area maps.

4.5 Survey design and site identification

All the above described information has been used to determine and document:

- Native vegetation cover within the Project area;
- Flora and fauna species (including species of national, state or local conservation significance) known or likely to occur within the Project area (5 km buffer) of the proposed Bungama Solar;
- Potential ecological constraints for the proposed Bungama Solar; and
- EBS viewed the vegetation and terrain within the Project area using NatureMaps and Google Earth to determine the appropriate method and estimate the time for field assessment.

4.6 Limitations

The content of the desktop study was derived from existing datasets and references from a range of sources. EBS has not attempted to verify the accuracy of any such information.

Flora and fauna records were sourced from the PMST and BDBSA and were limited to a 5 km buffer around the proposed BS Project area. The BDBSA only includes verified flora and fauna records submitted to DEW or partner organisations. It is recognised that knowledge is poorly captured and it is possible that significant species occur that are not reflected by database records. Although much of the BDBSA data has been through a variety of validation processes, the lists may contain errors and should therefore be used with caution. DEW give no warranty that the data is accurate or fit for any particular purpose of the user or any person to whom the user discloses the information.

The reliability of the BDBSA data ranges from 100 m to over 100 km. Fauna species, in particular birds, also have the ability to traverse distances in excess of 20 km. It is also acknowledged that the presence of species may not be adequately represented by database records. Hence the PMST and BDBSA results may not highlight all potential threatened flora and fauna species that may occur within a 5 km buffer of the Project area.

It is difficult to comment on the likelihood of occurrence of threatened species without observing the condition of vegetation in the Project area. A precautionary approach was therefore adopted during the desktop assessment, with reference to existing PMST and BDBSA records and native vegetation cover.

The findings and conclusions expressed by EBS are based solely upon information in existence at the time of the assessment. The combination of database records and background research have provided a solid foundation for determining the flora and fauna that are likely or are known to occur within the Project area.

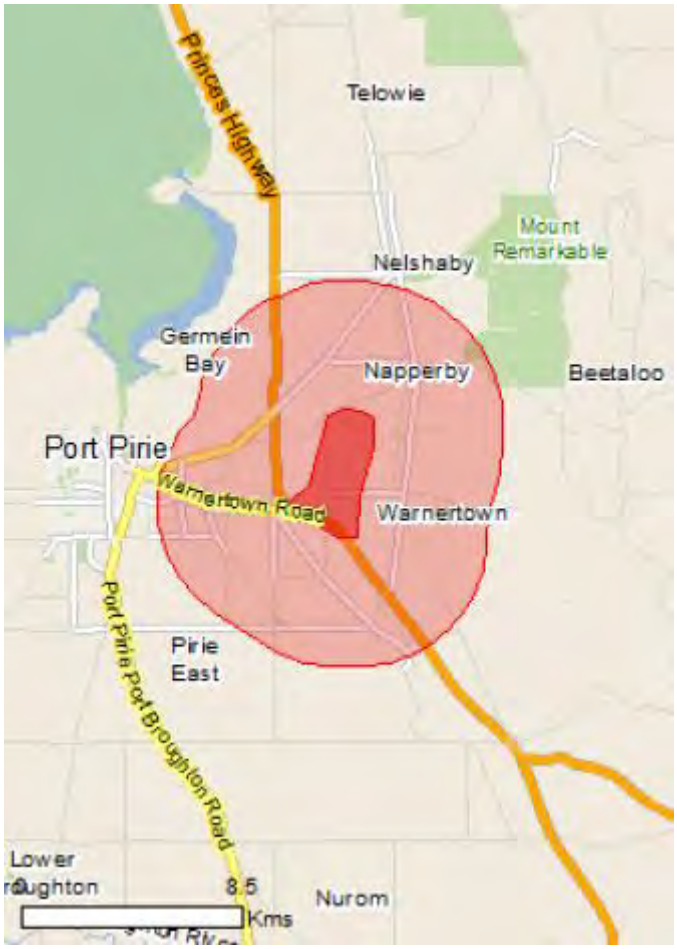
5 RESULTS

5.1 Matters of national and state environmental significance

The EPBC Protected Matters Search identified 41 threatened species, 28 migratory species, and 2 nationally threatened ecological communities, protected under the EPBC Act that may be relevant to the BS Project area. The results of the EPBC Act PMST report are summarised in Table 4 (DotEE 2018). The relevant matters of national environmental significance, other matters protected under the EPBC Act, and threatened species listed under the NPW Act are discussed in detail below.

Note that listed marine dependent species (e.g. marine birds, turtles, sea-lions, fish, whales, and other cetaceans) are included in Table 4. However, these matters are not impacted by or relevant to the project, given that the Project area and potential impacts are confined to the terrestrial environment. Therefore these species are not further discussed.

Table 4. Summary of the results of the EPBC Act Protected Matters Search Tool report (DotEE 2018).

Project area (5 km buffer)	Matters of national environmental significance under the EPBC Act	Identified within the search area
	World heritage properties	None
	National heritage properties	None
	Wetlands of international importance	None
	Great Barrier Reef marine park	None
	Commonwealth marine area	None
	Threatened ecological communities	2
	Threatened species	41
	Migratory species	28
	Commonwealth land	2
	Commonwealth heritage places	None
	Listed marine species	35
	Whales and other cetaceans	None
	Critical habitats	None
	Commonwealth reserves terrestrial	None
	Commonwealth reserves marine	None
	State and Territory reserves	2
	Regional forest agreements	None
	Invasive species	24
	Nationally important wetlands	1
	Key ecological features (marine)	None

5.1.1 Threatened Ecological Communities

The EPBC Act PMST report identified two Nationally Threatened Ecological Communities (TECs) within 5 km of the Project area (Table 5). Both of the TECs identified are considered unlikely to occur in the Project area due to the complete clearance of remnant vegetation within the Project area.

Table 5. Threatened ecological communities potentially occurring within 5 km of the Project area identified in the PMST (DotEE 2018) and BDBSA (DEW 2018) database searches.

Threatened Ecological Community	Conservation Status[1]	Likelihood of occurrence within Project area
Peppermint Box (*Eucalyptus odorata*) Grassy Woodland of South Australia	CE	Unlikely
Subtropical and Temperate Coastal Saltmarsh	VU	Unlikely

[1]**Conservation status**
Conservation codes under the *Environment Protection and Biodiversity Conservation Act 1999*: CE: Critically Endangered. EN: Endangered. VU: Vulnerable.

5.1.2 Nationally threatened flora

The EPBC Act PMST report identified 10 nationally threatened flora species within 5 km of the Project area. None of the nationally threatened flora species identified have potential to occur within Project area (Table 6), because the BS Project area has been entirely cleared of remnant vegetation and has been subsequently cropped.

5.1.3 State threatened flora

The BDBSA search identified six threatened flora species listed under the NPW Act (excluding those also listed under the EPBC Act) within 5 km of the Project area (Table 6 and Figure 3). None of the state threatened flora species identified by the BDBSA search have potential to occur within Project area as it has been entirely cleared of remnant vegetation and subsequently cropped.

All flora species identified in the BDBSA search within 5 km of the Project area are shown in Appendix 1.

Table 6. Threatened flora species potentially occurring within 5 km of the Project area identified in the PMST (DotEE 2018) and BDBSA (DEW 2018) database searches.

Scientific name	Common name	Conservation status[1]		Source[2]	Last BDBSA record	Likelihood of occurrence or habitat within Project area
		Aus.	SA			
Acacia iteaphylla	Flinders Ranges Wattle		R	2	2000	Unlikely
Acacia montana	Mallee Wattle		R	2	1979	Unlikely
Acanthocladium dockeri	Spiny Everlasting	CE	E	1		Unlikely
Brachyscome ciliaris var. subintegrifolia	Variable Daisy		R	2	1978	Unlikely
Caladenia macroclavia	Large-club Spider-orchid	EN	E	1		Unlikely
Caladenia tensa	Greencomb Spider-orchid	EN		1		Unlikely
Caladenia xantholeuca	White Rabbits	EN	E	1		Unlikely
Elatine gratioloides	Waterwort		R	2	1997	Unlikely
Olearia pannosa ssp. pannosa	Silver Daisy-bush	VU	V	1		Unlikely
Prasophyllum pallidum	Pale Leek-orchid	VU	R	1		Unlikely

Scientific name	Common name	Conservation status[1]		Source[2]	Last BDBSA record	Likelihood of occurrence or habitat within Project area
		Aus.	SA			
Prasophyllum validum	Sturdy Leek-orchid	VU	V	1		Unlikely
Santalum spicatum	Sandalwood		V	2	1992	Unlikely
Senecio megaglossus	Superb Groundsel	VU	E	1		Unlikely
Solanum eremophilum	Rare Nightshade		R	2	1997	Unlikely
Swainsona pyrophila	Yellow Swainson-pea	VU	R	1		Unlikely
Veronica parnkalliana	Port Lincoln Speedwell	EN	E	1		Unlikely

[1]**Conservation status**

Aus.: Australia (*Environment Protection and Biodiversity Conservation Act 1999*). SA: South Australia (*National Parks and Wildlife Act 1972*). Conservation codes: CE: Critically Endangered. EN/E: Endangered. VU/V: Vulnerable. R: Rare. ssp.: the conservation status applies at the sub-species level.

[2]**Source**

1: EPBC Act Protected Matters Search Tool (PMST) report (DotEE 2018) – 5 km buffer applied to Project area.

2: Biological Database of South Australia (BDBSA) data extract (DEW 2018) – 5 km buffer applied to Project area.

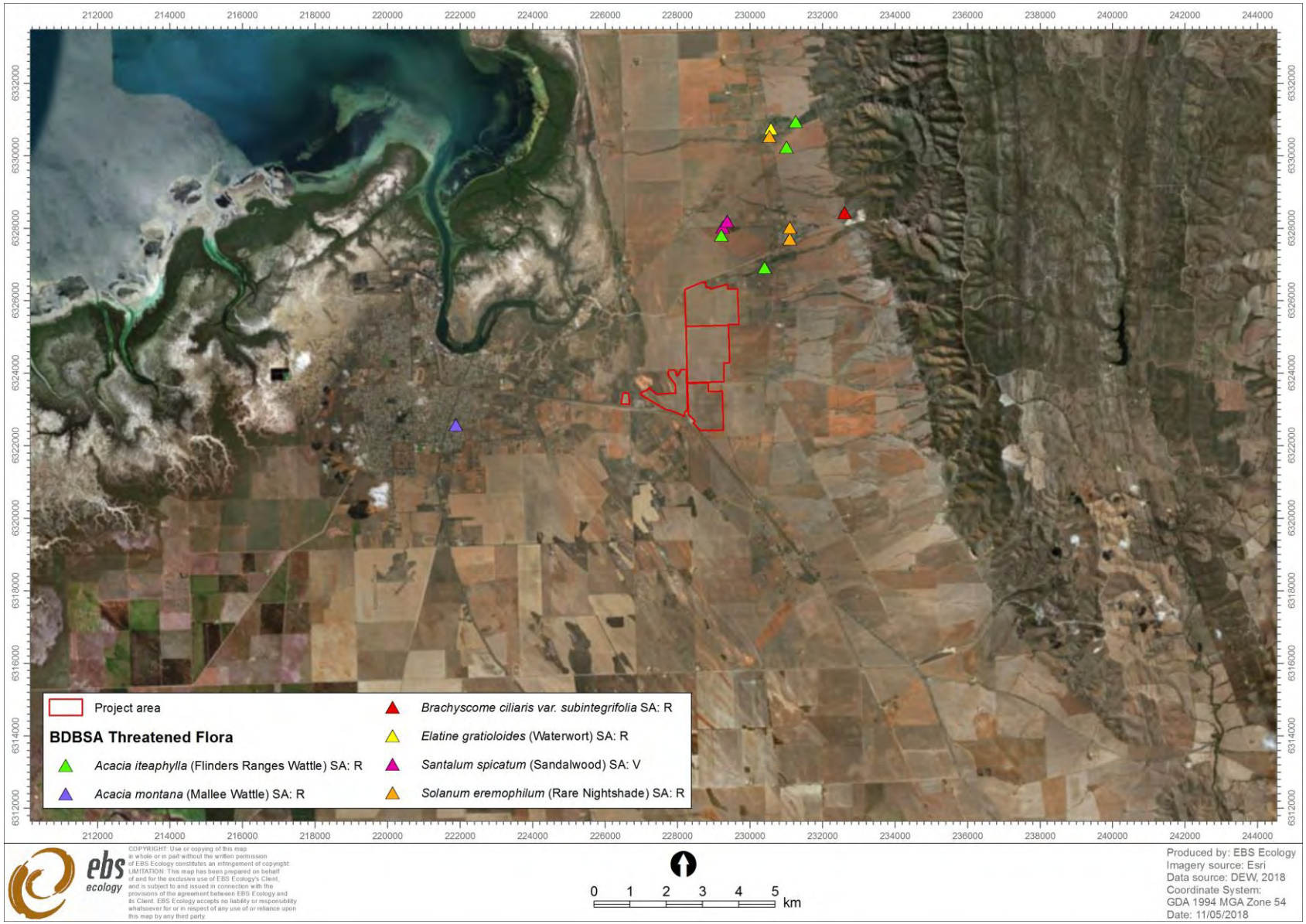


Figure 3. BDBSA records of threatened flora species recorded within 5 km of the Project area (DEW 2018).

5.1.4 Nationally threatened fauna

The EPBC Act PMST report identified 31 nationally threatened fauna species within 5 km of the Project area (Table 7). None of these species have potential to occur within Project area as it has been entirely cleared of remnant vegetation and subsequently cropped (Table 7). As such, there is no suitable habitat available for any of the threatened fauna species identified.

5.1.5 Migratory fauna

The EPBC Act PMST report and BDBSA search identified 29 migratory species within 5 km of the Project area. Two of these species were identified to potentially fly over the Project area (Table 7). No other migratory fauna species are expected to occur as they are either marine pelagic species, coastal or wetland species, or are terrestrial species that do not have suitable habitat in the Project area due to the complete clearance of native vegetation. The two species that may fly-over the Project area are the Fork-tailed Swift (*Apus pacificus*) and the Osprey (*Pandion haliaetus*).

The Fork-tailed Swift is almost exclusively aerial while in Australia, where it occurs over a weird range of habitats from open fields to rainforests to cities. The species is most common around coastal and subcoastal areas, and therefore, could possibly fly over the Project area.

The Osprey is a raptor that primarily occurs along the coast; however, will also inhabit major river systems. There are no Osprey territories in the Port Pirie region, and any individuals observed in the region are likely juveniles or lone birds. The Project area offers no habitats of importance to the species. Any individuals observed in the Project area are likely to be flying-over, while in search of a mate or new foraging grounds.

5.1.6 State threatened fauna

The BDBSA search identified seven fauna species listed under the NPW Act (excluding those also listed under the EPBC Act) within 5 km of the Project area (Table 7 and Figure 4). Two of the seven identified species; the Peregrine Falcon (*Falco peregrinus*) and Elegant Parrot (*Neophema elegans*) could use the Project area for foraging; however, nesting habitat is unlikely to occur. None of the remaining state listed species are expected to occur as they are either waterbirds or are reliant upon habitats which are absent from the Project area.

All fauna species identified in the BDBSA search within 5 km of the Project area are shown in Appendix 2.

Table 7. Threatened fauna species potentially occurring within 5 km of the Project area identified in the PMST (DotEE 2018) and BDBSA (DEW 2018) database searches.

Scientific name	Common name	Conservation status[1]		Source[2]	Last BDBSA record	Likelihood of occurrence within Project area
		Aus.	SA			
AVES	**Birds**					
Actitis hypoleucos	Common Sandpiper	Mi (W)	R	1		Unlikely
Apus pacificus	Fork-tailed swift	Mi (M)		1, 2	2003	Possible (Fly-over)
Biziura lobata	Musk Duck		R	2	2002	Unlikey
Botaurus poiciloptilus	Australasian Bittern	EN	V	1		Unlikely

Scientific name	Common name	Conservation status[1]		Source[2]	Last BDBSA record	Likelihood of occurrence within Project area
		Aus.	SA			
Calamanthus (Hylacola) pyrrhopygius	Chestnut-rumped Heathwren		E	2	1984	Unlikely
Calidris acuminata	Sharp-tailed Sandpiper	Mi (W)		1		Unlikely
Calidris canutus	Red Knot	EN, Mi (W)		1		Unlikely
Calidris ferruginea	Curlew Sandpiper	CE, Mi (W)		1		Unlikely
Calidris melanotos	Pectoral Sandpiper	Mi (W)	R	1		Unlikely
Diomedea antipodensis	Antipodean Albatross	VU, Mi (M)		1		Unlikely
Diomedea epomophora	Southern Royal Albatross	VU, Mi (M)	V	1		Unlikely
Diomedea exulans	Wandering Albatross	VU, Mi (M)	V	1		Unlikely
Diomedea sanfordi	Northern Royal Albatross	EN, Mi (M)	E	1		Unlikely
Egretta garzetta	Little Egret		R	2	2002	Unlikely
Falco peregrinus	Peregrine Falcon		R	2	2000	Possible
Gallinago hardwickii	Latham's Snipe	Mi (W)	R	1		Unlikely
Grantiella picta	Painted Honeyeater	VU	V	1		Unlikely
Hydroprogne caspia	Caspian Tern	Mi (W)		2	2001	Unlikely
Limosa lapponica baueri	Western Alaskan Bar-tailed Godwit	VU, Mi (W)	R	1		Unlikely
Limosa lapponica menzbieri	Northern Siberian Bar-tailed Godwit	CE, Mi (W)		1		Unlikely
Macronectes giganteus	Southern Giant Petrel	EN, Mi (M)	V	1		Unlikely
Macronectes halli	Northern Giant Petrel	VU, Mi (M)		1		Unlikely
Motacilla cinerea	Grey Wagtail	Mi (T)		1		Unlikely
Motacilla flava	Yellow Wagtail	Mi (T)		1		Unlikely
Myiagra cyanoleuca	Satin Flycatcher	Mi (T)	E	1		Unlikely
Neophema chrysogaster	Orange-bellied Parrot	CE	E	1		Unlikely
Neophema elegans	Elegant Parrot		R	2	2000	Possible
Numenius madagascariensis	Eastern Curlew	CE, Mi (W)	V	1		Unlikely
Pachyptila turtur subantarctica	Fairy Prion (Southern)	VU		1		Unlikely
Pandon haliaetus	Osprey	Mi (W)	E	1		Possible (Fly-over)
Pedionomus torquatus	Plains-wanderer	CE	E	1		Unlikely
Pezoporus occidentalis	Night Parrot	EN	E	1		Unlikely
Rostratula australis	Australian Painted Snipe	EN	V	1		Unlikely
Stagonopleura guttata	Diamond Firetail		V	2	2014	Unlikely
Sternula nereis nereis	Australian Fairy Tern	VU	E	1, 2	2001	Unlikely
Thalassarche cauta cauta	Tasmanian Shy Albatross	VU, Mi (M)	V	1		Unlikely
Thalassarche cauta steadi	White-capped Albatross	VU, Mi (M)		1		Unlikely
Thalassarche impavida	Campbell Albatross	VU, Mi (M)	V	1		Unlikely

Scientific name	Common name	Conservation status[1]		Source[2]	Last BDBSA record	Likelihood of occurrence within Project area
		Aus.	SA			
Thalassarche melanophris	Black-browed Albatross	VU, Mi (M)		1		Unlikely
Tringa nebularia	Common Greenshank	Mi (W)		1		Unlikely
Zoothera lunulata halmaturina	Bassian Thrush (South Australian)	VU		1		Unlikely
MAMMALIA	**Mammals**					
Neophoca cinerea	Australian Sea-lion	VU	V	1		Impossible
Petrogale xanthopus xanthopus	Yellow-footed Rock-wallaby	VU		1		Unlikely
REPTILIA	**Reptiles**					
Aprasia pseudopulchella	Flinders Ranges Worm-lizard	VU		1		Unlikely
Caretta caretta	Loggerhead Turtle	EN, Mi	E	1		Impossible
Chelonia mydas	Green Turtle	VU, Mi	V	1		Impossible
Dermochelys coriacea	Leatherback Turtle	EN, Mi	V	1		Impossible
Notechis scutatus ater	Krefft's Tiger Snake (Flinders Ranges)	VU		1		Unlikely
CHONDRICHTHYES	**Cartilaginous Fishes**					
Lamna nasus	Porbeagle	Mi		1		Impossible

[1]Conservation status

Aus.: Australia (*Environment Protection and Biodiversity Conservation Act 1999*). SA: South Australia (*National Parks and Wildlife Act 1972*). Conservation codes: CE: Critically Endangered. EN/E: Endangered. VU/V: Vulnerable. R: Rare. ssp.: the conservation status applies at the sub-species level. Mi.: Migratory. (W): Wetland bird. (M): Marine bird. (T): Terrestrial bird.

[2]Source

1: EPBC Act Protected Matters Search Tool (PMST) report (DotEE 2018) – 5 km buffer applied to Project area.

2: Biological Database of South Australia (BDBSA) data extract (DEW 2018) – 5 km buffer applied to Project area.

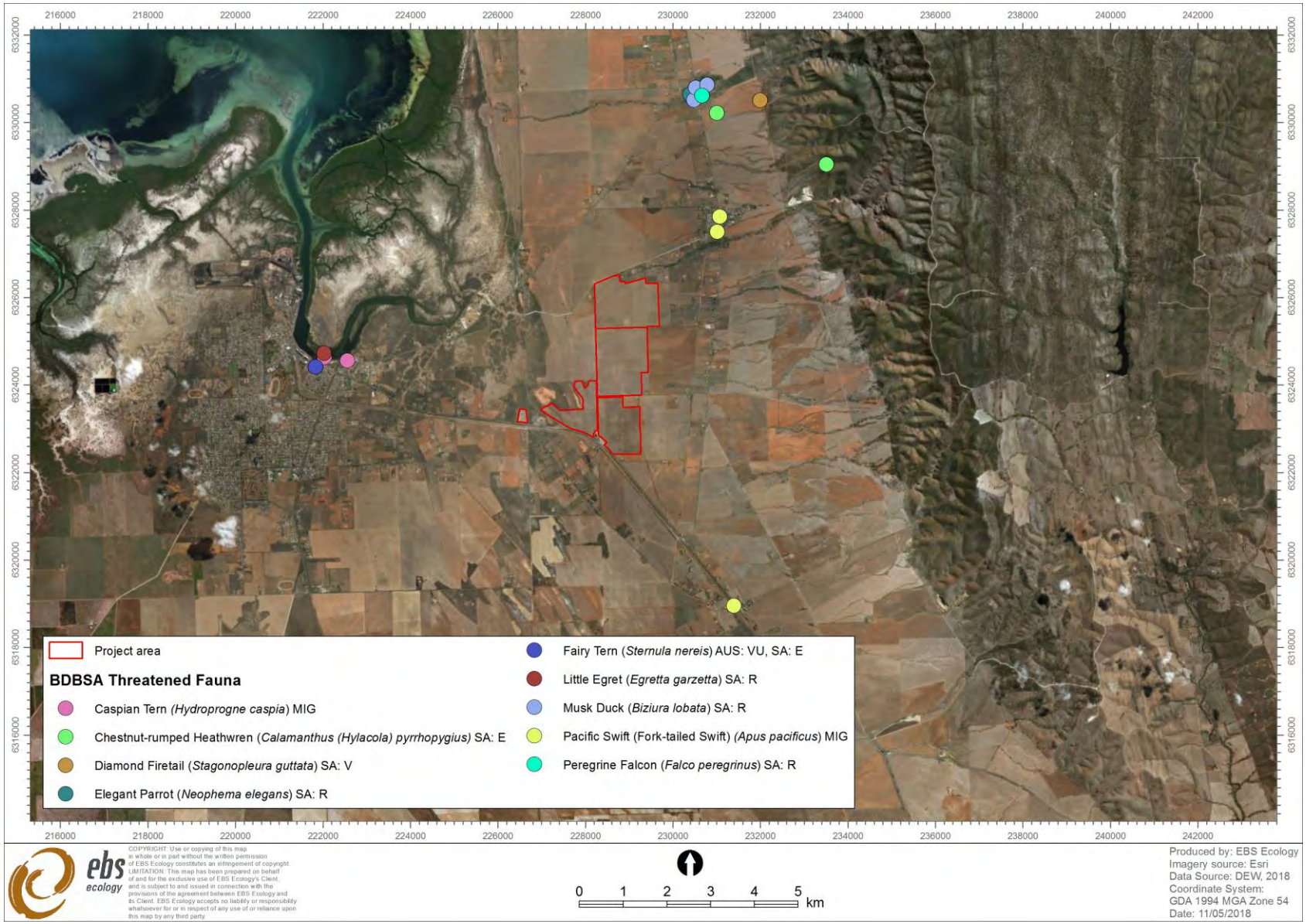


Figure 4. BDBSA records of threatened fauna species recorded within 5 km of the Project area (DEW 2018).

5.1.7 Invasive species

The EPBC Act PMST report identified 15 invasive fauna and nine invasive flora species within 5 km of the Project area. Eight invasive fauna species were determined likely to occur within the Project area. While five flora species were determined to possibly occur within the Project area (Table 8).

Table 8. Invasive flora and fauna species potentially occurring within 5 km of the Project area identified in the PMST database search (DotEE 2018).

Scientific name	Common name	Status[1]	Likelihood of occurrence within Project area
AVES	**Birds**		
Alauda arvensis	Skylark		Likely
Anas platyrhynchos	Mallard		Unlikely
Carduelis carduelis	European Goldfinch		Possible
Columba livia	Domestic Pigeon		Possible
Passer domesticus	House Sparrow		Likely
Streptopelia chinensis	Spotted Turtle-dove		Likely
Sturnus vulgaris	Common Starling		Likely
Turdus merula	Common Blackbird		Possible
MAMMALIA	**Mammals**		
Capra hircus	Goat		Unlikely
Felis catus	Cat		Likely
Lepus capensis	Brown Hare		Unlikely
Mus musculus	House Mouse		Likely
Oryctolagus cuniculus	European Rabbit		Likely
Rattus rattus	Black Rat		Possible
Vulpes vulpes	European Red Fox		Likely
PLANTAE	**Plants**		
Asparagus asparagoides	Bridal Creeper	WoNS, D	Unlikely
Austrocylindropuntia spp.	Prickly Pears	WoNS, D	Possible
Carrichtera annua	Ward's Weed	WoNS, E	Possible
Chrysanthemoides monilifera	Bitou Bush / Boneseed	WoNS, D	Unlikely
Lycium ferocissimum	African Boxthorn	WoNS, D	Possible
Opuntia spp.	Prickly Pears	WoNS, D	Possible
Rubus fruticosus aggregate	European Blackberry	WoNS, D	Unlikely
Salix spp.	Willows	WoNS, D, E	Unlikely
Solanum elaeagnifolium	Silver Nightshade	WoNS, D	Possible

[1]**Status**
WoNS: Weed of National Significance (*Environment Protection and Biodiversity Conservation Act 1999*). D: Declared (*Natural Resources Management Act 2004*). E: Environmental weed (Department of Planning, Transport and Infrastructure).

5.2 Survey design and site identification

5.2.1 Vegetation assessment

Aerial imagery and the preliminary layout of the Project area (Figure 1) showed that there are small patches of (potentially native) vegetation that are located outside of the proposed footprint, and that small patches of native vegetation within the Project area will be avoided. However some scattered

trees/shrubs may be located within the proposed BS construction footprint, which can only be determined by ground truthing the Project area. Therefore, a vegetation survey will be conducted by accredited consultants in accordance with the Scattered Tree Assessment Method (STAM), which was devised by the NVC in 2017 (NVC 2017). The STAM is suitable for assessing scattered trees in the following instances:

- Individual scattered trees (i.e. canopy does not overlap). Spatial distribution of trees may vary from approach what would be considered their pre-European distribution through to single isolated trees in the middle of a paddock; or
- Dead trees (when a dead tree is considered native vegetation); or
- Clumps of trees (contiguous overlapping canopies) if the clump is small (~<0.1 ha); and
- For both scattered trees and clumps:
    - The ground layer comprising wholly or largely of introduced species;
    - Some scattered colonising native species may be present, but represents <5% of the ground cover; and
    - The area around the trees consists of introduced pasture or crops.

Scattered trees are scored using a Point Scoring System (PSS), which facilitates the consistent and quantifiable assessment of the relative biodiversity value of a tree. This process assists in determining if clearance is at variance with the principles of clearance in Schedule 1 of the NV Act, particularly Principle 1(b) – Wildlife habitat. The PSS is also used in the calculation of the Significant Environmental Benefit (SEB) requirements.

During the assessment the following metrics of the PSS will be recorded:

- General information – date of inspection, inspectors, number of trees, name of applicant etc.;
- Photo;
- GPS point;
- Species – to subspecies level;
- Height (m);
- Diameter of trunk (cm) – recorded at 1.5 m above the ground;
- Health – % canopy dieback; and
- Hollows – number and size (Small = <5 cm, Medium = 5-15 cm, Large >15 cm).

5.2.2 Opportunistic fauna survey

Any opportunistic fauna sightings will be recorded as the Project area is traversed during the vegetation assessment. All fauna species observed, signs of fauna (i.e. scats, burrows, nests and skeletons) and potential habitat for fauna (e.g. hollows) will be recorded. In particular, scattered trees will be assessed for potential nesting (in tree hollows and spouts) and roosting habitat for the state rare Elegant Parrot (*Neophema elegans*) and Peregrine Falcon (*Falco peregrinus*).

6 DISCUSSION

6.1 Potential threatening processes

Potential impacts were assessed in relation to vegetation and fauna within the Project area and considered through elements of the project from pre-construction through to establishment of the proposed BS in South Australia.

Based on existing knowledge of potential receptors, the preliminary risks are summarised below:

- Invasion and spread of weeds and pest fauna species/pets;
- Loss of habitat and feeding opportunities via clearance/damage to nesting sites/dens for common fauna species;
- Loss of feeding and roosting habitat for nationally listed fauna species;
- Loss of feeding opportunities for threatened fauna that may visit the site on an irregular basis;
- Displacement due to habitat loss;
- Reduction in terrestrial fauna movement along existing corridors;
- Mortality via collision with vehicles associated with the BS operations; and
- Disturbance effects (e.g. impact on breeding activities, habitat suitability, flight pathways).

6.2 Protected areas

Both of the TECs identified in the EPBC Act PMST report were considered unlikely to occur in the Project area.

The Project area falls within the distribution of Peppermint Box (*Eucalyptus odorata*) Grassy Woodland and Subtropical and Temperate Coastal Saltmarsh. However, besides scattered native trees, the majority of the Project area has been entirely cleared of remnant vegetation and subsequently cropped, and remaining vegetation patches will be avoided. Therefore, it is unlikely that these TECs occur within the Project area.

6.3 Threatened flora

All of the national and state threatened flora species identified in the EPBC Act PMST report and BDBSA search were considered unlikely to occur within Project area. This is because, besides scattered native trees, the BS Project area has been entirely cleared of remnant vegetation and has been subsequently cropped, and remaining vegetation patches will be avoided.

6.4 Threatened fauna

Besides scattered native trees, the majority of the Project area has been entirely cleared of remnant vegetation and subsequently cropped, and remaining vegetation patches will be avoided. It was therefore determined that a total of two matters of national environmental significance could occur within the

Project area: the migratory Fork-tailed Swift (*Apus pacificus*) and Osprey (*Pandon haliaetus*). Both these species are expected to only fly over the Project area.

Scattered trees can be of high value in terms of habitat and movement pathways for protected species. Within the Project area this includes the state rare Elegant Parrot (*Neophema elegans*) and Peregrine Falcon (*Falco peregrinus*), which were determined to possibly occur.

6.5 Conclusion

A field component will verify the presence of any threatened flora and fauna records as well as determine the potential for habitat for threatened flora and fauna. Ground-truthing within the Project area is required to determine the presence of scattered trees and to assess if trees are of high value. Targeted flora surveys are recommended to ground-truth the findings of the desktop study and to confirm the presence of threatened flora species within the BS Project area The field surveys should aim to determine the presence and significance of the scattered trees as habitat (roosting, feeding, nesting, movement etc.) for these two above mentioned bird species.

Field data, combined with database records and background research, is part the way to providing an adequately detailed assessment of the flora and fauna that occurs, and is likely to occur, within the BS Project area in South Australia.

All native vegetation within the Project area is covered by the *Native Vegetation Act 1991* and any proposed clearance will need to be assessed against native vegetation principles and regulations. A clearance application to the Native Vegetation Council may be required.

7 REFERENCES

Atlas of Living Australia (ALA) (2018) Atlas of Living Australia. Available at http://www.ala.org.au [Accessed 18 April 2018]

Bureau of Meteorology (BOM) (2018) Climate data online. Available at http://www.bom.gov.au/climate/data/ [Accessed 18 April 2018]

Department of the Environment and Energy (DotEE) (2018) EPBC Act Protected Matters Report. http://www.environment.gov.au/erin/ert/epbc/index.html [Report created 18 April 2018]

Department of Environment and Water (DEW) (2018) Biological Database of South Australia. [Data sourced 18 April 2018]

Department of Environment, Water and Natural Resources (DEWNR) (2011) IBRA version 7.0.

Native Vegetation Council (NVC) (2017) Scattered Tree Assessment Manual, Native Vegetation Management Unit. Available at http://www.environment.sa.gov.au/managing-natural-resources/native-vegetation/clearing-offsetting/vegetation-assessments [Accessed 18 April 2018]

8 APPENDICES

Appendix 1. Flora species recorded in the BDBSA within 5 km of the Project area (DEW 2018).

*	Scientific name	Common name	Conservation status		Last sighting (year)
			Aus	SA	
	Acacia calamifolia (NC)	Wallowa			1998
	Acacia continua	Thorn Wattle			1979
	Acacia iteaphylla	Flinders Ranges Wattle		R	2000
	Acacia ligulata	Umbrella Bush			2000
	Acacia ligulata (NC)	Umbrella Bush			1992
	Acacia montana	Mallee Wattle		R	1979
	Acacia oswaldii	Umbrella Wattle			2000
	Acacia papyrocarpa	Western Myall			1983
	Acacia rupicola	Rock Wattle			1992
	Acacia salicina	Willow Wattle			1998
	Acacia sp.	Wattle			2003
	Acacia victoriae ssp.	Elegant Wattle			2000
	Acacia victoriae ssp. victoriae	Elegant Wattle			1992
	Actinobole uliginosum	Flannel Cudweed			1932
	Alectryon oleifolius ssp. canescens	Bullock Bush			1998
	Allocasuarina muelleriana ssp. muelleriana	Common Oak-bush			1978
	Allocasuarina verticillata	Drooping Sheoak			1900
	Alternanthera denticulata	Lesser Joyweed			1997
	Alyogyne huegelii	Native Hibiscus			1979
	Amaranthus grandiflorus	Large-flower Amaranth			1975
	Amyema miquelii	Box Mistletoe			1982
*	*Anethum graveolens*				1992
*	*Arctotheca calendula*	Cape Weed			1992
	Aristida contorta	Curly Wire-grass			1998
	Asperula conferta	Common Woodruff			1993
*	*Asphodelus fistulosus*	Onion Weed			2003
	Atriplex eardleyae	Eardley's Saltbush			1993
	Atriplex leptocarpa	Slender-fruit Saltbush			1993
	Atriplex lindleyi ssp. lindleyi	Baldoo			1992
	Atriplex nummularia ssp. nummularia	Old-man Saltbush			1988
	Atriplex paludosa ssp. cordata	Marsh Saltbush			2003
	Atriplex vesicaria	Bladder Saltbush			1992
	Austrostipa elegantissima	Feather Spear-grass			2002
	Austrostipa eremophila	Rusty Spear-grass			1992
	Austrostipa nitida	Balcarra Spear-grass			2002
	Austrostipa nodosa	Tall Spear-grass			2005
*	*Avena barbata*	Bearded Oat			2003
	Beyeria lechenaultii	Pale Turpentine Bush			1992
	Boerhavia dominii	Tar-vine			1992
	Boerhavia dominii (NC)	Tar-vine			1992
	Bothriochloa ewartiana	Desert Blue-grass			2003

*	Scientific name	Common name	Conservation status		Last sighting (year)
			Aus	SA	
	Brachyscome ciliaris var. subintegrifolia			R	1978
*	*Brassica tournefortii*	Wild Turnip			1992
*	*Bromus diandrus*	Great Brome			1992
*	*Bromus diandrus (NC)*	Great Brome			2003
*	*Bromus madritensis*	Compact Brome			1992
*	*Bromus rubens*	Red Brome			1992
	Bulbine semibarbata	Small Leek-lily			1992
	Callistemon teretifolius	Needle Bottlebrush			1900
	Callitris glaucophylla	White Cypress-pine			1992
	Calostemma purpureum	Pink Garland-lily			1992
	Calotis hispidula	Hairy Burr-daisy			1906
	Calytrix tetragona	Common Fringe-myrtle			1992
*	*Cardamine flexuosa*	Wood Bitter-cress			1998
*	*Carduus tenuiflorus*	Slender Thistle			1992
*	*Carrichtera annua*	Ward's Weed			1992
*	*Carthamus lanatus*	Saffron Thistle			2003
	Cassinia laevis ssp. laevis	Curry Bush			1992
*	*Casuarina glauca*	Grey Buloak			1989
	Casuarina pauper	Black Oak			1992
*	*Cenchrus ciliaris*	Buffel Grass			2014
*	*Cenchrus setaceus*	Fountain Grass			2014
	Cheilanthes lasiophylla	Woolly Cloak-fern			1943
*	*Chloris gayana*	Rhodes Grass			1998
*	*Chloris virgata*	Feather-top Rhodes Grass			2014
*	*Chrozophora tinctoria*	Dyer's Litmus Plant			1997
	Chrysocephalum apiculatum (NC)	Common Everlasting			1992
	Convolvulus erubescens/remotus (NC)	Native Bindweed			1992
	Convolvulus remotus	Grassy Bindweed			1992
	Craspedia haplorrhiza	Billy-buttons			1906
	Crassula colorata var.	Dense Crassula			1992
*	*Critesion murinum ssp. (NC)*	Barley-grass			1992
	Cullen australasicum	Tall Scurf-pea			1998
*	*Cynodon dactylon (NC)*	Couch			2003
	Cyrtostylis reniformis	Small Gnat-orchid			1998
*	*Datura stramonium*	Common Thorn-apple			1988
	Daucus glochidiatus	Native Carrot			1992
	Daviesia genistifolia	Broom Bitter-pea			1992
	Dianella revoluta var. revoluta	Black-anther Flax-lily			1992
	Disphyma crassifolium ssp. clavellatum	Round-leaf Pigface			1992
*	*Dittrichia graveolens*	Stinkweed			1992
	Dodonaea viscosa ssp. angustissima	Narrow-leaf Hop-bush			1998
	Dodonaea viscosa ssp. spatulata	Sticky Hop-bush			1992
	Dysphania cristata	Crested Crumbweed			1992

*	Scientific name	Common name	Conservation status		Last sighting (year)
			Aus	SA	
*	*Echium plantagineum*	Salvation Jane			2003
*	*Ehrharta calycina*	Perennial Veldt Grass			1998
*	*Ehrharta longiflora*	Annual Veldt Grass			1992
	Einadia nutans ssp.	Climbing Saltbush			1992
	Elatine gratioloides	Waterwort		R	1997
	Enchylaena tomentosa var. tomentosa	Ruby Saltbush			1992
	Enneapogon nigricans	Black-head Grass			1992
	Enteropogon acicularis (NC)	Umbrella Grass			1992
*	*Eragrostis cilianensis*	Stink Grass			1997
*	*Eragrostis curvula*	African Love-grass			2014
	Eragrostis falcata	Sickle Love-grass			1992
*	*Eragrostis minor*	Small Stink-grass			1997
*	*Eragrostis trichophora*	Hairyflower Lovegrass			2014
	Eremophila alternifolia	Narrow-leaf Emubush			1978
	Eremophila glabra (NC)	Tar Bush			1992
	Eremophila glabra ssp. glabra	Tar Bush			1994
	Eremophila longifolia	Weeping Emubush			2000
	Erodium crinitum	Blue Heron's-bill			1992
	Eucalyptus camaldulensis ssp.	River Red Gum			1998
	Eucalyptus leptophylla	Narrow-leaf Red Mallee			2000
	Eucalyptus odorata	Peppermint Box			1952
	Eucalyptus porosa	Mallee Box			1992
	Eucalyptus socialis (NC)	Beaked Red Mallee			1992
	Eucalyptus socialis ssp. socialis	Beaked Red Mallee			2000
	Eucalyptus sp.				2003
	Euchiton sphaericus	Annual Cudweed			1992
	Euphorbia tannensis ssp. eremophila	Desert Spurge			1946
*	*Euphorbia terracina*	False Caper			1992
*	*Eustachys distichophylla*	Evergreen Chloris			1981
	Exocarpos sparteus	Slender Cherry			1994
*	*Galenia pubescens var. pubescens*	Coastal Galenia			2003
*	*Galenia secunda*	Galenia			1998
*	*Galium aparine*	Cleavers			1998
*	*Galium spurium*	Bedstraw			1978
	Gonocarpus elatus	Hill Raspwort			1992
	Goodenia albiflora	White Goodenia			1932
	Grammosolen dixonii				1981
	Grevillea huegelii	Comb Grevillea			1992
	Hakea leucoptera ssp. leucoptera	Silver Needlewood			1932
	Hakea rugosa	Dwarf Hakea			1978
	Halosarcia sp. (NC)	Samphire			2003
*	*Helianthus annuus*	Sunflower			1998
*	*Hordeum glaucum*	Blue Barley-grass			2003
*	*Hordeum sp.*	Barley-grass			1992

*	Scientific name	Common name	Conservation status		Last sighting (year)
			Aus	SA	
	Hormophysa cuneiformis				2010
	Hyalosperma semisterile	Orange Sunray			1978
	Hybanthus monopetalus	Slender Violet			1978
*	*Hypochaeris glabra*	Smooth Cat's Ear			1992
*	*Hypochaeris radicata*	Rough Cat's Ear			1992
	Juncus aridicola	Inland Rush			1987
	Juncus bufonius	Toad Rush			1987
*	*Lactuca serriola (NC)*	Prickly Lettuce			2003
*	*Lamarckia aurea*	Toothbrush Grass			1992
	Leiocarpa tomentosa	Woolly Plover-daisy			1994
*	*Limonium sinuatum*	Notch-leaf Sea-lavender			2000
*	*Lolium perenne*	Perennial Ryegrass			1992
	Lomandra effusa	Scented Mat-rush			1992
	Lomandra multiflora ssp. dura	Hard Mat-rush			1978
	Lotus cruentus	Red-flower Lotus			1993
*	*Lycium ferocissimum*	African Boxthorn			1998
	Maireana brevifolia	Short-leaf Bluebush			2003
*	*Malva parviflora*	Small-flower Marshmallow			1992
	Malva preissiana	Australian Hollyhock			1979
*	*Marrubium vulgare*	Horehound			1998
*	*Matthiola longipetala ssp. bicornis*	Two-horned Stock			1989
*	*Medicago littoralis*	Strand Medic			1939
*	*Medicago minima var. minima*	Little Medic			1992
*	*Medicago polymorpha var. polymorpha*	Burr-medic			2000
	Melaleuca lanceolata	Dryland Tea-tree			2000
*	*Melilotus indicus*	King Island Melilot			1992
*	*Mesembryanthemum crystallinum*	Common Iceplant			1992
*	*Mesembryanthemum nodiflorum*	Slender Iceplant			1992
	Millotia myosotidifolia	Broad-leaf Millotia			1978
*	*Misopates orontium*	Lesser Snapdragon			1992
	Myoporum insulare	Common Boobialla			2000
	Myoporum montanum	Native Myrtle			2000
	Myoporum platycarpum ssp.	False Sandalwood			1992
	Myoporum viscosum	Sticky Boobialla			1994
	Myriophyllum verrucosum	Red Milfoil			1997
	Nicotiana sp.	Tobacco			1992
	Nitraria billardierei	Nitre-bush			2003
*	*Oenothera stricta ssp. stricta*	Common Evening Primrose			2000
*	*Olea europaea ssp. europaea*	Olive			2005
	Olearia pimeleoides	Pimelea Daisy-bush			1978
*	*Opuntia ficus-indica*	Indian Fig			2006
*	*Opuntia puberula*				2006
	Oxalis perennans (NC)	Native Sorrel			1992
*	*Oxalis pes-caprae*	Soursob			1992
*	*Parapholis incurva*	Curly Ryegrass			1992

*	Scientific name	Common name	Conservation status		Last sighting (year)
			Aus	SA	
	Parietaria cardiostegia	Mallee Smooth-nettle			1978
*	*Pentameris airoides ssp. airoides*	False Hair-grass			1992
	Persicaria prostrata	Creeping Knotweed			1997
	Phyllanthus saxosus	Rock Spurge			1994
	Pimelea microcephala ssp. microcephala	Shrubby Riceflower			1992
	Pimelea stricta	Erect Riceflower			1982
*	*Piptatherum miliaceum*	Rice Millet			2014
	Pittosporum angustifolium	Native Apricot			2000
*	*Polycarpon tetraphyllum*	Four-leaf Allseed			1992
	Polygonum plebeium	Small Knotweed			1997
	Pomaderris paniculosa ssp. paniculosa	Mallee Pomaderris			1982
	Portulaca oleracea	Common Purslane			1997
	Prostanthera sp.	Mintbush			2009
	Pultenaea largiflorens	Twiggy Bush-pea			1978
*	*Rapistrum rugosum ssp. rugosum*	Turnip Weed			1998
*	*Reichardia tingitana*	False Sowthistle			1992
	Rhagodia parabolica	Mealy Saltbush			1904
	Rhagodia spinescens	Spiny Saltbush			1992
	Rhodanthe haigii	Haig's Everlasting			1900
*	*Rostraria cristata*	Annual Cat's-tail			1992
*	*Rumex crispus*	Curled Dock			2003
*	*Rumex hypogaeus*	Three-corner Jack			1992
	Rytidosperma caespitosum	Common Wallaby-grass			1992
	Salsola australis	Buckbush			1992
*	*Salvia aethiopis*	Woolly Sage			1946
*	*Salvia verbenaca var. verbenaca*	Wild Sage			1992
	Santalum acuminatum	Quandong			1992
	Santalum lanceolatum	Plumbush			1994
	Santalum spicatum	Sandalwood		V	1992
	Sarcocornia quinqueflora	Beaded Samphire			2003
	Scaevola spinescens	Spiny Fanflower			1992
*	*Schinus molle*	Pepper-tree			1998
*	*Schismus barbatus*	Arabian Grass			1992
	Sclerolaena diacantha	Grey Bindyi			1988
	Sclerolaena patenticuspis	Spear-fruit Bindyi			1992
	Senecio glossanthus	Annual Groundsel			1930
	Senna artemisioides ssp. petiolaris				2000
	Sida fibulifera	Pin Sida			1997
	Sida intricata	Twiggy Sida			1997
	Sida petrophila	Rock Sida			1932
*	*Silene gallica var.*	French Catchfly			1992
*	*Silene gallica var. gallica*	French Catchfly			1932
*	*Silene nocturna*	Mediterranean Catchfly			1992
*	*Sisymbrium erysimoides*	Smooth Mustard			1992

*	Scientific name	Common name	Conservation status		Last sighting (year)
			Aus	SA	
*	*Sisymbrium orientale*	Indian Hedge Mustard			2000
*	*Sisymbrium sp.*	Wild Mustard			1998
	Solanum coactiliferum	Tomato-bush			1974
*	*Solanum elaeagnifolium*	Silver-leaf Nightshade			1983
	Solanum eremophilum	Rare Nightshade		R	1997
	Solanum esuriale	Quena			1964
*	*Solanum nigrum*	Black Nightshade			1992
	Solanum oligacanthum	Desert Nightshade			2012
	Solanum petrophilum	Rock Nightshade			1976
	Solanum simile	Kangaroo Apple			1979
*	*Sonchus oleraceus*	Common Sow-thistle			1992
*	*Spergularia diandra*	Lesser Sand-spurrey			1960
	Spyridium stenophyllum ssp. renovatum	Forked Spyridium			1978
	Stenanthemum leucophractum	White Cryptandra			1901
*	*Suaeda aegyptiaca*				2000
	Suaeda australis	Austral Seablite			1992
	Tecticornia halocnemoides ssp. longispicata	Grey Samphire			1967
	Tecticornia indica ssp. leiostachya	Brown-head Samphire			1992
	Tecticornia pergranulata ssp.	Black-seed Samphire			2003
	Tecticornia pergranulata ssp. pergranulata	Black-seed Samphire			1998
	Tetragonia eremaea	Desert Spinach			1992
	Tetragonia implexicoma	Bower Spinach			2000
	Tetragonia tetragonoides	New Zealand Spinach			1978
	Teucrium corymbosum	Rock Germander			1976
	Tribulus minutus				1997
*	*Trifolium arvense var. arvense*	Hare's-foot Clover			1992
*	*Trifolium campestre*	Hop Clover			1992
	Unidentified sp.				1998
*	*Vicia monantha*	Spurred Vetch			1992
	Vittadinia cervicularis var. cervicularis	Waisted New Holland Daisy			1992
	Vulpia bromoides/myuros				1992
*	*Vulpia myuros f. myuros*	Rat's-tail Fescue			1992
	Wahlenbergia gracilenta	Annual Bluebell			1978
	Wahlenbergia luteola	Yellow-wash Bluebell			1992
	Wahlenbergia stricta ssp. stricta	Tall Bluebell			1992
	Xanthorrhoea quadrangulata	Rock Grass-tree			1963
	Zygophyllum billardierei (NC)	Coast Twinleaf			1992

Aus: Australia (*Environment Protection and Biodiversity Conservation Act 1999*). SA: South Australia (*National Parks and Wildlife Act 1972*). Conservation codes: CE: Critically Endangered. EN/E: Endangered. VU/V: Vulnerable. R: Rare. *: Introduced.

Appendix 2. Fauna species recorded in the BDBSA within 5 km of the Project area (DEW 2018).

*	Scientific name	Common name	Conservation status	Last sighting

			Aus	SA	(year)
	Acanthagenys rufogularis	Spiny-cheeked Honeyeater			2003
	Acanthiza chrysorrhoa	Yellow-rumped Thornbill			2001
	Acanthiza nana	Yellow Thornbill			1999
	Acanthiza uropygialis	Chestnut-rumped Thornbill			2000
	Accipiter cirrocephalus cirrocephalus	Collared Sparrowhawk			1999
	Accipiter fasciatus	Brown Goshawk			2000
	Acrocephalus australis	Australian Reed Warbler			2001
	Anas gracilis	Grey Teal			2003
	Anas superciliosa	Pacific Black Duck			2003
	Anthochaera carunculata	Red Wattlebird			2003
	Aprasia inaurita	Red-tailed Worm-lizard			1990
	Apus pacificus	Pacific Swift (Fork-tailed Swift)			2003
	Ardea alba modesta	Great Egret			2006
	Ardea pacifica	White-necked Heron			2001
	Artamus cinereus	Black-faced Woodswallow			2000
	Artamus cyanopterus	Dusky Woodswallow			1999
	Aythya australis	Hardhead			2002
	Barnardius zonarius	Australian Ringneck			2006
	Biziura lobata	Musk Duck		R	2002
	Cacomantis pallidus	Pallid Cuckoo			2000
	Calamanthus (Hylacola) pyrrhopygius	Chestnut-rumped Heathwren		E	1984
	Caligavis chrysops samueli	Yellow-faced Honeyeater (MLR, southern FR)			2002
*	*Capra hircus*	Goat (Feral Goat)			2010
	Chalcites lucidus	Shining Bronze Cuckoo			2000
	Chroicocephalus novaehollandiae	Silver Gull			2006
	Cincloramphus mathewsi	Rufous Songlark			2001
	Circus assimilis	Spotted Harrier			1999
	Colluricincla harmonica	Grey Shrikethrush			2003
*	*Columba livia*	Feral Pigeon			2006
	Coracina novaehollandiae	Black-faced Cuckooshrike			2003
	Corvus coronoides	Australian Raven			2002
	Corvus mellori	Little Raven			2003
	Corvus sp.	crows			2000
	Coturnix pectoralis	Stubble Quail			2000
	Cracticus torquatus	Grey Butcherbird			2001
	Crinia signifera	Common Froglet			2002
	Cryptoblepharus pannosus	Speckled Wall Skink			1985
	Ctenophorus decresii	Tawny Dragon			1979
	Cygnus atratus	Black Swan			2001
	Dacelo novaeguineae	Laughing Kookaburra			2000
	Diplodactylus furcosus	Ranges Stone Gecko			1989
	Egretta garzetta	Little Egret		R	2002
	Egretta novaehollandiae	White-faced Heron			2001
	Elanus axillaris	Black-shouldered Kite			2001
	Elseyornis melanops	Black-fronted Dotterel			2001

*	Scientific name	Common name	Conservation status		Last sighting (year)
			Aus	SA	
	Eolophus roseicapilla	Galah			2006
	Erythrogonys cinctus	Red-kneed Dotterel			2002
	Falco berigora	Brown Falcon			2000
	Falco cenchroides	Nankeen Kestrel			2002
	Falco peregrinus	Peregrine Falcon		R	2000
	Fulica atra	Eurasian Coot			2002
	Gavicalis virescens	Singing Honeyeater			2006
	Gehyra lazelli	Southern Rock Dtella			1950
	Geopelia placida	Peaceful Dove			2006
	Gliciphila melanops	Tawny-crowned Honeyeater			2002
	Grallina cyanoleuca	Magpielark			2003
	Gymnorhina tibicen	Australian Magpie			2006
	Haliastur sphenurus	Whistling Kite			2002
	Hemiergis decresiensis	Three-toed Earless Skink			1985
	Hieraaetus morphnoides	Little Eagle			2004
	Hirundo neoxena	Welcome Swallow			2003
	Hydroprogne caspia	Caspian Tern			2001
	Lalage tricolor	White-winged Triller			2000
	Larus pacificus	Pacific Gull			2001
	Lerista dorsalis	Southern Four-toed Slider			1990
	Lerista edwardsae	Myall Slider			1969
	Limnodynastes dumerilii	Banjo Frog			2001
	Limnodynastes tasmaniensis	Spotted Marsh Frog			2001
	Macropus robustus	Euro			2001
	Malacorhynchus membranaceus	Pink-eared Duck			2002
	Malurus lamberti	Variegated Fairywren			2004
	Malurus leucopterus	White-winged Fairywren			2003
	Manorina flavigula	Yellow-throated Miner			2006
	Megalurus gramineus	Little Grassbird			2001
	Menetia greyii	Dwarf Skink			2000
	Merops ornatus	Rainbow Bee-eater			1999
	Microcarbo melanoleucos melanoleucos	Little Pied Cormorant			2002
	Milvus migrans	Black Kite			2002
	Neobatrachus pictus	Burrowing Frog			2001
	Neophema elegans	Elegant Parrot		R	2000
	Ocyphaps lophotes	Crested Pigeon			2006
	Pachycephala pectoralis	Golden Whistler			1981
	Pachycephala rufiventris rufiventris	Rufous Whistler			2004
	Parasuta spectabilis	Mallee Black-headed Snake			2000
	Pardalotus striatus	Striated Pardalote			2006
*	*Passer domesticus*	House Sparrow			2006
	Pelecanus conspicillatus	Australian Pelican			2006
	Petrochelidon nigricans	Tree Martin			2001
	Petroica goodenovii	Red-capped Robin			2001
	Phalacrocorax sulcirostris	Little Black Cormorant			2002

*	Scientific name	Common name	Conservation status		Last sighting (year)
			Aus	SA	
	Phalacrocorax varius	Great Pied Cormorant			2006
	Phaps chalcoptera	Common Bronzewing			2001
	Phylidonyris novaehollandiae	New Holland Honeyeater			2002
	Platycercus elegans	Crimson Rosella			2004
	Podargus strigoides	Tawny Frogmouth			2001
	Poliocephalus poliocephalus	Hoary-headed Grebe			2002
	Pomatostomus superciliosus	White-browed Babbler			2001
	Porzana fluminea	Australian Crake (Australian Spotted Crake)			2002
	Porzana pusilla	Baillon's Crake			2001
	Psephotus haematonotus	Red-rumped Parrot			2006
	Psephotus haematonotus haematonotus	Red-rumped Parrot (eastern SA except NE)			2000
	Pseudonaja aspidorhyncha	Patch-nosed Brown Snake			1978
	Pseudonaja textilis	Eastern Brown Snake			1985
	Ptilotula penicillata	White-plumed Honeyeater			2002
	Ptilotula plumula	Grey-fronted Honeyeater			1981
	Purnella albifrons	White-fronted Honeyeater			2003
	Rhipidura albiscapa	Grey Fantail			2004
	Rhipidura leucophrys	Willie Wagtail			2004
	Smicrornis brevirostris	Weebill			2003
*	*Spilopelia chinensis*	Spotted Dove			2006
	Stagonopleura guttata	Diamond Firetail		V	2014
	Sternula nereis	Fairy Tern	VU	E	2001
	Strophurus intermedius	Southern Spiny-tailed Gecko			1989
*	*Sturnus vulgaris*	Common Starling			2006
	Sugomel niger	Black Honeyeater			1991
	Tachybaptus novaehollandiae	Australasian Grebe			2002
	Todiramphus sanctus	Sacred Kingfisher			2003
	Tribonyx ventralis	Black-tailed Nativehen			2003
*	*Turdus merula*	Common Blackbird			2004
	Tyto delicatula delicatula	Eastern Barn Owl			2007
	Vanellus miles	Masked Lapwing			2006
	Zosterops lateralis	Silvereye			2002

Aus: Australia (*Environment Protection and Biodiversity Conservation Act 1999*). SA: South Australia (*National Parks and Wildlife Act 1972*). Conservation codes: CE: Critically Endangered. EN/E: Endangered. VU/V: Vulnerable. R: Rare. *: Introduced.

EBS Ecology
3/119 Hayward Avenue
Torrensville, SA 5031
www.ebsecology.com.au
t. 08 7127 5607
f. 08 8352 1222

APPENDIX 9

Desktop Heritage Assessment

BUNGAMA SOLAR

DESKTOP HERITAGE ASSESSMENT

Prepared for Bungama Solar

Prepared by EBS Heritage

EPS ENERGY

Reference No. 11297

November 18

BUNGAMA SOLAR

www.bungamasolar.com.au

ebs heritage

Bungama Solar

Desktop Heritage Assessment

Bungama Solar: Desktop Heritage Assessment

23 July 2018

Version 3

Prepared by EBS Heritage for Bungama Solar 1 Pty Ltd

Document Control					
Revision No.	Date issued	Authors	Reviewed by	Date Reviewed	Revision type
1	30/04/2018	Shannon Smith	Dr Marina Louter	30/04/2018	Draft
2	30/05/2018	Shannon Smith	Kate Tierney	22/05/2018	Final
3	25/07/2018	Shannon Smith	Kate Tierney	22/05/2018	Final

Distribution of Copies			
Revision No.	Date issued	Media	Issued to
1	30/04/2018	Electronic	Kate Tierney, EPS Energy
2	30/05/2018	Electronic	Kate Tierney, EPS Energy
3	25/07/2018	Electronic	Kate Tierney, EPS Energy

Project Number: G80401

COPYRIGHT: Use or copying of this document in whole or in part (including photographs) without the written permission of EBS Heritage's client and constitutes an infringement of copyright. *Notwithstanding anything to the contrary Environmental and Biodiversity Services Pty Ltd (ACN: 105 535 822 trading as EBS Group) has prepared this document for the sole us of the client including their respective heirs, successors and assigns and vests copyright of all material produced by Environmental and Biodiversity Services Pty Ltd (ACN: 105 535 822 trading as EBS Group) (but excluding pre-existing material and material in which copyright is held by a third party) in the client including their respective heirs, successors and assigns.*

LIMITATION: EBS Heritage accepts no liability or responsibility whatsoever for or in respect of any use of or reliance upon this report by any third party.

CITATION: EBS Heritage (2018) Bungama Solar: Desktop Heritage Assessment. Report to Bungama Solar Pty Ltd. EBS Heritage, Adelaide.

125 Hayward Avenue
Torrensville, South Australia 5031
t: 08 7127 5607
email: shannon.smith@ebsheritage.com.au

GLOSSARY AND ABBREVIATION OF TERMS

AHA	*Aboriginal Heritage Act* 1988
CHMP	Cultural Heritage Management Plan
DAC	Development Assessment Commission
DEW	Department of Environment and Water (formerly Department of Environment, Water and Natural Resources (DEWNR))
DPC-AAR	Department of the Premier and Cabinet – Aboriginal Affairs and Reconciliation
DSD-AAR	Department of State Development – Aboriginal Affairs and Reconciliation
EPBC Act	*Environmental Protection and Biodiversity Conservation Act 1999*
IBRA	Interim Biogeographical Regionalisation of Australia
KM	Kilometres
NTA	*Native Title Act 1993*
Project	The proposed development of the solar farm at Bungama
Project area	The land where the solar farm at Bungama is proposed to be constructed
BS	Bungama Solar
SA	South Australia / South Australian
SAM	The South Australian Museum

Table of Contents

List of Tables

List of Figures

1 INTRODUCTION

EBS Heritage has been engaged by EPS Energy to undertake a heritage desktop and risk assessment of the proposed Bungama Solar Project (BS). EBS understands that these initial investigations are necessary to determine if the proposed site is suitable for development.

The following report contains a summary of the available previous heritage work carried out for the Project area, and heritage management recommendations in light of the desktop risk assessment and the relevant heritage protection legislation.

1.1 Project area

The Project area is located near Bungama, South Australia (SA), which is approximately 5 km east of Port Pirie and 200 km north of Adelaide (Figure 1). The proposed Project area is located to the the east and north-east of of the existing substation, and consists of approximately 500 ha across four parcels of land with multiple land owners (Table 1 and Figure 1). The proposed Project area of the BS is provided in Figure 1.

Table 1: Land parcel details for the proposed Bungama Solar.

Lot Number	Address	Approx. Area of Interest (Ha)
CT 5954/187	Lot 52 Augusta Highway, Warnertown SA 5540	109
CT 5949/272	Lot 4 Augusta Highway, Warnertown SA 5540	77
CT 6217/5	Lot 558 Augusta Highway, Warnertown SA 5540	174
CT 6037/29	Lot 20 Gulf View Road, Napperby SA 5540	158.1
Total		**518.1**

1.2 Cultural Heritage Desktop Assessment Objectives

- Conduct background research including a review of heritage register searches and the SA Heritage Database as well as background research of primary and secondary sources and previous heritage reports for the Project area;
- Review archival aerial photographs where available to determine levels of historical disturbance in Project area;
- Identify State and Commonwealth legislative requirements pertinent to heritage in the current Project area;
- Determine the likelihood or risk of cultural heritage sites being present as well as the potential impacts for any known heritage within the Project area in accordance with the South Australian Aboriginal Heritage Act 1988; and
- Prepare risk management recommendations for future works and provide recommendations in relation to any potential impacts the proposed activities could have on locations of heritage significance, in light of clients' responsibilities under the South Australian *Aboriginal Heritage Act 1988.*

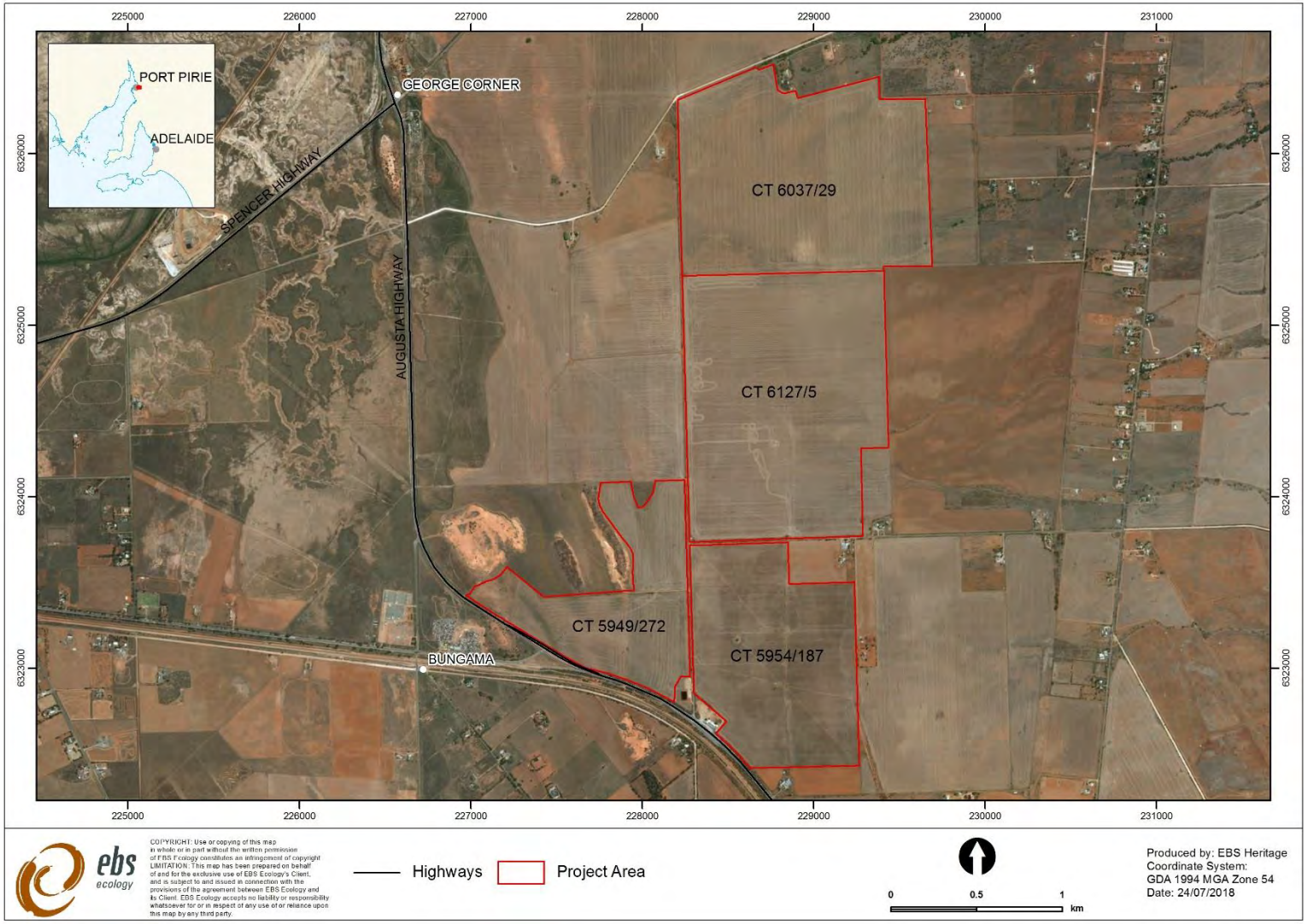


Figure 1: Location of the Project area.

2 COMPLIANCE AND LEGISLATIVE SUMMARY

2.1 Commonwealth Legislation

2.1.1 Environmental Protection & Biodiversity Conservation Act 1999 (amended 2003).

The Commonwealth *Environmental Protection and Biodiversity Conservation Act 1999* (EPBC Act) and the *Environment Protection and Biodiversity Conservation Regulations 2000* protect places of national cultural and environmental significance from damage and interference by establishing a National Heritage list (for places outside of Commonwealth land) and a Commonwealth Heritage List (for places within Commonwealth land). Under the EPBC Act any action that has, will have, or is likely to have a significant impact on a place of national culture and/or environmental significance must be referred to the Minister for the Environment for approval. The EPBC Act sets out a procedure for obtaining approval, which may include the need to prepare and environmental impact statement for the proposed action (an action is defined in section 523 to include a project, development or undertaking or an activity or series of activities).

The EPBC Act is only relevant in relation to Aboriginal heritage sites if the site is entered onto the National Heritage List or the Register of the National Estate. None of these sites are located within the Project area.

2.1.2 Aboriginal & Torres Strait Islander Heritage Protection Act 1984

The Commonwealth *Aboriginal and Torres Strait Islander Heritage Protection Act 1984* provides a mechanism for the Commonwealth Minister for Environment to make declarations regarding the protection of an Aboriginal area when the Minister is not satisfied that under State or Territory Law there is effective protection of the area from a threat of injury or desecration. Declarations made under this Act involve restricting activities and/or access to an Aboriginal site.

Under Section 21H of the *Aboriginal and Torres Strait Islander Protection Act 1984* it is an offence to conduct behaviour or partake in an action that contravenes a declaration made by the Minister. Penalties under this section are $10,000 or imprisonment for 5 years, or both for an individual, or $50,000 for a corporate body where an Aboriginal place is concerned and $5,000 and imprisonment for 2 years or both for an individual, or $25,000 for a corporate body where an Aboriginal object is concerned.

If the requirements of the South Australian Aboriginal Heritage Act are adhered to and sufficiently protect any Aboriginal heritage in the eyes of the Federal Minister, the *Aboriginal and Torres Strait Islander Heritage Protection Act 1984* will not be relevant for any cultural heritage site that may be in the Project area.

2.1.3 Native Title Act 1993

The Commonwealth *Native Title Act 1993* (NTA) is part of the Commonwealth's response to the High Court's decision in Mabo v Queensland (No.2) and adopts the common law definition of Native Title which is defined as the rights and interests that are possessed under the traditional laws and customs of Aboriginal people in lands and waters.

The NTA recognises the existence of Indigenous land ownership tradition where connections to country have been maintained and where acts of government have not extinguished this connection.

The following list is indicative of the type of land that might be subject to native title:

- Vacant Crown Land
- State forests
- National Parks
- Public Reserves
- Beaches and foreshores
- Land held by the government agencies
- Land held in trust for Aboriginal communities
- Any other public or Crown lands including oceans and inland waterways
- Pastoral leases

Under the amended NT Act, native title is extinguished by the following:

- Private freehold land,
- Valid grants of private freehold land or waters,
- Residential or commercial leases,
- Exclusive possession of leases,
- Mining dissection leases,
- Community purpose leases,
- Public works

2.2 SA State Legislation – Aboriginal Heritage

2.2.1 Native Title (SA) Act 1994

The act establishes a Register that must keep a register of native title and claims to native title in land in the State. The register is to determine whether the claim is to be registered. It is a requirement of this Act that when a developer is carrying out certain activities or development in areas where native title exists or may exist, the developer will need to consider the possible impacts of their actions on native title rights and interests. A search of National Native Title register Native Title Vision is presented in Table 2.

Table 2: Native Title Claims

Name	Tribunal No.	Status
Nukunu Native Title	SC1996/005	Accepted for registration

Contact information for the group was identified by DPC-AAR:

Nukunu Peoples Council Inc.

Chairperson: Doug Turner
Email: dmturner@internode.on.net
Mobile: 0421 612 236

2.2.2 Aboriginal Heritage Act 1988 (SA)

The South Australian *Aboriginal Heritage Act 1988* (AHA) is administered by the South Australian Department of Premier and Cabinet, Aboriginal Affairs and Reconciliation (DPC-AAR). This legislation

outlines that any Aboriginal site, object or remains whether previously recorded or not, are covered by the AHA. The Act provides the following definition of an Aboriginal site in Section 3.

“Aboriginal Site” means an area of land;

a) That is of significance according to Aboriginal tradition; and / or

b) That is of significance according to Aboriginal archaeology, anthropology or history.

The AHA states that it is an offence under Section 23 (s.23) of the AHA to ‘damage, disturb or interfere’ with an Aboriginal site, object or remains unless written authorisation is obtained from the Minister for Aboriginal Affairs and Reconciliation. Penalties for an offence under s.23 are up to $10,000 or six months’ imprisonment for an individual or $50,000 in the case of a corporate body. An owner or occupier of private land, or an employee or agent of such an owner or occupier, who discovers on the land an Aboriginal site or Aboriginal object must as soon as practicable report the discovery to the Minister. Penalties for an offence under s.20 are up to $50,000 for a body corporate and $10,000 or 6 months imprisonment for an individual.

It is also an offence under s.35 of the Act to divulge information relating to an Aboriginal site, object, remains or Aboriginal tradition without authorisation from the relevant Aboriginal group or groups. Penalties for an offence under this section are up to $10,000 or six months imprisonment.

The *Aboriginal Heritage Act 1988* is the most relevant piece of legislation for this particular project.

2.3 A State Legislation – European Heritage

2.3.1 Heritage Places Act 1993

The Heritage Places Act 1993 makes provision for the identification, recording and conservation of places and objects of non-Aboriginal heritage significance in SA. A State Heritage Place is entered in the SA Heritage Register or contained within an area established as a State Heritage Area. Once registered, State Heritage Places are protected under the Heritage Places Act 1993 and the Development Act 1993.

The Heritage Places Act 1993 is governed by the Department of Environment and Water (DEW) and the South Australian Heritage Council. No Heritage Places related to the current Project area.

Under sections 26, 27 and 28 of this act it is an offence to carry out the following actions without a permit from the Council:

- Excavate or disturb a State Heritage Place designated as a place of archaeological significance; or remove archaeological artefacts from such a place.
- Excavate or disturb any land (not designated as a place of archaeological significance) for the purpose of searching for or recovering archaeological artefacts of heritage significance; or excavate or disturb any land (not designated as a place of archaeological significance) knowing or having reasonable cause to suspect that the excavation or disturbance will or is likely to result in an archaeological artefact of heritage significance being discovered, exposed, moved, damaged or destroyed.

- Damage, destroy or dispose of an archaeological artefact removed from a State Heritage Place designated as a place of archaeological significance (whether removed before or after the entry of that place in the Register) and to damage, destroy or dispose of an object entered in the Register (either as a provisional or confirmed entry).

Penalties for any offences under section 26, 27 and 28 of the Heritage Places Act 1933 are up to $75,000.

Under section 36 of the Heritage Places Act, a person who intentionally or recklessly damages a heritage place or engages in conduct knowing that it will or might destroy or reduce the significance to a State Heritage Place can be fined a maximum penalty of $120,000.

There is no penalty if damage results from an action authorised by an approval or authorisation under the Development Act 1993.

2.3.2 Planning, Development and Infrastructure Act 2016

The Planning, Development and Infrastructure Act 2016 (PDI Act) provides for matters that are relevant to the use, development and management of land and buildings, including the provision of a planning system to regulate development within the State, rules with respect to the design, construction and use of buildings, and other initiatives to facilitate the development of infrastructure, facilities and environments that will benefit the community. The PDI Act repeals the Development Act 1993 and will gradually come into operation over a five year period.

The PDI Act deals with planning and development measures in the State and specifically deals with any proposed activity which may materially affect a heritage place of either State or local significance. The PDI Act enables local councils to include places of local heritage value into a Planning and Design Code (To replace development plans). The Planning and Design Code will be a central feature of SA's new planning system, becoming the state's single planning rulebook for assessing all development applications. It will transform complex, inconsistent planning rules found within the 72 Development Plans into a single, easy-to-access set of rules that can be applied consistently across the State.

Approval must be obtained if a site or place on the State Heritage Register is to be affected. Places of local heritage value are listed in an inventory attached to the State Heritage Register.

Where construction is likely to take place in the vicinity of heritage listed places, and direct disturbance is possible, the client should seek advice from construction, vibration and sound engineers on mitigation measures that may be required, such as buffer zones to protect the integrity of the building or structure. Where disturbance is likely the client may also need a more detailed assessment of sub-surface deposits associated with historical buildings, such as an archaeological assessment.

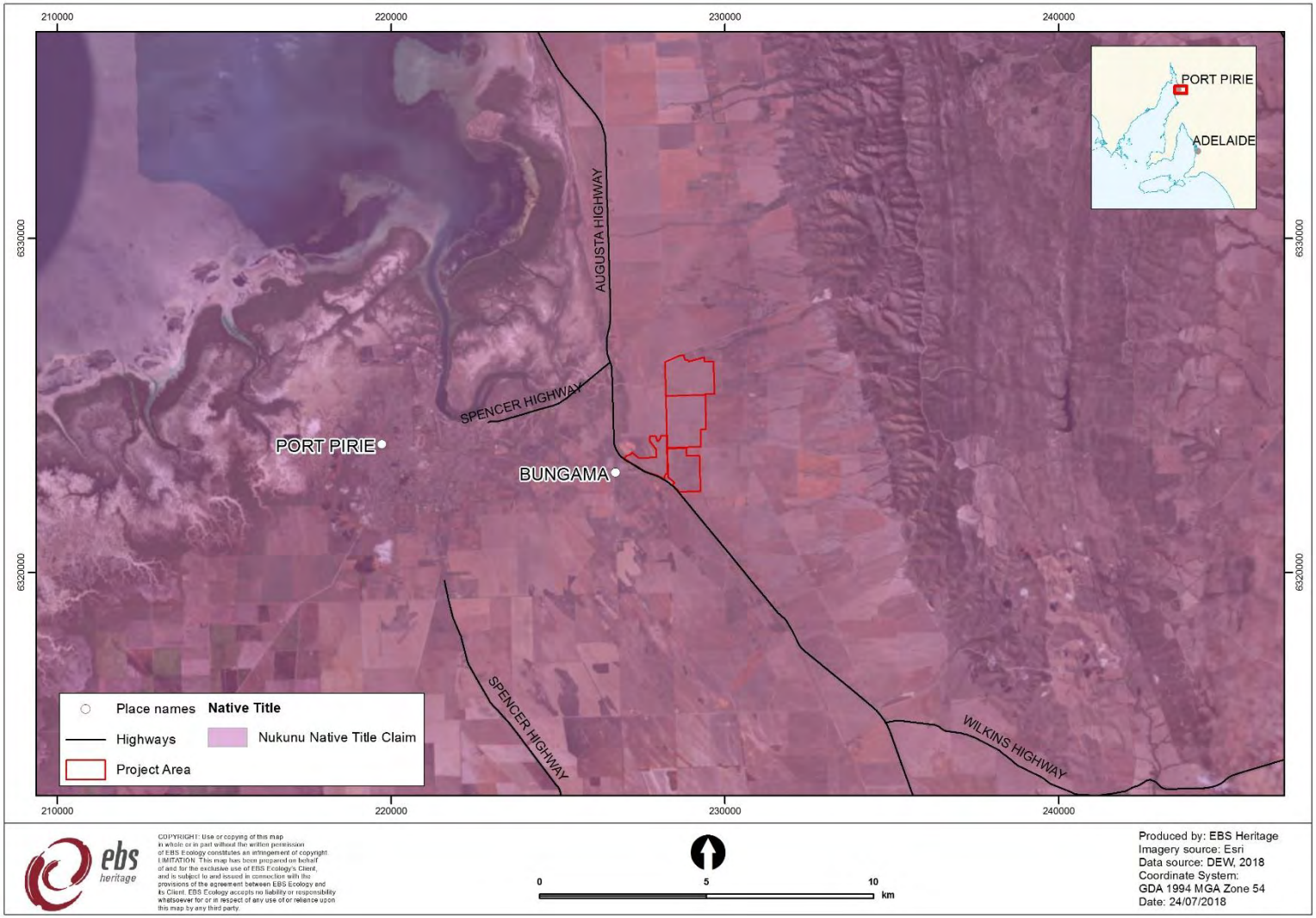


Figure 2: Native Title within in the Project area.

3 BACKGROUND INFORMATION

In order to understand the archaeological context of an area it is important to have a good understanding of local environmental landscape features. Past and present environmental factors have an impact on the type, presence and location of cultural material.

3.1 IBRA

The Interim Biogeographical Regionalisation of Australia (IBRA) identifies geographically distinct bioregions based on common climate, geology, landform, native vegetation and species information. The bioregions are further refined into subregions and environmental associations (DEWNR 2011). The Project area is located within the Eyre Yorke Block IBRA Bioregion, the St Vincent IBRA Subregion and the Nurom (to the southwest) and Glendella (to the northeast) IBRA Environmental Associations Table 3

Table 3: IBRA bioregion, subregion, and environmental association environmental landscape summary.

Eyre Yorke Block IBRA Bioregion	
Archaean basement rocks and Proterozoic sandstones overlain by undulating to occasionally hilly calcarenite and calcrete plains and areas of Aeolian quartz sands, with Mallee Woodlands, Shrublands and Heaths on calcareous earths, duplex soils and calcareous to shallow sands, now largely cleared for agriculture.	
St Vincent IBRA Subregion	
Most of this region consists of with calcrete development and shallow reddish earths. The plain is mainly dune free but isolated areas are overlain by low indistinct sand dunes. Near the Mt Lofty Ranges the plains have a definite westerly gradient and merge eastwards with the alluvial fans from the Mt Lofty Ranges. Moderately deep Red Mallee / Yorrell (*Eucalyptus socialis, E. gracilis*) association occurs throughout the region with some woodland of *E. porosa* on the plains or *E. odorata* on the hills and footslopes. The subregion has been extensively cleared and sown to crops or exotic pastures so little of the natural vegetation remains. What does remain exists on road verges and a few isolated blocks.	
Remnant vegetation	Approximately 8% (87,402 ha) of the subregion is mapped as remnant native vegetation, of which 5% (4,732 ha) is formally conserved.
Landform	Alluvial and littoral plains with NW-SE longitudinal dunes mainly stabilized in isolated areas. Near the Mt Lofty Ranges the plains have a detritic westerly gradient and merge eastwards with the alluvial fans of the ranges.
Geology	Calcrete development; some variably oriented dunes in north west of unit beyond Port Augusta. Calcareous loams. Clay rich soils, both plastic & cracking varieties.
Soil	Cracking clays, brown calcareous earths, highly calcareous loamy earths, plastic saline clay soils, hard setting loamy soils with red clayey subsoils.
Vegetation	Mixed Chenopod, Samphire or Forblands.
Conservation significance	125 species of threatened fauna, 103 species of threatened flora. 5 wetlands of national significance.
Nurom IBRA Environmental Association	
Remnant vegetation	Approximately 5% (1,740 ha) of the association is mapped as remnant native vegetation, of which 0% (0 ha) is formally conserved.
Landform	Gently undulating calcrete plain with extensive sand sheets or longitudinal dunes.
Geology	Sand and calcrete.
Soil	Crusty red duplex soils and brown calcareous sands.

Vegetation	Open scrub of beaked Red Mallee and Yorrell and Chenopod Shrubland of Saltbush.
Conservation significance	2 species of threatened fauna, 1 species of threatened flora. 1 wetlands of national significance.
Glendella IBRA Environmental Association	
Remnant vegetation	Approximately 28% (12,641 ha) of the association is mapped as remnant native vegetation, of which 13% (1,702 ha) is formally conserved.
Landform	Coalescing alluvial fans, extending from low hills onto a narrow sandy plain with tidal flats on the coastal margin.
Geology	Gravelly alluvium, alluvium, sand and quartzite.
Soil	Hard pedal red duplex soils, red calcareous earths, red friable loams and black non-cracking plastic clays.
Vegetation	Open scrub of Beaked Red Mallee and Yorrell, Chenopod Shrubland of Saltbush and Bluebush, Chenopod Shrubland of Samphire and Low Woodland of Mangroves.
Conservation significance	28 species of threatened fauna, 25 species of threatened flora. 1 wetlands of national significance.

3.2 Climate

The nearest long-term climate data was sourced from Georgetown weather station, which is approximately 34 km east / south east of the Project area. Rainfall and temperature data are indicative that the region surrounding Bungama experiences a Mediterranean climate, with cool wet winters and hot dry summers. Changes of weather are generally associated with frontal systems from southwest in the Spencer Gulf. These frontal systems are most active in winter and spring and bring reliable and frequent light to moderate rainfall. Annual average rainfall is 474.7 mm. The majority of the rainfall occurs during winter with the highest falls in June (average 58.4 mm) and July (average 57.2 mm). The mean minimum temperature ranges from 4.2°C (July) to 15.2°C (February) and the mean maximum temperature ranges from 14.2°C (July) to 31.1°C (January) (Figure 3).

Rain shapes almost all human activity in Australia. The deviation from the average and the cycles of prolific rain, which the early settlers of this region convinced themselves were normal, followed inevitably by years of drought, have shaped the economy and the way of life of the region for over 160 years (Austral Archaeology 2000).

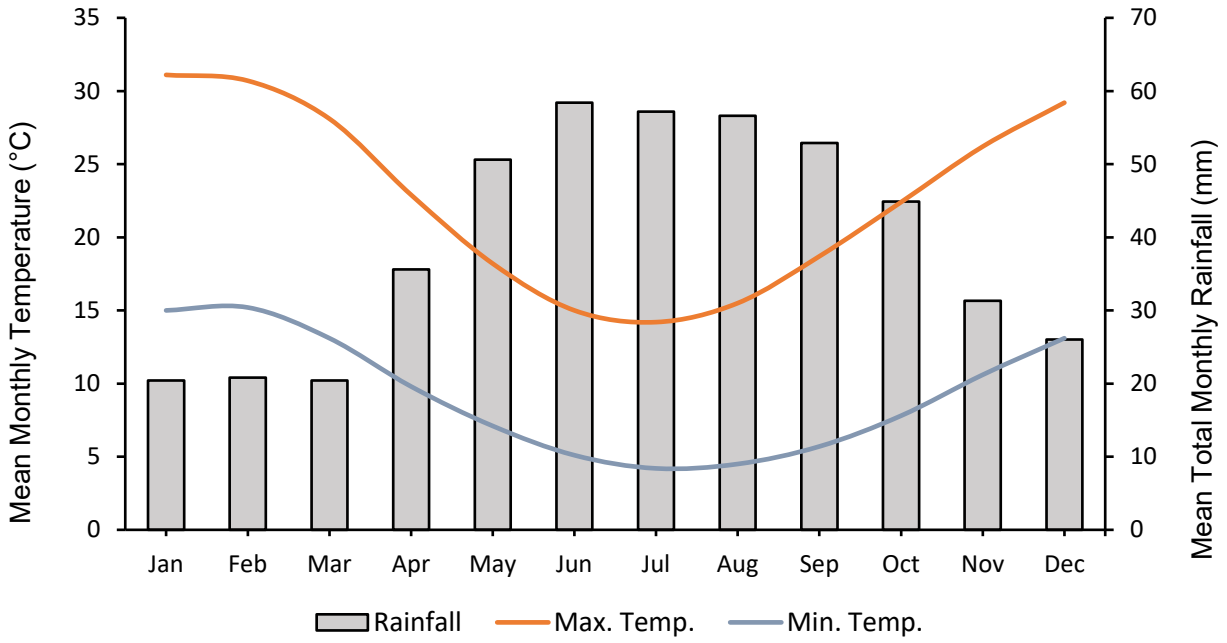


Figure 3. Mean total monthly rainfall and mean monthly maximum and minimum temperatures recorded Georgetown (station no. 21020), located 33.9 km ESE of the Project area (BOM 2018).

3.3 Soil Landscape Information

The Project area is predominantly located within plains and gentle slopes with mainly deep calcareous soils and dune / swale systems with unbleached neutral to alkaline PH sand with calcareous subsoils on dunes (Figure 4). Most descriptions of the soil within this Project area note a deep subsoil and connections to the coastal dune environment. Neutral soils are more conductive to decomposition than acidic or alkaline soils. This is important because certain soil landscapes, such as this one, have a higher risk of containing and preserving cultural material.

3.4 Hydrology

When looking at an area it is important to take into consideration the natural water sources in the region and how these would have affected the occupation of the area by past peoples. The most major waterway in the area is the Port Pirie River and its associated estuary, which is just west of the current Project area. The Port Pirie River is a tide dominated tidal flat / creek. Although this is not a freshwater source, it would have provided a food source for people living in the area. The second most important waterway is the Broughton River and the Broughton catchment area. The Broughton catchment is the major drainage system in the district and covers around 5761 Km^2 (NYNRSMB 2018). There are also a number of drainage lines that run down from the southern Flinders Ranges into the Project area (Figure 5 and Figure 6).

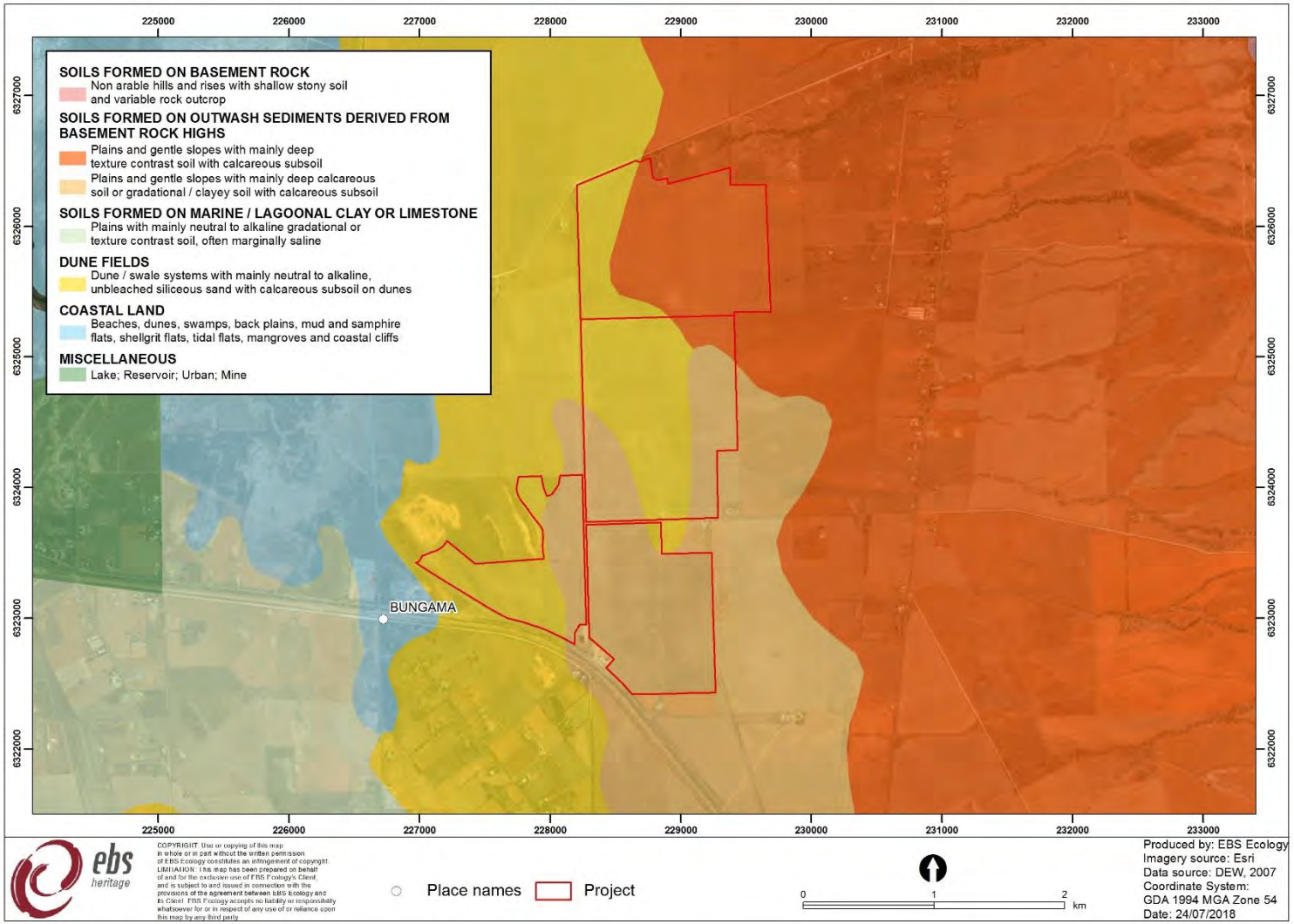


Figure 4: Soil landscape in the Project area.

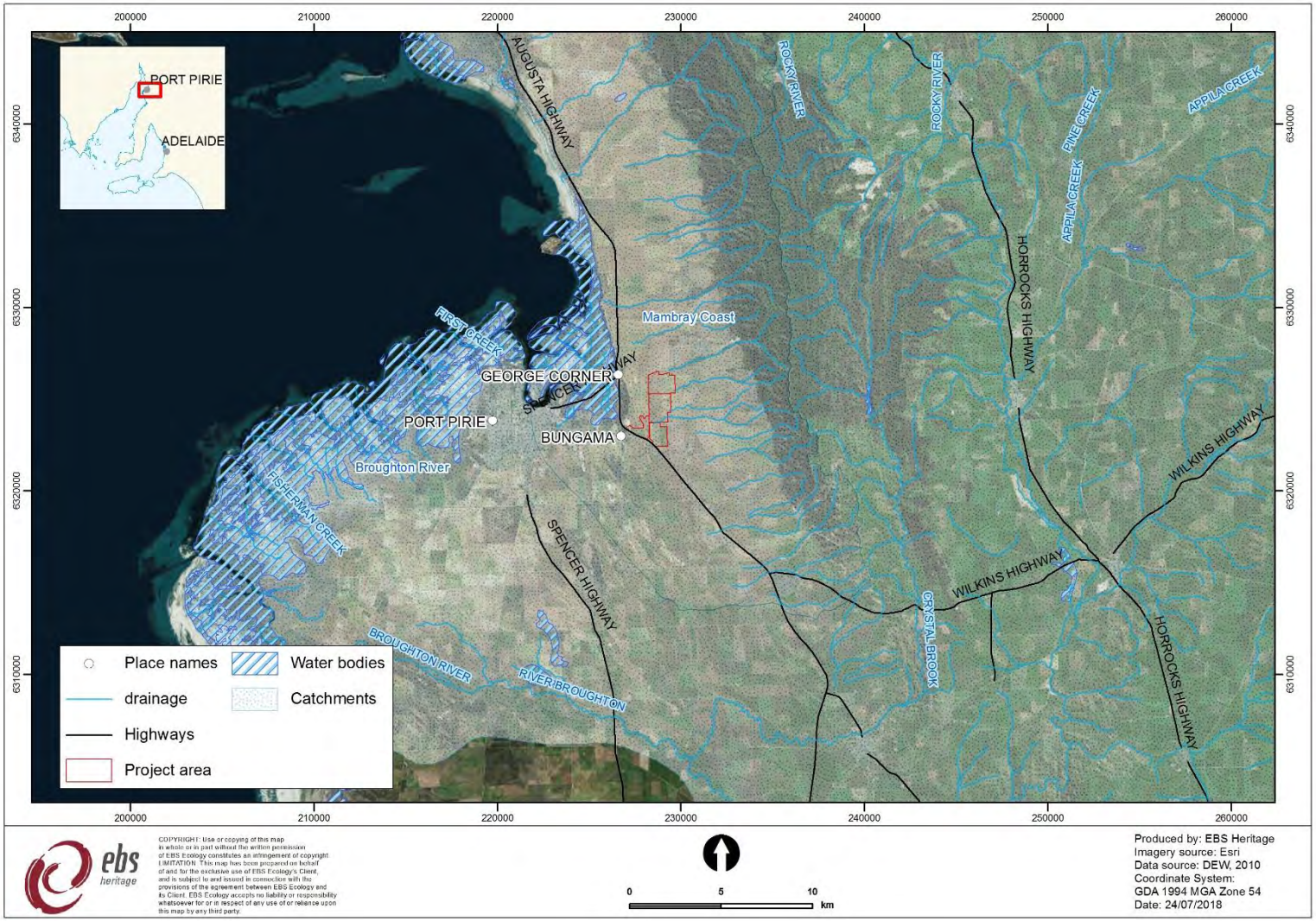


Figure 5: Hydrology in the local area.

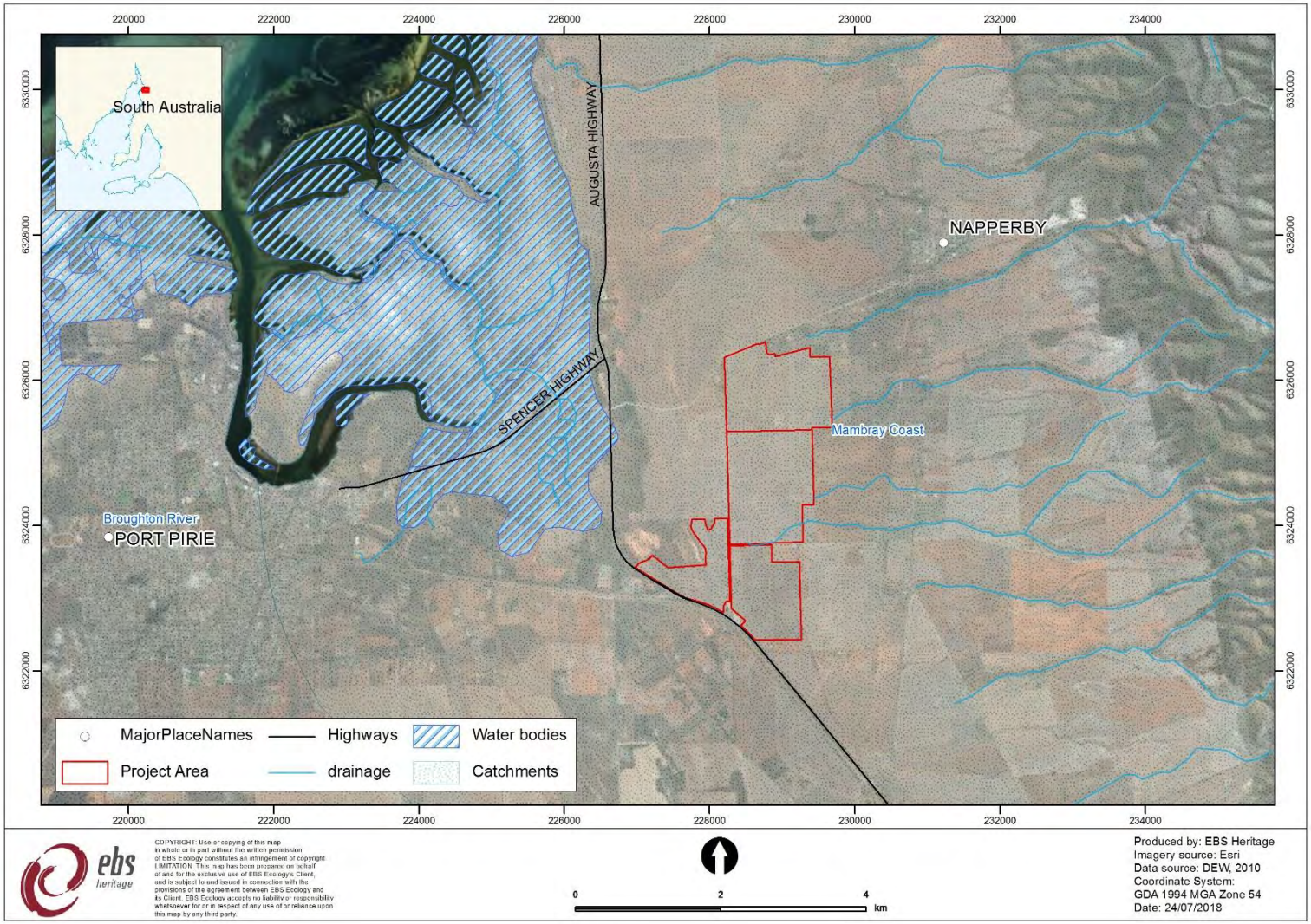


Figure 6: Hydrology in the Project area.

4 DESKTOP ASSESSMENT METHODS

The heritage desktop assessment was conducted to assess the risk of encountering any Aboriginal sites within the Project area. This was achieved by undertaking the following:

4.1 DPC-AAR Register Search

EBS completed a search of the Central Archive and Register of Aboriginal Sites and Objects maintained by DPC-AAR. This search identified any previously recorded sites (as defined under Part 1, Section 3 of the *Aboriginal Heritage Act 1988* (AHA)). Not only does the DSD-AAR search provide a list of sites within the Project area, it also provides an indicator of the types of sites found in the region. The results can be found in Section 7.1.

4.2 Archival Research

EBS undertook searches to find any available information regarding early land use and European heritage items within the Project area. Searches were conducted of the:

- the Australian Heritage Database (World Heritage list, National Heritage list, Commonwealth heritage list, the register of the National Estate and places under consideration);
- the SA Heritage Places Database (State, Territory and Commonwealth heritage places);
- the South Australian Museum Database (SAM);
- the Australian Heritage Photographic Library; and
- Local council development plans.

EBS conducted research at the SA archives for archival information such as images, newspaper clippings, journal entries and other primary sources that may contain information on the early uses of the area and early interactions between Aboriginal people and European colonialists. The results from this research can be seen in Section 5 and 7.

4.3 Previous Work / Consultancy Reports

EBS undertook a review of any available heritage reports / works previously carried out in the area and general region, where available and applicable. Section 6 of this report summarise those relevant projects.

4.4 Cultural Heritage Risk Assessment

EBS undertook a risk assessment of the Project areas to assess the likelihood of the project impacting environmental landforms most commonly associated with cultural heritage sites. Coupled with the desktop research, EBS prepared a detailed maps showing areas of high, moderate and low risk for encountering cultural heritage sites. Section 8 presents this information.

4.5 Limitations

The search results of the Department of Premier and Cabinet – Aboriginal Affairs and Reconciliation (DPC-AAR) (Formally the Department of State Development – Aboriginal Affairs and Reconciliation (DSD-AAR)) central archive search results are provided only as a guide and is not an extensive list of all heritage items within an area.

5 BACKGROUND RESEARCH

5.1 Aboriginal Occupation

5.1.1 Nukunu

In 1974 Norman Tindale published a detailed map of Aboriginal tribal boundaries at the time of European contact based on tribal boundary research in the 1930's (Figure 7). The *Nukunu* territory was identified by Tindale to stretch from the eastern side of Spencers Gulf from a little north of the mouth of the Broughton River and vicinity of Crystal Brook, northward to Port August (Hercus 1992; Tindale 1974; Field & Morley 2014).

Tindale wrote of the Nukunu:

> ***Location:*** *Eastern side of Spencer Gulf from a little north of the mouth of the Broughton River and vicinity of Crystal Brook northward to Port Augusta; east to Melrose, Mount Remarkable, Gladstone, and Quorn; at Baroota. The Ngaiawang of the Murray River used the term Nulonno as name of a fabulous Being who went about at night killing people. The Kaurna tribe term ['nokun: a] has a meaning of an imaginary being, like a man, who prowls at night and kills, an assassin (Teichelmann and Schurmann 1840). The Nukunu were the southeasternmost tribe to practice subincision, in addition to circumcision, as a male initiation rite. Pangkala men used the pronunciation ['Nukuna] for the name. The few survivors are settled at Baroota inland from Port Germein where they are known as the Barutadura.*
>
> ***Coordinates:*** 138º10'E x 32º55'S.
>
> ***Area:*** *2,200 sq. .m. (5,700 s. km.).*
>
> ***Alternatives:*** *Wongaidja (valid alternative), Nukuna, Nukunnu, Nugunu, Nookoona, Nukunna, oocoona, Nokunna, Nuguna, Pukunna (misprint), Wongaidja, Wongaiydya, Tura ['tura] = man), Tyura, Doora, Eura (general term for several tribes), Warra (name of language), Barutadura (men of Baroota)..*
>
> Tindale 1974

Elkin's (1934-1938) work showed that the *Nukunu* people were the south eastern most of those people who had a matrilineal kinship system and used the terms *Mathari* and *Kararru* for their moieties (Elkin 1934-1938). *Nukuna* had social, cultural and ceremonial interest in the Port Augusta region and shared strong bonds with other neighbouring groups like the *Kokatha*, *Barngarla* and the *Adyamathanha*. These bonds included similar social systems, possibly shared ceremonies and a similar language.

The *Nukunu* language is closely related to the neighbouring *Nharangka, Kaurna* and *Ngadjuri* groups and is one of the languages sometimes collectively called the *Thura-Miru* The languages from around Port Augusta also have similarities with those the Gawler Ranges. Margot Barefoot noted that many *Nukunu* words had close associations with a number of *Wirangu* words (Hercus 1992, Field & Morley 2014). Hercus and Simpson wrote:

"O'Grady (1966) claimed that the languages of central and southern Australia surrounding Spencer's Gulf and the Gulf of St Vincent form a subgroup, dubbed 'Yura'. These languages include at least Barngala, Nukunu, Narrangu, Kuyani, Ngadjuri, Adnyamathanha and Kaurna, with Nauo and Wirangu as possible outliers. We support this supposed subgroup by reconstruction of an ancestral case system for those languages for which inflectional data is recorded (Barngala, Nukunu, Kuyani, Adnyamathanha, Kaurna and Wirnagu)."

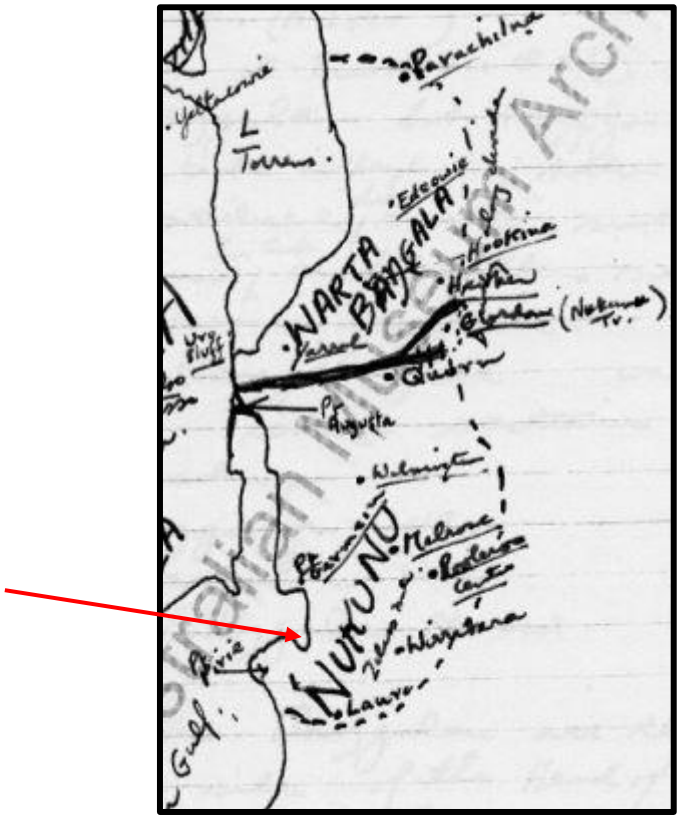


Figure 7: Nukunu territory (red arrow indicating the current Project area) (Tindale 1938-1939).

5.1.2 Ethnographic Background

Note: Information provided in this section is brief so as to not offend Aboriginal cultural tradition.

Occupation of this area has been expressed throughout the landscape in complex tangible (physical) and intangible (not physical) locations of significance. Myths associated with the constellations known as the Pleiades and Orion, are the most widely recorded in the world. In Australia, these myths can extend across the entire country, crossing the boundary of a number of tribal groups. These myths are generally associated with Dreamtime Beings and can be dived into several categories, which can be restricted depending on a person's gender and tribal association. For this reason information about these stories is not often published and is still considered highly sensitive for Aboriginal people (Field *et al.* 2014). Archaeological sites represent tangible connections to country where as dreaming stories and song lines represent an intangible connection between people and certain places. Stanner (1991) stated in his work that this creates a '…*interrelated responsibility between people and country*…'

Several important Ancestor Creation (or Dreaming) stories travel through the region, linking the local tribal groups through ceremony and ritual (Field *et al.* 2014; Walshe 2005). A number have been recorded previously including the "Seven Sisters", "Willuroo Man", "Moon", "Native Cat" and "Urumbula" song lines.

Tindale wrote a definitive description of the Kungkarungkara or "Seven Sisters" myth:

> *In Western Desert lore the Pleiades and the Morning Star are ancestral Women Beings…They climbed into the sky and became stars to escape the attentions both of a man named Njiru, and of his son Jula. These women attacked Njiru with packs of dogs that they kept as their protectors. In the sky of autumn, the early morning appearance of the Pleiades, low down in the east, marks to beginning of the aboriginal New Year and the commencement of the season when dingo dogs (papa) give birth to their young. Since these pups serve as food for men, Increase Ceremonies for the dingo are a feature of the autumn season. The stories of the would-be virgin women are made complex because the names of some of the principal beings are changed and even become transposed in some tribal versions of the story (Tindale 1959: 305).*

The Kungkarungkara women are then believed to have fled south and Tindale stated that Jangkundjara senior men told him that they understood that the Kungkarungkara women went south into:

> *…the Pangkala territory near Port Augusta with Njiru still in pursuit. They have the idea that the Beings made a circuitous eastward journey returning again to the north. During the journey Njiru and the Kelilbi (Star Women) are supposed to have visited a big jabu (hill) beside the sea, south and east of Port Augusta… (Tindale 1959: 321).*

Work done by Hagen has also stated that accounts given to him by various informants does confirmed that the Kunkaralinya or "Seven Sisters" story refers to starting in Port Augusta. Hagen stated:

> *Arcoona the sisters travelled to the west, creating the sand-hills in the Phillip Ridge area, and at the site of the proposed new town (see Mountford, 1976 for an analogous version from parts of Central Australia). They travel on through Lake Blanche (Matlumpa), heading towards Kingoonya, then turn to the north-east, towards Stuart Ck…They travel to a place west of Fregon…This track also passes through the Cane Grass Dam area according to my informants* (Hagen 1983, Field *et al.* 2014).

The "Urumbula" story line is of interest to this Project area, as it travels from Port Augusta north to the Gulf of Carpentaria in the Northern Territory. This story line is concerned with the travels of the Malbunga, or the Native Cat and his followers. (Field *et al.* 2014; Gara 1989; Hercus & Potezny 1996; Walshe 2005).

Louise Hercus has also made mention of another creation story in their work, related to the salty lakes above Spencers Gulf. Hercus was told by Nukunu man Gilbert Bramfield that:

> *An Ancestor from Pt Germain [Germein] made that kangaroo bone and made that sea right through (he carved out Spencer Gulf). The bloke that went this way with his kangaroo bone he broke it at Pt Augusta, and then he was digging with a really short stumpy one and made all these lakes all the way through (the salty lakes up from Pt Augusta) (Hercus 1992: 16).*

5.1.3 Language

Connections between the languages of the people of the Gawler Ranges and the Port Augusta area have been identified (Austral Archaeology 2000, Field *et al.* 2014; O'Grady *et al* 1966). Hercus and Simpson wrote:

> *O'Grady (1966) claimed that the languages of central and southern Australia surrounding Spencer's Gulf and the Gulf of St Vincent form a subgroup, dubbed 'Yura'. These languages include at least Barngala, Nukunu, Narrangu, Kuyani, Ngadjuri, Adnyamathanha and Kaurna, with Nauo and Wirangu as possible outliers. We support this supposed subgroup by reconstruction of an ancestral case system for those languages for which inflectional data is recorded (Barngala, Nukunu, Kuyani, Adnyamathanha, Kaurna and Wirnagu).*

5.1.4 European contact and historical research

Specific ethno-historical data on the region is limited. Two early accounts of European expeditions into the area are from Eyre in 1839 and Sturt in 1844. The Eyre (1845) expedition passed the region to the west and Sturt (1849) (Sturt and Waterhouse 1984). Both expeditions failed in their purpose seeking the centre of the continent. Journal accounts of both explorers display little contact with Aboriginal people, even though the area supported large numbers of Aboriginal people. Eyre writes:

> *"In going up the watercourse I again found a native fire, where the natives had been encamped within a mile of us during the night, without our being aware of it..."* (Eyre 1845:93).

There are little other written records of contact between European settlers and Indigenous land owners in the Upper North. There were Aboriginal employees in many of the pastoral runs and stations. In 1853 a magistrate did report that:

> *"The natives in the northern settlements are very bold and troublesome…" (J.W Macdonald to Colonial Secretary 31 January 1853).*

5.2 European Settlement History

The history of European settlement within SA, or Adelaide, had its beginning in 1836 when Colonel William Light (the inaugural surveyor-general for the colony of South Australia) undertook a survey of the Adelaide plains to identify a suitable location for the future capital city. Before Adelaide was first surveyed, Captain Mathew Flinders, sailed his ship the *Investigator* into the head of Spencers Gulf on the 21 February 1802. This was one of his many stops made during his discovery and circumnavigation of Australia. The gulf was named by Flinders in honour of the First Lord of Admiralty, George John the Second Earl Spencer (Flannery 2000). By March the 10th 1802 Flinders' party had already ascended a nearby peak, now named Mount Brown, which is located 75 km north of the current Project area (Walshe 2005).

When the Province of South Australia was established in 1834 by an Act of British Parliament, provisions were made for local government when the colony's population passed 50,000. That figure was reached in 1849, but the first attempt of establishing local government outside of Adelaide was made in the form of District Boards of Roads, based on the surveyed Hundreds. By the 1850s the South Australian government had established a standard hierarchy of Counties, Hundreds, rural sections and town allotments. By 1860 no land could be sold unless located within a proclaimed County and Hundred (Susan 2012).

SA was settled during a time when humanitarian principles were being spread in England. Due to this it was thought that Aboriginal people, particularly in SA, would be treated more humanely. In the first annual report in 1836 made by SA Colonisation Commissioners it was remarked that the subject of Aboriginal rights can "…*be regarded as of first importance in the formation of the new settlement of South Australia"*. They stated that:

> "…*colonisation of South Australia will be an advert of mercy to the native tribes… [In Australia] they are now exposed to every species of outrage and treated like cattle of the fields; they will in future be placed under the protection of British laws, and invested with the rights of British subjects".*

The Commissioners also made plans to occupy land only by agreement with the Aboriginal inhabitants; with it also being proposed that one-fifth of every 80 acres section of the land be *"… resumed as a reserve for the use of the Aborigines, and the remaining four parts, or 64 acres, to remains with the proprietor as his freehold."* Small pockets of land were also suggested to be designated within settled areas as refuges for Aboriginal people. However, these proposals conflicted with the SA Colonisation Act of 1834, which was to regulate land sales in SA. Governor Hindmarsh and Commissioner Fisher ignored the 1836 suggestions by the Colonisation Commissioners. Not until the passing in 1842 of the Waste Lands Act that the Governor could start to put aside land for the benefit of the Aboriginal people. By 1860 over forty reserves has been declared. After 1860 it was argued that the Aborigines were not properly using the land put aside for them and it was subsequently resumed and then leased or sold to European settlers.

By 1915, only two kinds of land remained for Aboriginal use in settled areas. First, very small pockets of land unwanted by Europeans and second, relatively substantial areas, often land considered to be poor or unsuitable for European use, were owned or leased by missionary societies. This land was leased to mission societies for the 'benefit of Aborigines' rather than being granted directly to them (Atlas 1986).

Below is a table highlighting the general chorology of the current Project area (Table 4).

Table 4: General Chorology of the local area (Austral Archaeology 2001, Walshe and Bonnell 2003, Wood 2009a).

Date Range	Event
1802 – March	First Europeans in the region on the ship HMS *Investigator.*
1802 – April	French explorer Nicolas Baudin charted the gulf on the ship *Le Geographe.*
1839	Edward John Eyre set out from Adelaide north to Mount Arden.
	Anlaby on the Light River had been taken up by pastoralists.
1840	Edward Eyre again went north from Adelaide in search of grazing lands and instead located the chain of salt lakes known as Torrens, Eyre, Blanche, Callabinna and Frome.
	John Ainsworth Horrock followed northward through the region.
1842	Deputy Surveyor-General Thomas Burr and Inspector Alexander Tolmer led an expedition north.
	John Hallett is believed to have been the first to bring sheep into the Hallett district. He made a selection of land in the Hallett district, named Willogoleeche.
	The *Act to Protect the Waste Lands of the Crown from Encroachment, Intrusion and Trespass* was passed. This was as a result of impatient graziers driving their flocks out beyond the surveys and occupying land without legal entitlement. This created Occupation Licences to give pastoralists renewable tenure of land which was identified by a system of landmarks rather than a formal survey.
1840s.	John Bristow established Bundaleer Station. This run extended from the Broughton River in the south to Mount Lock in the north and comprised an area of 799 square kilometres.
1843	Surveyor-General Edward Frome continued the search for pastoral lands in the north.
	John Bristow Hughes taken up Bundaleer Run straddling the Broughton River.
1844	William Younghusband and Peter Ferguson took up Crystal Brook.
	John Jacob and William Jacob took up Beetaloo Run, Samuel White and Fredrick White took up the Charlton Run near Wirrabara and Herbert Hughes took up the run adjacent to his brother John Hughes at Booyoolee.
1845	John Pirie during his voyage discovered Port Germein. His voyage was at the request of William Younghusband in search of a port for his Crystal Brook Run. For a while it was called Hammocks Harbour but soon became Port Pirie.
1847	Bundaleer, Booyoolee and Crystal Brook runs were shipping their wool from Port Pirie.
1849	A private town was surveyed at the anchorage known as Port Pirie and in November allotments were offered at auction.
1850s	Most of the suitable grazing land was taken up.
1865	Joseph Gilbert took over Willogoleche and Mount Bryan stations.
1869	*Strangways Act* was passed through parliament. Here were vast changes to what became known as the North Agricultural Areas. During the following years the whole of the area was resumed by the Government and surveyed into farms with an average size of 130 hectares. The large sheep

Date Range	Event
	runs in the region were subsequently broken up and made available to small farmers. Many of the smaller farmers used their newly acquired land for wheat growing. By 1875, 400,000 hectares of land were under wheat.
	Within months of the *Strangways Act* towns were established.
	The towns of Georgetown and Redhill were drawn up.
1870	The towns of Hallet and Yacka were surveyed.
	The railway reached the mining town of Burra.
1871	The towns of Caltowie, Jamestown, Laura and Narridy were drawn up and surveyed.
	The Port Pirie that we know of today was surveyed along the Port Pirie river. It became one of the very few SA towns to have curved streets.
1872	Appila, Boroota and Gladstone are established.
1874	Gulnare, Nelshaby, Pekina, Stone Hut, Yarcowie, Wirrabarra and Yatina were established. Nelshaby is 6 km north of the current Project area.
1875	Crystal Brook, Lake View, Koolunga and Tarcowie were established.
	The first railway line from Port Pirie through Crystal Brook Gap to Peterborough. The line was extended to Gladstone in 1876, Caltowie in 1878 and Jamestown in July 1877. A line was built from Burra to Hallett in 1878.
1876	The towns of Orroroo, Spalding, Wilmington and Yongala were drawn up.
	After passing the Act to Encourage the Planting of Forest Trees, the first seedlings were grown at Bundaleer, south of Jamestown.
1877	Huddleston, Lancelot, Mannanarie, Morchard and Warnertown were established. Warnertown is 4 km south east of the current Project area.
1878	Booleroo, Hornsdale, Port Germein, Terowie and Willowie were established.
25 July 1878	Corporation of Jamestown was proclaimed. The town was named after the then Governor of South Australia, Sir James Fergusson.
1879	Amyton and Hammond were established.
1881	Jamestown had a population of 995.
1880s	Franklyn, Merriton and Petersburg were established.
	The wheat farmers of Jamestown and district formed the Farmers' Co-operative Union. It heralded the start of a number of well-known brands including Farmers Union, Southern Farmers, Safcol and Fine Foods.
29 June 1885	Land grant of CT 5949/272, (section of the current Project area) was given to labourer John Keane of Spencer Street Adelaide.
1902	Land grant of a portion of CT 6037/29 (section of current Project area), was granted to William George Hendrt.
1903	Transfer of CT5954/187 (section of current Project area) to Thomas Henry League a farmer.

Through examining the contextual history of the Project area a number of historical themes relating to the occupational history have been identified. Historical sites located within the Project area, if discovered, would relate to the national, SA and local historical themes presented within Table 5.

Table 5: Australian, SA and Local Historical themes relevant to the Project area.

Australian Theme	State Theme	Local Theme	Examples
Peopling Australia	Aboriginal Cultures and interactions with other cultures	Activities associated with maintaining, developing, experiencing and remembering Aboriginal cultural identities and practises, past and present; with demonstrating distinctive ways of life; and with interactions demonstrating race relations.	Place name, camp site, midden, fish trap, trade route, massacre site, missions and institutions, pastoral workers camp, timber mill settlement, removed children's home, town reserve, protest site, places relating to self-determination, keeping place, resistance & protest sites, places of segregation, places of indentured labour and places of reconciliation.
Developing local, regional and national economies	Agriculture	Activities relating to the cultivation and rearing of plant and animal species, usually for commercial purposes, can include aquaculture.	Hay barn, wheat harvester, silo, dairy, rural landscape, plantation, farmstead, shelterbelt, silage pit, fencing, plough markings, shed, irrigation ditch and Aboriginal seasonal picking camp.
	Commerce	Activities relating to buying, selling and exchanging goods and services.	Trade routes, Aboriginal trading places, Aboriginal ration/blanket distribution points and Aboriginal tourism ventures
	Communication	Activities relating to the creation and conveyance of information.	Telegraph equipment, network of telegraph poles, track and airstrip.
	Events	Activities and processes that mark the consequences of natural and cultural occurrences.	Monument, flood marks, memorial, blazed tree, obelisk, camp site, place of pilgrimage, places of protest, demonstration, congregation and celebration.
	Exploration	Activities associated with making places previously unknown to a cultural group known to them.	Explorers route, marked tree, camp site, mountain pass, water source, Aboriginal trade route and landing site.
	Pastoralism	Activities associated with the breeding, raising, processing and distribution of livestock for human use.	Pastoral station, shearing shed, slaughter yard, homestead, pastoral landscape, common, fencing, grassland, well, water trough, freezer boat shipwreck and wool store.
	Transport	Activities associated with the moving of people and goods from one place to another, and systems for the provision of such movements.	Highway, lane, stock route, footpath, radar station, toll gate, horse yard and coach stop.

Australian Theme	State Theme	Local Theme	Examples
Building settlements, towns and cities	Land tenure	Activities and processes for identifying forms of ownership and occupancy of land and water, both Aboriginal and non-Aboriginal.	Fence, survey mark, subdivision pattern, boundary hedge, stone wall, shelterbelt, cliff, river, seawall, rock engravings, shelters & habitation sites, cairn, survey mark, trig station and colonial/state border markers.
	Utilities	Activities associated with the provision of services, especially on a communal basis.	Water pipeline, sewage tunnel, gas retort, powerhouse, garbage dump, windmill, radio tower, bridge, culvert, weir, well, cess pit, reservoir, dam, places demonstrating absence of utilities at Aboriginal fringe camps.
Working	Labour	Activities associated with work practises and organised and unorganised labour.	Shearing shed.
Developing Australia's cultural life	Persons	Activities of, and associations with, identifiable individuals, families and communal groups.	A monument to an individual, a family home, a dynastic estate, private chapel, a birthplace, a place of residence, a gendered site, statue, commemorative place name and place dedicated to memory of a person.

6 PREVIOUS HERITAGE WORK

6.1 Accessible

A number of cultural heritage studies have been undertaken for various development projects in the area. However, information relating to some of these reports is limited due to the fact that a letter from the relevant Indigenous organisations is required to get more detailed access to the database of reports held by DPC-AAR. Some details of these studies are provided in Table 6 and Table 7.

6.1.1 Port Augusta region

Table 6: Archaeological studies undertake north of the Project area (Port Augusta).

Year	Author	Description
2005	Draper, D. Mott, D & J. Mollan	In 2005, ACHM was engaged by ElectraNet to undertake an Aboriginal Cultural Heritage Survey for the proposed Davenport Substation Expansion with representatives of the Barngarla people. A previously recorded archaeological site was re-assessed and the boundary was revised. Monitoring was undertaking and two areas were classified as sensitive landforms. Recommendations for further monitoring were also made by the Barngarla.
2005	Wood, V. & Fitzpatrick, P.	Vivienne Wood Heritage Consultant Pty Ltd was engaged by ElectraNet to undertake heritage assessment. Vivienne Wood and Phil Fitzpatrick undertook two field studies of the proposed Davenport Substation near Port Augusta. The field studies were undertaken with representatives of the Nukunu people. The recommendations from the survey were that the works could proceed with a number of restrictions. Monitoring was recommended for a number of locations, along with salvaging of cultural material, with the exception of skeletal remains. This assessment also predicted that there would be a high potential for pre-contact artefact scatters and / or campsites and for mythological sites and a lower potential for stone arrangements, painting or engraving sites.
2008	Mott, D.	ACHM carried out an Aboriginal cultural heritage survey of two truck parking bays and one turning lane, at Warnertown (4 km south east of current Project area) and Winninowie (66 km north of current Project area). A field survey was conducted along with representatives of the Nukunu. No Aboriginal archaeological or anthropological sites were identified within the Project areas. Recommendations were made that Aboriginal monitors be present for any excavation works and that any new borrow pits would require further assessment.
2014	Field M. & A. Morley	ACHM was engaged by DP Energy Australia Pty Ltd, to undertake an anthropological and archaeological heritage survey of the proposed Port Augusta Renewable Energy Park. A total of five registered archaeological sites were located within 1 km of the survey area. During the anthropological survey, it was determined that the survey area was clear of anthropological significance. However, several areas within the survey area were deemed to be of higher risk of containing Aboriginal heritage sites. These areas included ephemeral and permanent water sources and watercourses, sand dunes and areas of undisturbed native vegetation. The recommendations from this assessment were that an archaeological pedestrian cultural heritage survey be

Year	Author	Description
		undertaken prior to the commencement of ground disturbance work for the entire projects footprint and a Cultural Heritage Management Plan should be developed to provide for long term management of heritage sites for those sites not subject to a Section 23 application to destroy.
2017	EBS Heritage	EBS Heritage was engaged to undertake an Archaeological and Anthropological assessment for a proposed Solar Project located near Port Augusta, in SA. The field surveys were carried out by EBS staff, members of the Barngarla Determination Aboriginal Corporation (BDAC) and a representative of the UQ Cultural Heritage Unit. During the assessment a total of five archaeological sites were recorded, all of which were artefact scatters with four containing potential archaeological deposits. The survey team also located eight isolated artefacts of silcrete and quartz. A total of 15 other areas were identified as important to the BDAC representatives.
2017	EBS Heritage	EBS Heritage was engaged to undertake a desktop assessment and heritage survey of a proposed pipeline route located near Port Augusta. The desktop assessment assessed that there was a moderate to high level of impacting Aboriginal sites. There were also two registered sites in close proximity to the Project area. The field survey was carried out by EBS staff, members of the Barngarla BDAC and a representative of the UQ Cultural Heritage Unit. The heritage survey located two new archaeological sites (artefact scatters & potential archaeological deposits) and six new anthropological / cultural sites.

6.1.2 Burra / Clare region

Table 7: Archaeological studies undertake south / south east of the Project area (Burra / Clare).

Year	Author	Description
1925	Biddle, J.P.	Research on engraving sites that is located five miles due east of Burra, at Deep Creek. The engraving site consisted of a huge platform with a series of pecking's. Campbell (1925) also recorded this site and noted a number of various animal tracks, circular and ovate motifs.
1983	Gara, T.	Gara conducted an archaeological survey of a 275kV transmission line from Port Augusta to Eudunda. During this assessment a total of five Aboriginal archaeological sites were located. The sites consisted of stone artefact scatters and a scar tree.
1995	Crow, H. & P. Clark	Crow and Clark undertook s heritage assessment of Burra Creek Gorge (Worlds end), which is situated 20 km north of Robertstown. During the assessment a total of 15 Aboriginal sites were located. Seven were artefact scatters, one was an isolated artefact and the other seven were scarred trees. All scar trees were found on red river gums and all were located in creek banks.
1995	Stockton, J.	Stockton undertook a survey of the road between Morgon and Burra. During the assessment a total of five stone artefact scatters were located. Three of these sites are located just south of the current Project area. Four were in line with the road alignment

Year	Author	Description
		and would be destroyed. The fifth was next to an eroding gully. The main stone material noted was quartz, which is available from fossil river gravels. These occur throughout the plains. The sites were located on hill slopes or ridgetops, all well drained locations.
2001	Wood, V.	Wood undertook a heritage survey of the proposed location of communication infrastructure for the emergency serves network at Bumbunga Hill, near Clare. The survey was the result of a previous study undertaken by Rhondda Harris, on behalf of the Native Title Unit. No Aboriginal archaeological sites were found during the survey by Harris, but it was suggested that Bumbunga Hill was a possible anthropological sites. Wood suggested further work be undertaken into the significance of the area.
2003	Walsh, K & J. Bowell	Walsh and Bowell were engaged by Wind Prospect Pty Ltd to undertake an archaeological and anthropological desktop assessment of known Aboriginal and non-Aboriginal archaeological sites and heritage places for the proposed Willogoleche Wind Farm located near Hallet. The recommendations from the assessment included that a ground survey be undertaken across the development area due to the high likelihood of finding stone cairns, culturally modified trees, quarries and a lower possibility of finding stone tool scatters, campsites, engravings, painting sites and burials.
2007	Wood, V.	Wood was engaged to undertaken an Indigenous cultural heritage survey of the proposed Willogoleche Hill Wind Farm, near Hallet. No archaeological or anthropological sites were identified during the survey. It was recommended that monitoring occurring of any ground disturbance.
2009	Lower, K.	Lower Master's thesis focused on landscape archaeology and Indigenous nation building in *Ngadjuri* Country. Lowers work included comparing site types recorded in the area by previous studies to those recorded by Smith's work at Plumbago (1980). When comparing this data is was evident that there were a greater occurrence of rock art, particularly engravings outside of Smith's survey area. Lower suggested this was probably indicative of selective recording practices, rather than a reflecting of genuine site distribution. This research showed that landscape archaeology can play a vital role in the re-acquisition of cultural knowledge, assertion and authentication of identity (Figure 8).
2009a	Wood, V.	Wood undertook a heritage desktop assessment of the proposed transmission line connection the Bluff Wind Farm to the southern end of the North Brown Hill Wind Farm in Jamestown. The development was considered to have a low impact and was unlikely to impinge into location that have elevated archaeological sensitivity.
2009b	Wood, V.	Wood undertook a heritage survey of the North Brown Hill Range Wind Farm. During the assessment a total of three Aboriginal archaeological sites were noted including stone artefact scatters and a stone cairn.
2009c	Wood, V.	Wood undertook a field cultural heritage assessment of the Willogoleche Wind Farm Project area. No Indigenous sites of significance to archaeology, anthropology, history or tradition were identified during the study.

Year	Author	Description
2010	Wood, V.	Wood was engaged by International Power Pty Ltd to undertake a desktop study for the proposed amendments to the Willogoleche Hill Wind Farm previously investigated. The report summarised previous work done in the area and concluded that were was still a risk of encountering Aboriginal sites and objects in the area.
2016	Hobbs, J.	ACHM was commissioned by Aurecon Australia Pty Ltd to undertake a desktop assessment of the proposed Hornsdale Wind Farm, near Jamestown in SA. The desktop analysis found that there was a moderate likelihood of the proposed Project area containing undiscovered Aboriginal sites. A recommendation to undertake a cultural heritage survey be undertaken to ensure that no European or Indigenous heritage places were damaged. They also made recommendations to engage with both the Ngadjuri and Nukunu traditional owners.
2017	EBS Heritage	EBS Heritage undertook a heritage desktop and risk assessment of the Barrier Highway intersection of Copperhouse Road. The assessment concluded that there were no registered Aboriginal sites in the area and that there was a moderate risk in one section due to the presence of an ephemeral creek line.
2017	EBS Heritage	EBS Heritage undertook a gap analysis desktop and field inspection for the Barn Hill Wind Farm, near Redhill. The survey identified eight previously recorded Aboriginal sites in the Project area. New locations were surveyed but no new sites were identified. All the sites were stone artefact scatters.

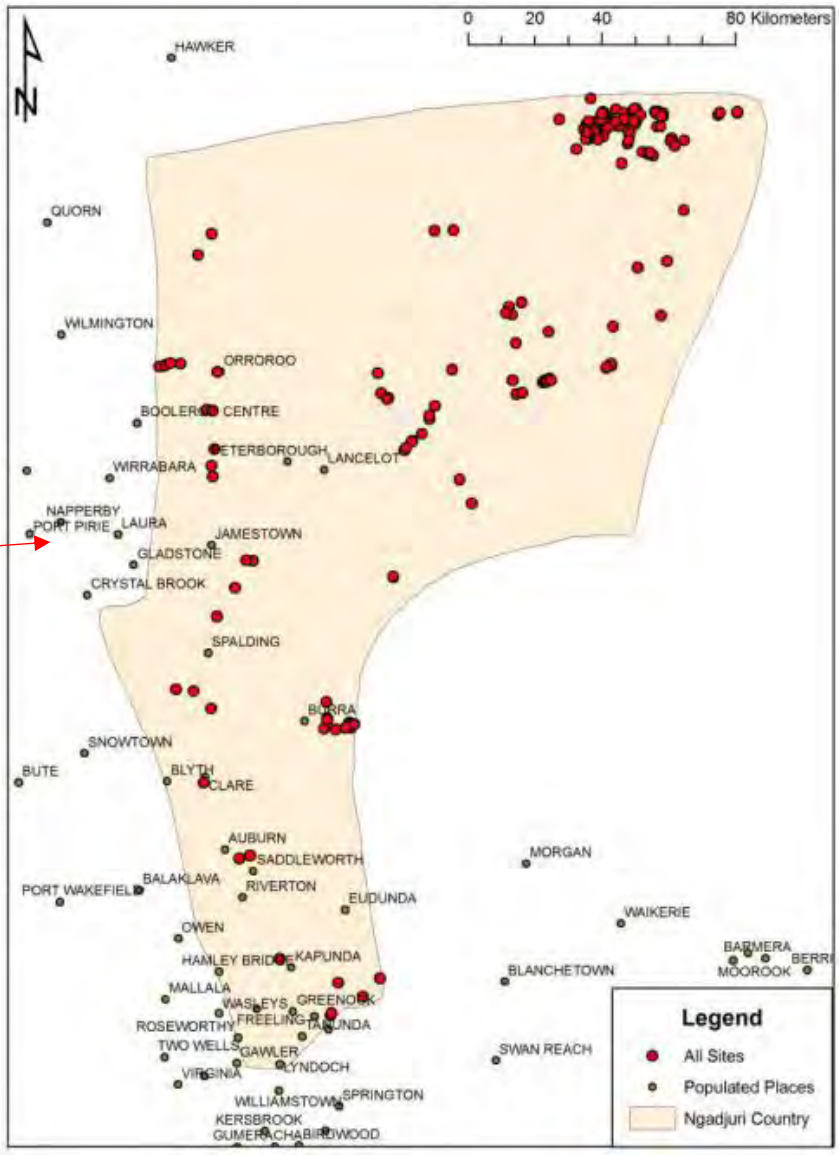


Figure 8: Figure showing the location of all known sites in 2009 in Ngadjuri land (red arrow indicating the location of the current Project area (Lower 2009).

7 HERITAGE REGISTER SEARCHES

7.1 DPC-AAR Register Search

The Central Archive is maintained by DPC-AAR and includes the Register of Aboriginal Sites and Objects. The Central Archive is a record of previously recorded heritage sites in SA and facilitates the identification of known sites within a project development area. The Central Archive is not an exhaustive list of heritage sites in a specific area, it contains only sites that have been reported and/or registered.

A request for a search of the DPC-AAR records for information on previously recorded Aboriginal sites located within the development area was submitted on the 18th of April 2018. A registered Aboriginal site is located on the boundary line of the current Project area. The accuracy of these sites boundaries will need to be further investigated to insure that the proposed works will not impact them (Figure 9).

EBS Heritage also undertook a DPC-AAR search of the wider area to gather information about previously recorded Aboriginal sites types within the broader area. This information would then be used to generate the predictive statements and risk assessment for the current Project area. The search results were received on the 26 April 2018 and indicated that there are 13 registered and reported Aboriginal sites in the wider area (Table 8 and Figure 10). The most dominate site types are archaeological sites, scarred trees and cultural sites.

Due to the restriction of data imposed by DPC-AAR the precise spatial data for these sites was not obtained. DPC-AAR advises that all Aboriginal sites recorded are protected under the AHA and pursuant to the Act, it is an offence to damage, disturb or interfere with any Aboriginal site or damage any Aboriginal object (registered or not) without Authority from the Minister for Aboriginal Affairs and Reconciliation. If construction is to occur within the boundaries of these Aboriginal sites a Section 23 permit would be required.

Table 8: DPC-AAR Registered Sites in close proximity to the Project area.

Site Number	Site Status	Site Type
6531 2971	Registered	Archaeological
6531 2972	Registered	Archaeological
6531 3361	Registered	Scarred Tree
6531 4070	Reported	Archaeological
6531 5871	Reported	Archaeological
6531 5872	Reported	Archaeological
6531 6227	Reported	Cultural
6531 6396	Reported	Scarred Tree
6531 6397	Reported	Scarred Tree
6531 6533	Registered	Archaeological
6531 6534	Registered	Archaeological
6531 7775	Reported	Archaeological
6531 7776	Reported	Archaeological

7.2 SA Museums Database

The SAM contains information regarding culturally sensitive finds such as human remains and items recorded prior to the establishment of the DPC-AAR Register. Where available, the database contains information on how the item(s) came into the collection, the location in which it was found and the date it was acquired.

EBS Heritage conducted a search of the SAM Database for references to Port Pirie, Port Germein, Solomontown, Napperby, Bungama, Warnertown, Nelshaby and Crystal Brooke. A total of 98 entries were found that made reference to these areas. Out of this seven are related to human remains. Of particular note are the ones recorded at Solomontown, which is approximately 4.7 km to the west of the current Project area.

As the SAM database does not always specify exactly where cultural material items and human remains were found and its contents are often the result of specifically targeted expeditions and accidental finds, the database is best viewed as an indicative tool. The results indicate that a significant level of cultural activity has occurred in the vicinity. Of note are the entries regarding human remains. This information, combined with the other research indicates that it is likely that unrecorded Aboriginal sites are located within undisturbed sections of the Project area.

7.3 European Heritage

The South Australian (SA) Heritage Places Database is maintained by the South Australian Government Department of Planning and Local Government. This database holds information relating to places on the SA Heritage Register, Local Heritage Places from SA Development Plans and Contributory Items from SA Development Plans.

7.3.1 Commonwealth Heritage Places

The National Heritage List records places with outstanding natural, Indigenous or historic heritage value to the nation of Australia. Places on the National Heritage List and their heritage value are recorded on the list and are protected by the *EPBC Act 1999*. In order to be listed on the National Heritage, the item must meet one or more of nine criteria. These criteria are as follows;

(a) the place has outstanding heritage value to the nation because of the place's importance in the course, or pattern, of Australia's natural or cultural history;

(b) the place has outstanding heritage value to the nation because of the place's possession of uncommon, rare or endangered aspects of Australia's natural or cultural history;

(c) the place has outstanding heritage value to the nation because of the place's potential to yield information that will contribute to an understanding of Australia's natural or cultural history;

(d) the place has outstanding heritage value to the nation because of the place's importance in demonstrating the principal characteristics of:

(i) a class of Australia's natural or cultural places; or

(ii) a class of Australia's natural or cultural environments;

(e) the place has outstanding heritage value to the nation because of the place's importance in exhibiting particular aesthetic characteristics valued by a community or cultural group;

(f) the place has outstanding heritage value to the nation because of the place's importance in demonstrating a high degree of creative or technical achievement at a particular period;

(g) the place has outstanding heritage value to the nation because of the place's strong or special association with a particular community or cultural group for social, cultural or spiritual reasons;

(h) the place has outstanding heritage value to the nation because of the place's special association with the life or works of a person, or group of persons, of importance in Australia's natural or cultural history; and / or

(i) the place has outstanding heritage value to the nation because of the place's importance as part of Indigenous tradition.

No listings were found for places of Commonwealth level historical significance within the Project area (DotEE 2018).

7.3.2 State Heritage Places

The South Australian Heritage Register is a list of places of heritage value in the state of SA. The list is on the Department of Environment and Water SA Heritage Register. In order to be listed as a State Heritage Place it must satisfy one or more of the criteria listed in Section 16 of the *Heritage Places Act* 1993. These places are also identified and protected by the *Development Act* 1993 and the *Planning, Development and Infrastructure Act* 2016. The State Heritage Place criterion are as follows;

- Demonstrates important aspects of the evolution or pattern of the state's history;
- Has rare, uncommon or endangered qualities that are of cultural significance;
- May yield information that will contribute to an understanding of the state's history, including its natural history;
- Is an outstanding representative of a particular class of places of cultural significance;
- Demonstrates a high degree of creative, aesthetic or technical accomplishment or is an outstanding representative of particular construction techniques or design characteristics;
- Has a strong cultural or spiritual association for the community or group within it; and
- Has a special association with the life or work of a person or organisation or an event of historical importance.

No listings were found for places of State level historical significance within the Project area. There are a number of locations of State significance in close proximity to the Project area (Figure 11) (Austral Archaeology 2000, DEW 2018, DPTI 2017).

7.3.3 Local Heritage Places

A Local Heritage Place is a place of heritage value due to its history, architectural and design qualities, built form character and integrity. These places are listed in the Development Plan and may be considered to have local heritage value if they meet one or more of the listed criteria in the Development Act 1993 section 23(4). The criteria are as follows:

- Displays historical, economic or social themes that are of importance to the local area;
- Represents customs or ways of life that are characteristic of the local area;
- Has played an important part in the lives of local residents;
- Displays aesthetic merit, design characteristics or construction techniques of significance to the local area;
- Is associated with a notable local personality or event;
- Is a notable landmark in the area; and
- Is a tree of special historical or social significance or importance within the local area.

No listings were found for places of local level historical significance within the Project area (Austral Archaeology 2000, DEWNR 2018, DPTI 2017, PPRC 2017).

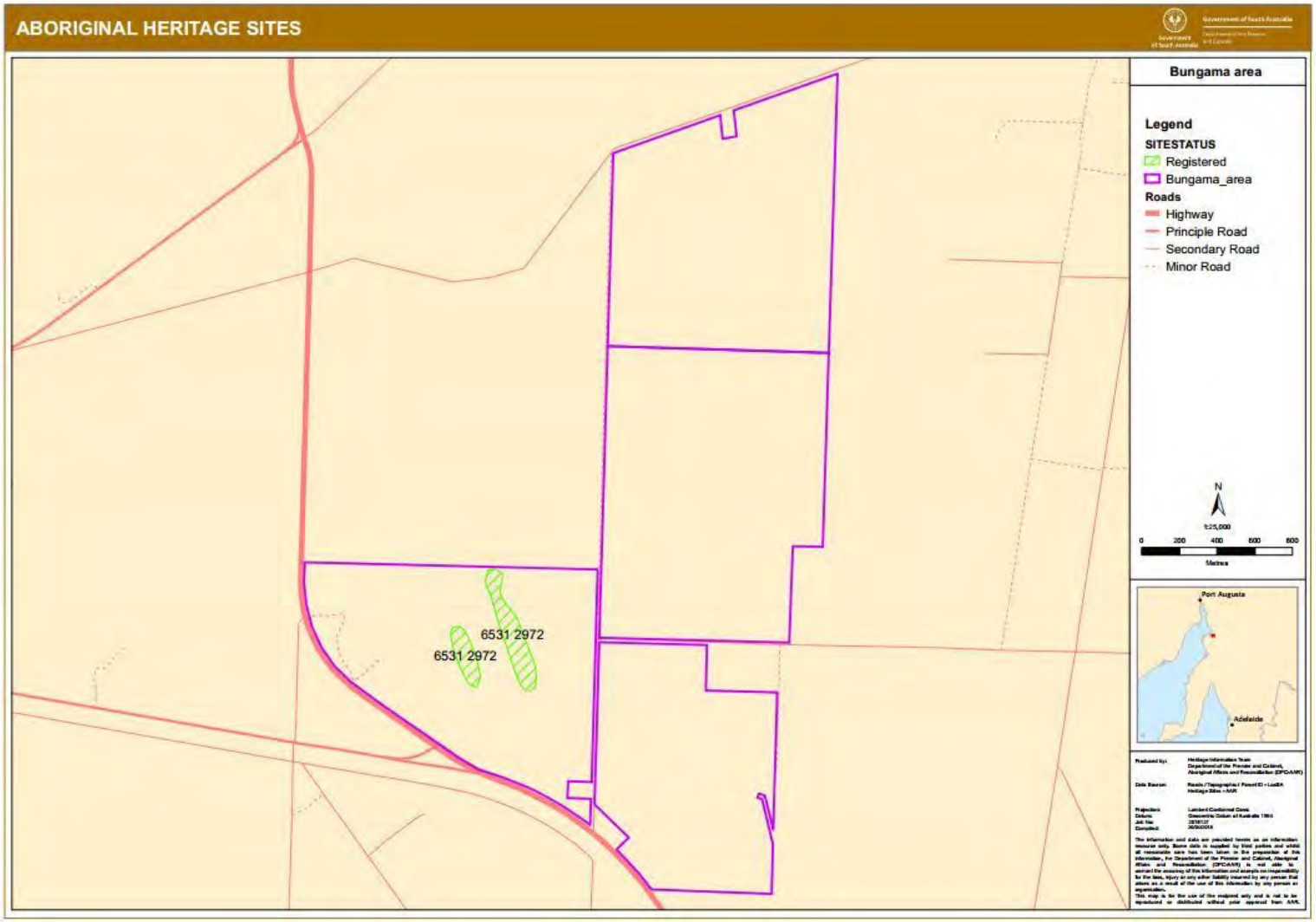


Figure 9: DPC-AAR Registered Aboriginal Heritage sites within the local area (DPC-AAR 2018).

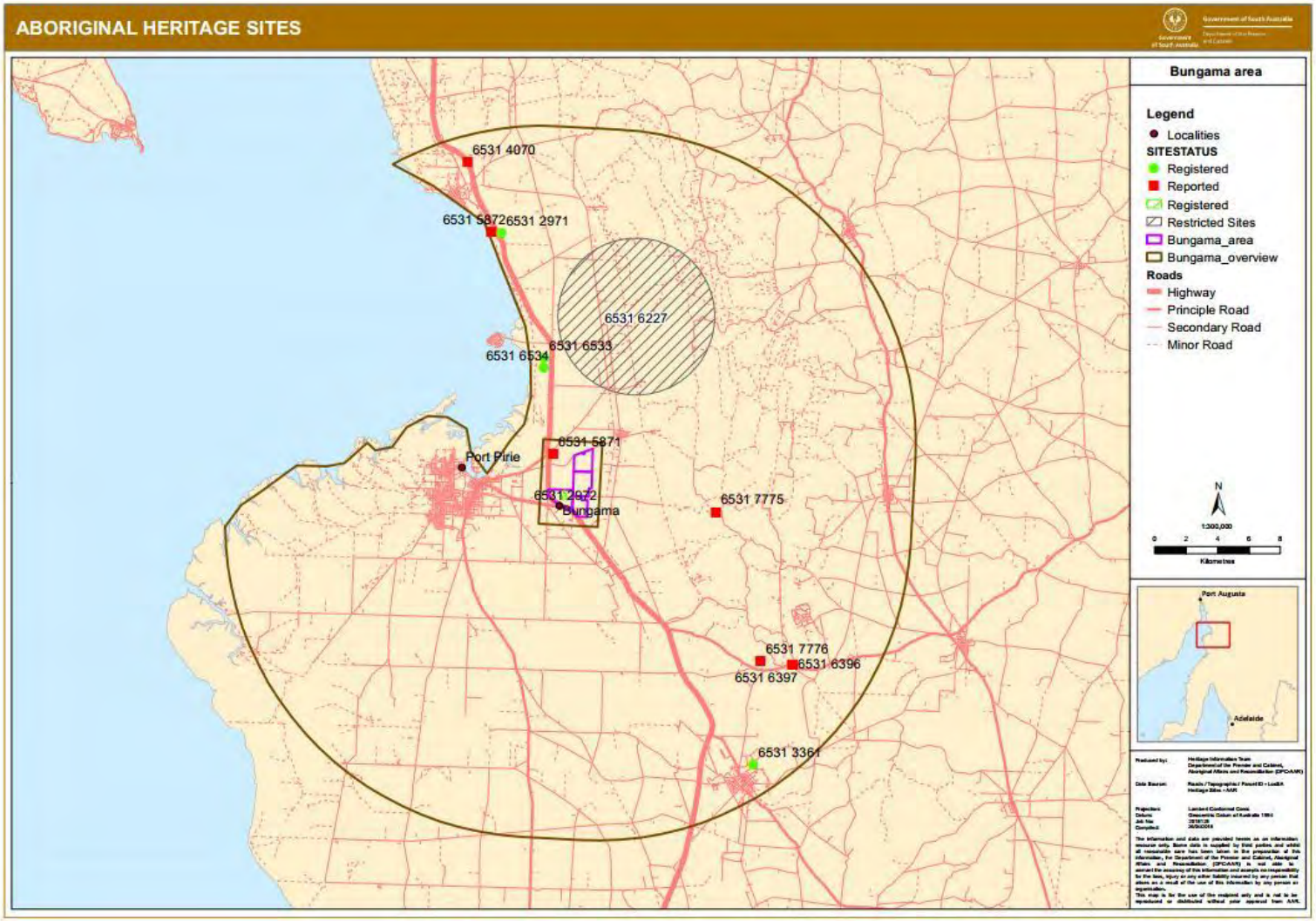


Figure 10: DPC-AAR Registered Aboriginal Heritage sites within the broader area (DPC-AAR 2018).

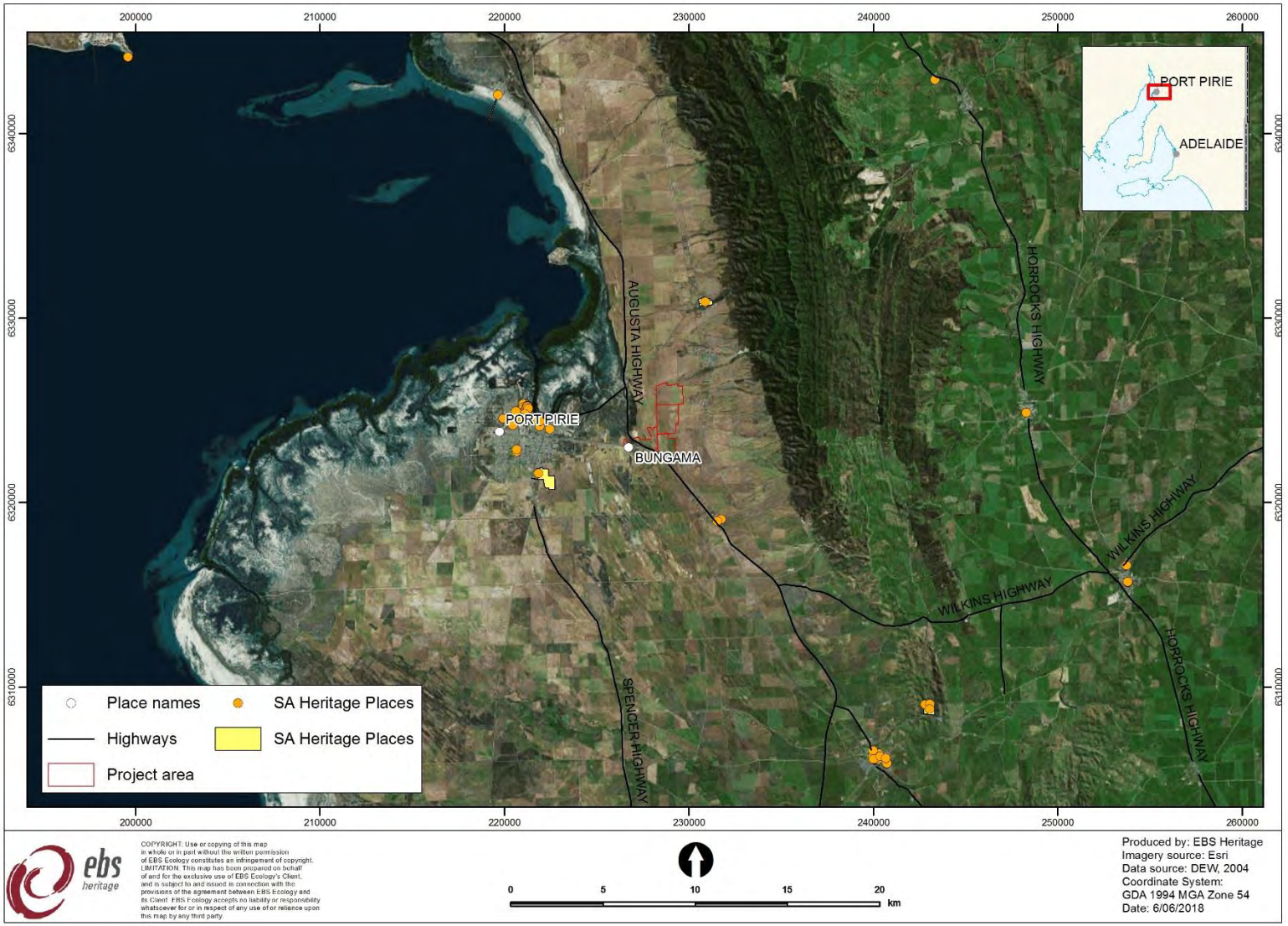


Figure 11: European Heritage within the local area.

8 PREDICTIVE STATEMENTS AND RISK ASSESSMENT

8.1 Predictive Statements

The archaeological predictive statements and risk assessment has been formulated based on the results of the locations and type of Aboriginal sites that have been recorded with the regional area and information about previous archaeological work. From the predictive statements evident that there is a higher chance of encountering stone artefact scatters / isolated artefacts, potential archaeological deposits and burials sites within the Project area. The results are presented in Table 9 below.

Table 9: Table with predictive statements and risk assessments for the Project area.

Site Type	Site Description	Associated Landform / Environment	Statement
Artefact Scatters / Isolated Artefacts	Debris which results from flaking stone and will include unmodified flakes, cores and flaked pieces. Actual stone tools such as deliberately formed artefacts (such as scrapers, backed blades or adzes) or pieces which possess evidence of use are generally present in low frequencies.	Stone artefacts are located either on the ground surface and/or in subsurface contexts. Within alluvial plains this site type is normally located to high terraces and sand bodies on the floodplain adjacent to drainage features.	Due to the widespread and common nature of this site type there is a high change of finding it within the Project area, especially considering the areas close location to the coastline. There were also nine 'archaeological' sites recorded in the area. The previous work in the area also noted this site type.
Scarred Trees	This site type consists of tress that have been modified through the removal of bark sections to construct canoes, shields and dishes. Typically river red gums or river box are targeted. Sculpted trees are when the tree has been carved for ceremonial purposes.	These site types can occur anywhere that trees of sufficient age are present, however, in an Aboriginal land use context would most likely have been situated on flat or low gradient landform units in areas suitable for either habitation and/or ceremonial purposes.	This site type is the second highest recorded according to the DPC-AAR database search. However, there does not appear to be any remnant vegetation in the current Project area. There is subsequently a moderate chance only if mature vegetation is present.
Potential Archaeological Deposit (PAD)	These are areas that have a potential to contain an archaeological deposit. They can be found in association with other cultural material or without.	They can be located in many different environmental locations including within rock shelters, along creek lines, sand dunes and anywhere a deposit can assimilate.	The soil profile in this area would assimilate subsurface deposits. There is a high chance of locating this site type.

Site Type	Site Description	Associated Landform / Environment	Statement
Engravings	Creation of geometric shapes, patterns or symbols into rock surface. There are many different styles including pecked, grooved etc.	This site type is located on bedrock outcrops are varying sizes and formations.	At this stage of the assessment there appears to be few rock outcrops, suggesting a low risk of locating this site type within the Project area. However, if there were rock outcrops then this site type could be located.
Quarries	They consist of sources of stone that is used to manufacture stone artefacts. There are also quarries of ochre. Quarries are procurement sites and normally have an associated artefact scatter and areas of reduction or knapping areas.	Located in areas where there are large bedrock outcrops that are available for quarrying.	At this stage of the assessment there appears to be few rock outcrops, suggesting a low risk of locating this site type within the Project area.
Burials	This site type can include an isolated bone fragment to a complete individuals or group of burials. Burials include flexed, extended and cremated inhumations with common comprising extended inhumations with an east-west attitude. Bundle burials are restricted to the late Holocene.	Burials in this area tend to be associated with ridges and lunettes and other sand bodies, such as source boarding dunes, perched dunes, and point bar deposits, spits and sandy river or creek banks.	The current Project area is located in dune / swale systems that have deep soils. There were also a number of human remains noted in the SAM database. The nine 'archaeological' sites or the one 'cultural' site recorded with DPC-AAR could be burials. There is subsequently a moderate chance of burials in some sections of the Project area.
Middens	This site type typically comprise of shell remains and other faunal materials. In the region middens will be dominated by freshwater mussels, but are also likely to contain animal bones, stone artefacts, ash, charcoal and other remnants of hearths such as heat retainer stones.	These site types are located in associated with waterways. They are present on floodplain and riverbanks. Older middens are found along prior streams and within lunette sediments.	The current Project area is located in close association with the coastal estuary, system associated with the Port Pirie River a salt water creek. Because of the close proximity to this environmental feature there is a moderate chance of locating this site type.
Rock Art / Paintings	Rock art is found across the continent as paintings, drawings, and pecked or abraded imagery and mechanically produced motifs such as stencils.	Art in the Australian semi-arid zone is associated with rock shelters and other stone feature, in open contexts as pecked or abraded art.	At this stage of the assessment there appears to be few rock outcrops, suggesting a low risk of locating this site type within the Project area. However, if there were rock outcrops then this site type could be located.

Site Type	Site Description	Associated Landform / Environment	Statement
Stone Arrangements	Stone arrangements are formed by placing rocks in a variety of different patterns and shapes. These can include standing stones, cairns, bora rings and fish traps. Bora Rings are Aboriginal ceremonial places.	Anywhere that suitable rock is located. Fish traps are normally located in association with waterways.	There is a low chance of finding this site type in the Project area. However, if there are suitable rocks within the Project area there is some chance of locating this site type.
Engravings	Creation of geometric shapes, patterns or symbols into rock surface. There are many different styles including pecked, grooved etc.	This site type is located on bedrock outcrops are varying sizes and formations.	There is a low chance of finding this site type in the Project area. However, if there are suitable rocks within the Project area there is some chance of locating this site type.
Mythological Sites / Aboriginal Ceremony and Dreaming	Places of significance to Aboriginal people connected to ceremonial activates or dreaming stories.	They can be present in wide variety of environmental landforms.	There is a registered 'cultural' site with DPC-AAR north of the current Project area. There is a moderate chance of finding this site type.
Soaks / Water Holes / Water sources	Locations that are a source of water. Some examples include rock holes that collect rain water (known as "gnamma" holes and natural springs).	These can be located anywhere there is natural water and rock formations.	There are no recorded soaks in the area and there is not the right bedrock present in the Project area. There is a low chance of locating this site type.
Historic Sites	These are sites relating to the shared history of Aboriginal and non-Aboriginal people after first contact. Examples include missions, massacre sites, post-contact camping sites.	Not dictated by any landform or environmental factors. More common in areas that had a higher influence by Europeans after contact.	Although there are none recorded in the area this part of SA has a long European history with intensive occupation after settlement. There is also accounts of Aboriginal people working in farms and stations. There would be a low to moderate chance of finding this site type.
Rock Shelters	Habituation locations that are formed naturally and may contain rick art, stone artefacts or midden deposits.	These sites will occur within rock overhands, shelters and caves where suitable bedrock is present.	There does not appear to be the required large rock formations to create this site type. There is a low chance of finding it within this Project area.

8.2 Risk Assessment

There are generally three levels of heritage risk assigned; low, moderate and high risk.

High Risk: identifies landforms where traditionally, cultural heritage sites have been found and where there is a high risk of proposed works encountering heritage sites. This risk has been assessed on the understanding that these areas have not experienced high levels of disturbance or geotechnical data indicates that the disturbance has not significantly impacted sub-surface soils. Areas traditionally considered to be of 'high' risk include the margins of undisturbed waterways, sand dunes and remnant trees.

Moderate Risk: identifies landforms where traditionally opportunistic use cultural heritage sites have been found and where there is a moderate risk of proposed works encountering unidentified heritage sites. Areas traditionally considered to be of 'moderate' risk are areas which may have once been classified as 'high' risk but appear to have been impacted by modern disturbance.

Low Risk: are areas where there is a very low to no chance of encountering cultural heritage sites and where there is low likelihood of proposed work impacting heritage sites. Areas assessed as having a 'low' risk are areas where there has been considerable modern impact and/or where geotechnical data indicates soils have been heavily impacted by modern activities and there is therefore a lower risk of cultural heritage sites to remain undisturbed.

Based on a review of the previous heritage work and the landforms present in the current Project area, EBS has assessed that there is a ***high*** to ***moderate*** risk of works impacting archaeological sites. Areas with visible sand dune features, or the areas in close proximity to these environmental features, have been assessed as high risk. These areas have also been registered as Aboriginal sites previously. The remainder of the Project area has been assessed as having a moderate risk because of the close proximity to the coastline, the Port Pirie River and the drainage lines that run down from the ranges in the east. Although there has been surface disturbance, recordable to the 1880's in some sections of the Project area, there could still be a risk of intact deep subsurface deposits in certain sections. Of note are the presence of human remains being uncovered in Solomontown in close proximity. This would of course depend on the soil profiles, which currently appear to be deep sandy dunes or swales, but this is something that can be reassessed during field inspections (Figure 12).

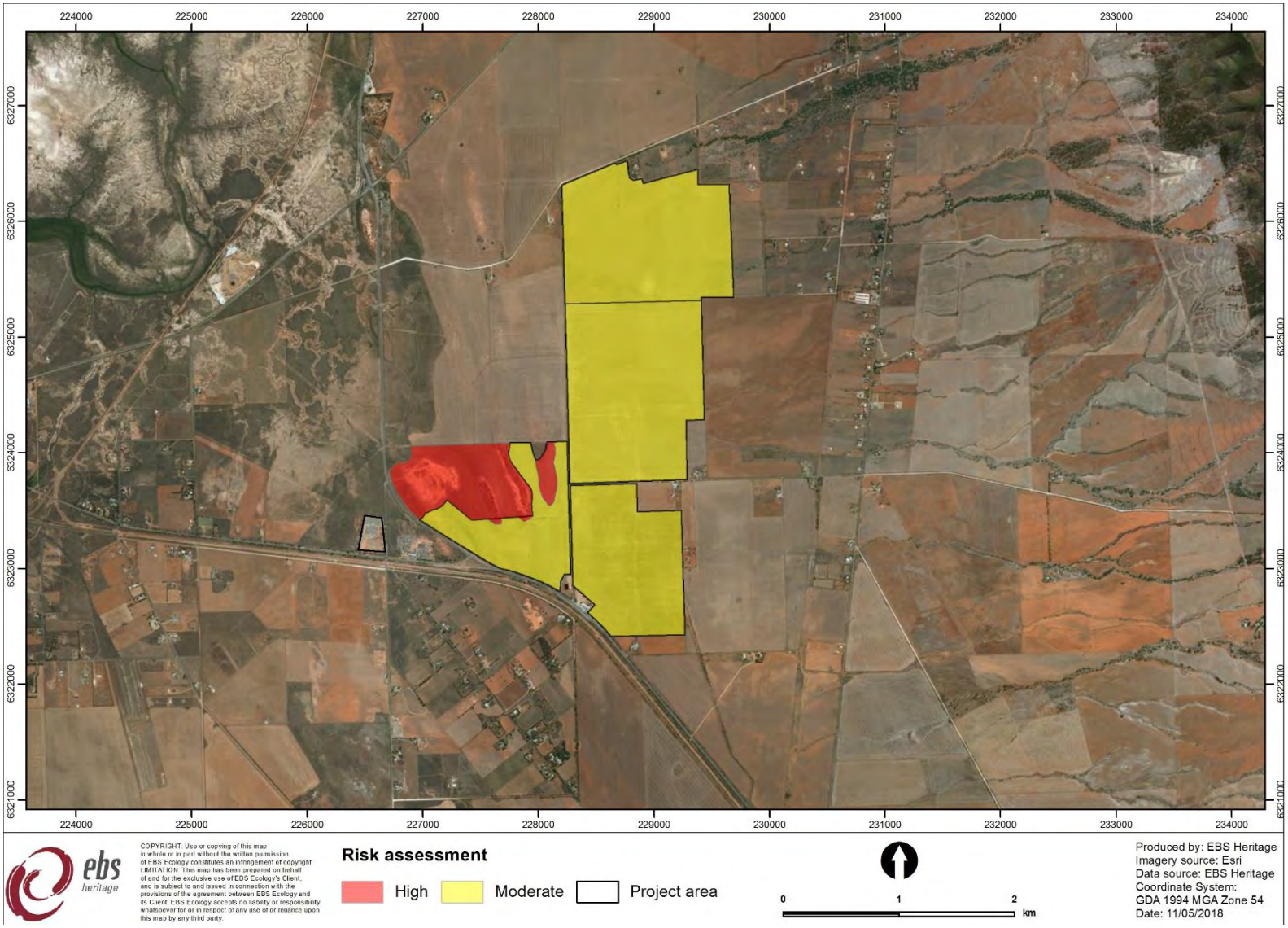


Figure 12: Heritage Risk Assessment.

9 SUMMARY AND RECOMMENDATIONS

EBS Heritage has carried out a desktop risk assessment based on the information available. As a result of this assessment, EBS Heritage recommend the following:

- The client should undertake community consultation with the recognised Aboriginal Traditional Owners for the region before the construction phase of the project;
- A site avoidance survey is undertaken for the proposed infrastructure footprint. If any heritage sites are located, the client has the capacity to modify their proposed construction footprint to avoid any sites. If the client is able to avoid all sites, there is no requirement to apply for a Section 23 permit (Ministerial consent to damage, disturb or interfere with Aboriginal Heritage Sites under the South Australian *Aboriginal Heritage Act 1988*);
- Should the future heritage survey identify any previously unreported Aboriginal sites within the Project area that cannot be avoided, then Section 23 approval will be required to damage, disturb or interfere with those sites;
- After the site avoidance survey, a Cultural Heritage Management Plan (CHMP) should be developed to provide long term management of Aboriginal sites within the Project area that can be avoided and will not be subject to Section 23 approval. This CHMP should include a site discovery procedure (refer Appendix 1);
- EBS recommends that construction personnel receive a heritage induction prior to works as a minimum requirement to manage heritage risk;
- EBS recommends that the client have a stop work/site discovery procedure in place in the event of an unexpected find. EBS has included a site discovery procedure in the appendix of this report for the client's convenience; and
- The client may wish to engage the services of an archaeologist "on-call" to assist in the identification of any unexpected finds.

10 REFERENCES

Note: Referencing style based on the Australian Archaeological Association style guide

Austral Archaeology 2000 Heritage of the Upper North. Volume 7. Port Pirie Regional Council. Report prepared for the Department for Environment and Heritage.

Bureau of Meteorology (BOM) 2018 Climate data online. Retrieved 18 April 2018 from <http://www.bom.gov.au/climate/data/>.

Crow, H. and P. Clark. 1995 Burra Gorge (Worlds end) Recreation Reserve and Archaeological survey.

Department of Environment, Water and Natural Resources (DEWNR) 2011 IBRA version 7.0.

Department of Environment, Water and Natural Resources (DEWNR) 2018 Search of the SA Heritage Places Database. Retrieved 18 April 2018. Report available from < http://maps.sa.gov.au/heritagesearch/SearchResultPage.aspx?p_searchtype=LOCATION&p_suburb=PORT%20PIRIE&p_lga=ALL&p_class=ALL>.

Department of Environment and Energy (DEE) 2018 Search of the Austrlian Heriitage Database. Retrieved 18 April 2018. Report available from <http://www.environment.gov.au/cgi-bin/ahdb/search.pl>.

Department of Planning, Transport and Infrastructure (DPTI) 2017 SA Heritage Places Dataset. Dataset available from <https://data.sa.gov.au/data/dataset/sa-heritage-places>.

Draper, D., Mott D. & Mollan, J. 2005 Aboriginal Cultural Heritage Survey and Monitoring for proposed Davenport Substation Upgrades, Port Augusta, SA – Barngarla. Unpublished Report Prepared for

ElectraNet SA, October 2005 Australian Cultural Heritage Management Pty Ltd, Adelaide, SA.

Elkin, A. P. 1934 –1938 Kinship in South Australia. *Oceania,* Vol. VIII: 419 – 452.

Eyre, J. E. 1845 Journals of Expeditions of Discovery into Central Australia.

Field, M. & A. Morley, 2014 Port Augusta Renewable Energy Park: Cultural Heritage Site Assessment, Anthropological and Archaeological. Unpublished Report Prepared for DP Energy Australia Pty Ltd. Australian Cultural Heritage Management Pty Ltd, Adelaide, SA.

Flannery, T. 2000 *Terra Australis: Mathew Flinders' great Adventures in the Circumnavigation of Australi.*. Test Publishing, Melbourne.

Field, M. and A. Morley, 2014 Port Augusta Renewable Engery Park: Cultral Heritage Site Assessment, Anthropological and Archaeological. Unpublished report to DP Energy Austrlia Pty Ltd. Australian Cultural Heritage Management Pty Ltd, Adelaide, SA.

Gara, T. 1989 The Kokotha Heritage Survey. Unpublished report to Australian Heritage Commission, NE

Hobbs, J. 2016 AU01 Hornsdale Wind Farm Desktop Assessment. Unpublished report prepared for Aurecon Australia Pty Ltd. ACHM, Adelaide.

Jacobs, J. & L. Potter. 1981 Anthropological Assessment (Stony Point EIS). Unpublished Report.

Lower, K. 2009 Landscape Archaeology and Indigenous Nation Building in Ngadjuri Country. Unpublished Masters of Archaeology thesis, Archaeology Department, Flinders University.

Mott, D. 2008 Aboriginal Cultural Heritage Survey of Two Truck Parking Bays and One Turning Lane, Warnertown and Winninowie, South Australia. Unpublished Report Prepared for Department of Transport, Energy and Infrastructure. Australian Cultural Heritage Management Pty Ltd, Adelaide, SA.

Northern and Yorke Natural Resources Management Board (NYNRMB) 2018. Northern and Yorke Natural Resources News: The Broughton Catchment – meeting the needs of the community and the environment. Retrieved 18 April 2018. Available at <http://www.naturalresources.sa.gov.au/northernandyorke/water/managing-water-resources/surface-water/Broughton_Catchment>.

O'Grady G. N., Stephen A. W. & L. H. Kenneth 1966 Map of Aboriginal languages of Australia. Victoria, Canada: Department of Linguistics, University of Victoria.

Port Pirie Regional Council (PPRC) 2017 Development Plan. Unpublished report prepared for the Department of Planning, Transport and Infrastructure, Government of South Australia, Adelaide.

Stanner, W.E.H. 1991 [1953] After the Dreaming. Crow's Nest, New South Wales.

Stockton, J.1995 A survey for Aboriginal Heritage Sites between Morgon and Burra, South Australia. Report to Department of Transport.

Sturt, C. & J. Waterhouse 1984 *Journal of the central Australian expedition, 1844-5.* Caliban Books, London, Dover, N.H., USA.

Susan, M. 2012 *A History of South Australian Councils to 1936*. Local Government Association of South Australia.

Hagen, R. 1983 Mythological tracks in the vicinity of the Olympic Dam Mining Venture. Report Prepared for Kokatha People's Committee.

Hercus, L. A. 1992 *A Nukunu Dictionary*. Canberra, AIATSIS.

Hercus, L. & V. Potezny. 1996 Mythological and Ceremonial Sites, north eastern South Australia and adjacent area. Unpublished report to Australian Heritage Commission, NEGP, Canberra.

Horton, D. 1994 *Encyclopaedia of Aboriginal Australia*. AIATSIS, Canberra.

Tindale, N.B.1938-1939 Adelaide/Harvard University Anthropological Expedition. Volumes 1-2, Adelaide, SA, South Australian Museum.

Tindale, N.B. 1937 Two legends of the Ngadjuri tribe from the middle north of South Australia. *Transactions of the Royal Society South Australia* (61): 149-153.

Tindale, N. B. 1959 Totemic beliefs in the Western Desert of Australia. Part 1 – Women who became the Pleiades. Records of the South Australian Museum, 13: 305–322

Tindale, N.B. 1974 *Aboriginal Tribes of Australia: Their Terrain, Environmental Controls, Distribution, Limits, and Proper Names*. Australian National University Press. Canberra.

Walshe, K. & J. Bonell 2005 Cultural Heritage Assessment of the Proposed Lincoln Gap Wind Farm, South Australia. Unpublished report prepared for Wind Energy Solutions Pty Ltd.

Walshe, K. and J., Bonell 2003 Archaeological and Anthropological Desktop Study of the Proposed Wind Farm Development Area, Hallett, South Australia. Unpublished report to Wind Prospect Pty Ltd. Time Map Pty Ltd.

Warrior, F., F. Night, S. Anderson and A. Pring 2005 Ngadjuri Aboriginal people of the mid north of South Australia. SASOSE Council, Meadows

Wood, V. 2001 Aboriginal Heritage Survey: Government Radio Network – Bumbunga Hill. Unpublished report.

Wood, V. 2007 Aboriginal Cultural Heritage Survey and Reporting: Willogoleche Hill Wind Farm. Unpublished report to the Aboriginal Affairs and Reconciliation Division. Vivienne Wood Heritage Consultant Pty Ltd.

Wood, V. 2009a Indigenous and non-Indigenous desk-top cultural heritage study of the proposed Bluff Grid Connection, SA. Unpublished report to Wind Prospect Pty Ltd. Vivienne Wood Heritage Consultant Pty Ltd.

Wood, V. 2009b Indigenous Cultural Heritage study of the proposed Willogoleche Wind Farm Gris Connection and Substation, SA. Unpublished report to Wind Prospect Pty Ltd.

Wood, V. 2009c North Brown Hill Wind Farm: Indigenous cultural heritage assessment (Ngadjuri Walpa Juri Lands & Heritage Association). Unpublished report to Wind Prospect Pty Ltd., Adelaide.

Wood, V. 2010 Aboriginal Cultural Heritage Desktop Study of the proposed amendments to the Willogoleche Hill Wind Farm. Unpublished report to Wind Prospect Pty Ltd. Vivienne Wood Heritage Consultant Pty Ltd.

Wood, V. & Fitzpatrick, P. 2005 An Indigenous cultural heritage study of the proposed remote substation and upgrade to the Davenport Substation, Port Augusta, South Australia. Unpublished Report Prepared for ElectraNet SA, December 2005. Vivienne Wood Heritage Consultant Pty Ltd. Adelaide, SA.

11 APPENDIX

11.1 DPC-AAR Register Search

Physical ID: AHRCA18D0112
File No. 2018/000011

Government of South Australia
Department of the Premier and Cabinet

Aboriginal Affairs & Reconciliation
GPO Box 320
Adelaide SA 5001
DX 452
Tel 08 8226 8900
Fax 08 8226 8999

26 April 2018

Shannon Smith
EBS Heritage
3/119 Hayward Avenue
TORRENSVILLE SA 5031

Dear Shannon

Thank you for your correspondence (email) dated 18 April 2018, regarding G80401 Project area 2, search 1, zoomed into the Bungama area, and to be used as part of a desktop risk assessment and cultural heritage survey. The search was based on the shapefile provided.

I advise that the central archive, which includes the Register of Aboriginal Sites and Objects (the Register), administered by the Department of the Premier and Cabinet, Aboriginal Affairs and Reconciliation (DPC-AAR), has an entry for Aboriginal sites within the project area.

This entry for an Aboriginal site is described as one archaeological site. The enclosed map identifies the approximate site location. It should be noted however that the site indicator does not reflect the actual area of the site; as this will vary from site to site, depending on the site information contained in the Central Archive.

The applicant is advised that sites or objects may exist in the proposed development area, even though the Register does not identify them. All Aboriginal sites and objects are protected under the *Aboriginal Heritage Act 1988* (the Act), whether they are listed in the central archive or not. Land within 200 metres of a watercourse (for example the River Murray and its overflow areas) in particular, may contain Aboriginal sites and objects.

Pursuant to the Act, it is an offence to damage, disturb or interfere with any Aboriginal site, object or remains (registered or not) without the authority of the Minister for Aboriginal Affairs and Reconciliation (the Minister). If the planned activity is likely to damage, disturb or interfere with a site, object or remains, authorisation of the activity must be first obtained from the Minister under Section 23 of the Act. Section 20 of the Act requires that any Aboriginal sites, objects or remains, discovered on the land, need to be reported to the Minister. Penalties apply for failure to comply with the Act.

It should be noted that this Aboriginal heritage advice has not addressed any relevant obligations pursuant to the Native Title Act 1993.

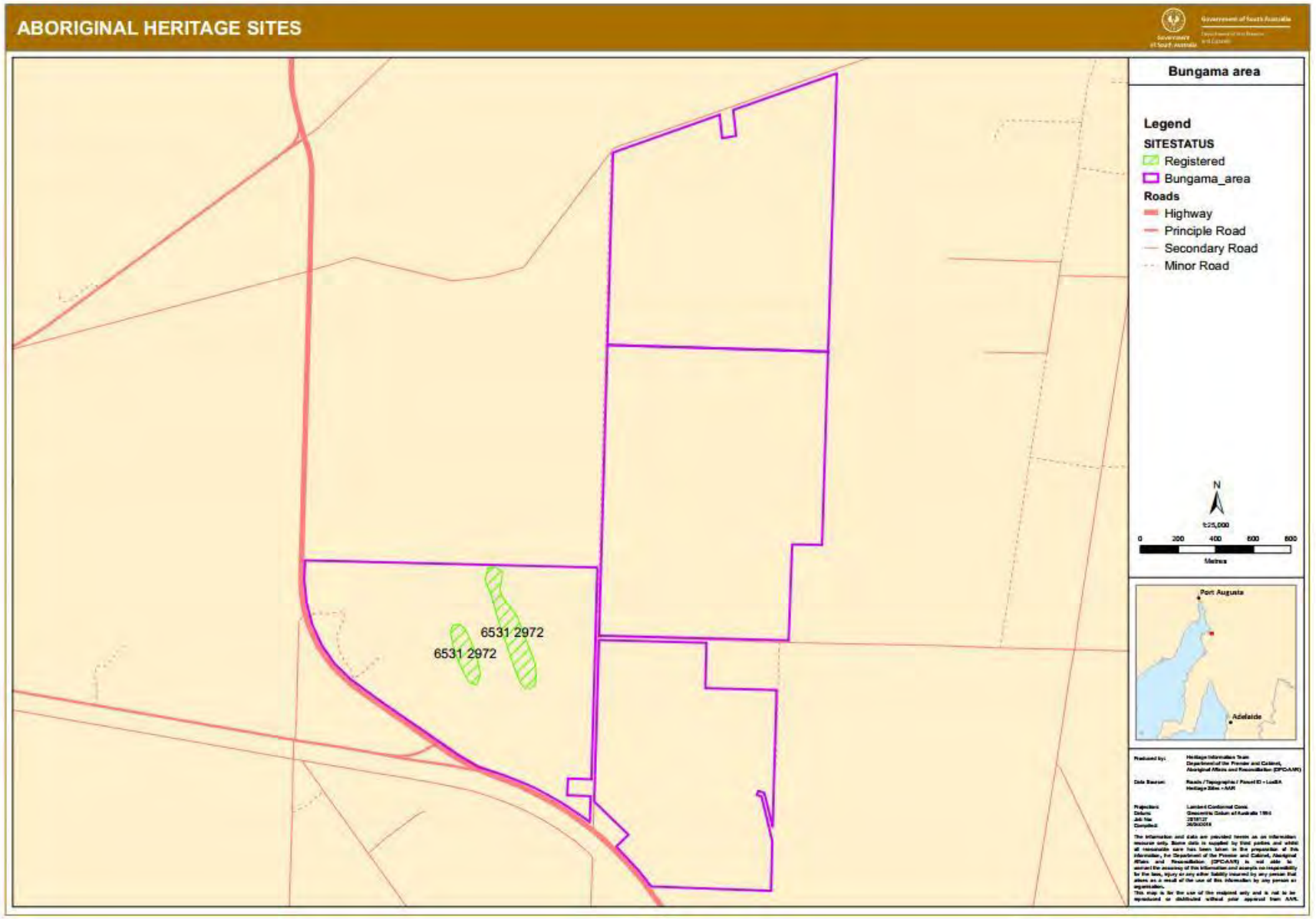
Please be aware in this area there are various Aboriginal groups/organisations/traditional owners that may have an interest, these may include:

NUKUNU PEOPLES COUNCIL INC
Chairperson: Doug Turner
Email: dmturner@internode.on.net
Mobile: 0421 612 236

If you require further information, please contact the Aboriginal Heritage Team on telephone (08) 8226 8900 or send to our generic email address dsdaarheritagesites1@sa.gov.au

Yours sincerely

Perry Langeberg
SENIOR INFORMATION OFFICER (HERITAGE)
ABORIGINAL AFFAIRS & RECONCILIATION


ABORIGINAL HERITAGE SITES
Government of South Australia
Bungama area
Legend
SITESTATUS
Registered
Bungama_area
Roads
Highway
Principle Road
Secondary Road
Minor Road
N
1:25,000
0
200
400
600
800
Metres
Port Augusta
Adelaide
6531 2972
6531 2972

Physical ID: AHRCA18D0113
File No. 2018/000011

Government of South Australia
Department of the Premier and Cabinet

Aboriginal Affairs & Reconciliation
GPO Box 320
Adelaide SA 5001
DX 452
Tel 08 8226 8900
Fax 08 8226 8999

26 April 2018

Shannon Smith
EBS Heritage
3/119 Hayward Avenue
TORRENSVILLE SA 5031

Dear Shannon

Thank you for your correspondence (email) dated 18 April 2018, regarding G80401 Project area 2, search 2, overview of the Bungama area, and to be used as part of a desktop risk assessment and cultural heritage survey. The search was based on the shapefile provided.

I advise that the central archive, which includes the Register of Aboriginal Sites and Objects (the Register), administered by the Department of the Premier and Cabinet, Aboriginal Affairs and Reconciliation (DPC-AAR), has entries for Aboriginal sites within the project area.

These entries for Aboriginal sites are described in the attached site table. The enclosed map identifies the approximate site location. It should be noted however that the site indicator does not reflect the actual area of the site; as this will vary from site to site, depending on the site information contained in the Central Archive.

The applicant is advised that sites or objects may exist in the proposed development area, even though the Register does not identify them. All Aboriginal sites and objects are protected under the *Aboriginal Heritage Act 1988* (the Act), whether they are listed in the central archive or not. Land within 200 metres of a watercourse (for example the River Murray and its overflow areas) in particular, may contain Aboriginal sites and objects.

Pursuant to the Act, it is an offence to damage, disturb or interfere with any Aboriginal site, object or remains (registered or not) without the authority of the Minister for Aboriginal Affairs and Reconciliation (the Minister). If the planned activity is likely to damage, disturb or interfere with a site, object or remains, authorisation of the activity must be first obtained from the Minister under Section 23 of the Act. Section 20 of the Act requires that any Aboriginal sites, objects or remains, discovered on the land, need to be reported to the Minister. Penalties apply for failure to comply with the Act.

It should be noted that this Aboriginal heritage advice has not addressed any relevant obligations pursuant to the Native Title Act 1993.

Please be aware in this area there are various Aboriginal groups/organisations/traditional owners that may have an interest, these may include:

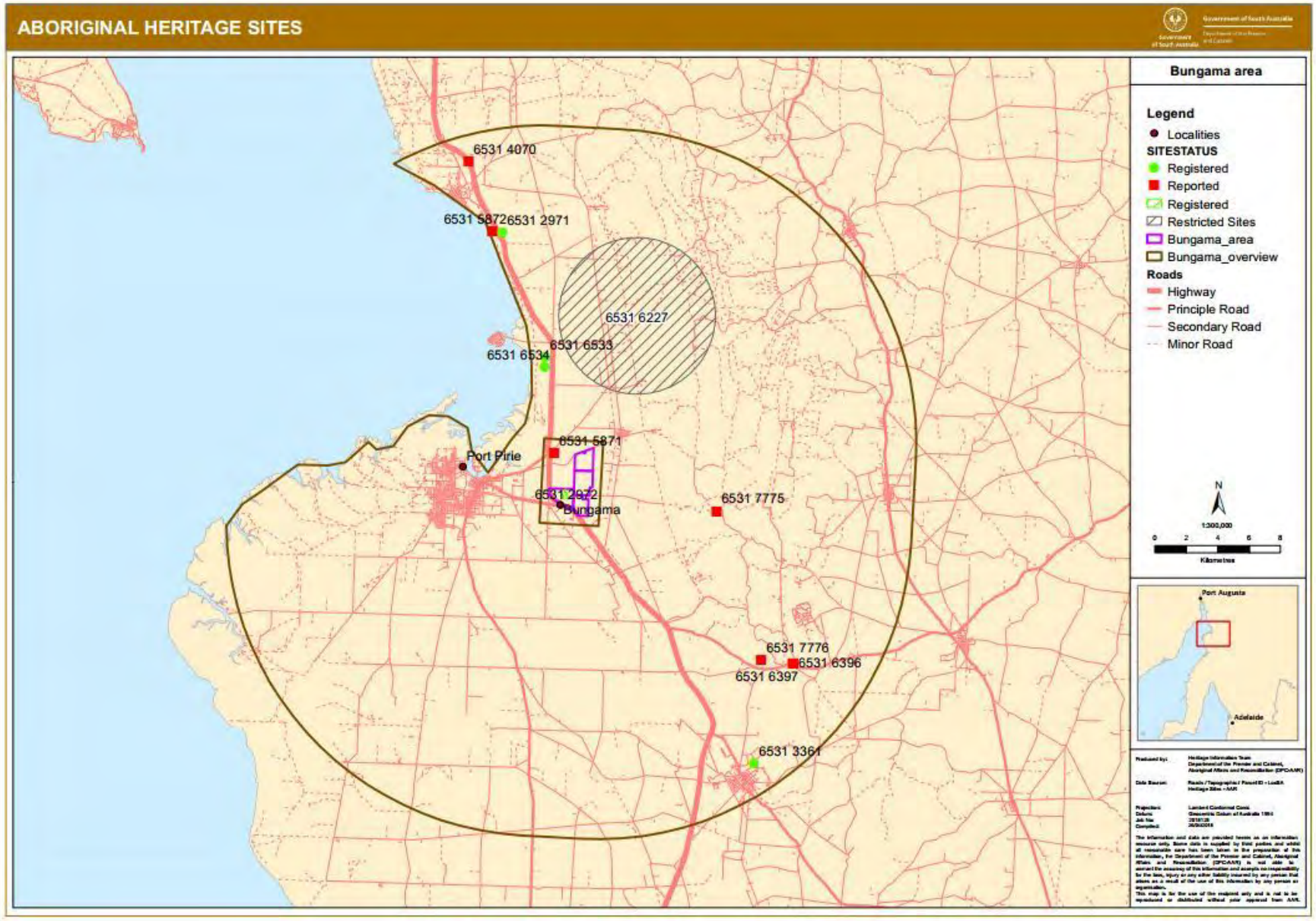
NUKUNU PEOPLES COUNCIL INC

Chairperson:	Doug Turner
Email:	dmturner@internode.on.net
Mobile:	0421 612 236

If you require further information, please contact the Aboriginal Heritage Team on telephone (08) 8226 8900 or send to our generic email address dsdaarheritagesites1@sa.gov.au

Yours sincerely

Perry Langeberg
SENIOR INFORMATION OFFICER (HERITAGE)
ABORIGINAL AFFAIRS & RECONCILIATION


ABORIGINAL HERITAGE SITES
Government of South Australia
Bungama area
Legend
Localities
SITESTATUS
Registered
Reported
Registered
Restricted Sites
Bungama_area
Bungama_overview
Roads
Highway
Principle Road
Secondary Road
Minor Road
6531 4070
6531 5872
6531 2971
6531 6227
6531 6533
6531 6534
6531 5871
Port Pirie
6531 2972
Bungama
6531 7775
6531 7776
6531 6396
6531 6397
6531 3361
N
1:300,000
0 2 4 6 8
Kilometres
Port Augusta
Adelaide

11.2 Site Discovery Procedure

Discovery of Aboriginal Heritage Procedure

Have you found a site, object or skeletal remains that may be Aboriginal Heritage?

- See example pictures on next page.

STOP

All works in Vicinity of Site

- **Do not disturb/remove/touch or displace the site**, object or skeletal remains.
- It is an offence to disturb or interfere with Aboriginal heritage or skeletal remains.
- (*SA Aboriginal Heritage Act 1988*)
- ***Leave objects in place*** –Supervisor to take photos and send to archaeologists for verification.

PROTECT

Restrict access. Site supervisor to take note of:

- Location in relation to site works (pref GPS).
- Identify any immediate threats to heritage e.g. construction activities, vandalism, water level.
- Name and contact details of the person who made the discovery.
- Do not proceed with any works (or move ot touch objects) until advice has been sought from site archaeologists

NOTIFY

Site Supervisor to immediately notify:

- Client Representative
- Archaeologists
- Local Police or 131 444. If suspected human remains have been discovered.

MANAGE

Manage the incident with appropriate guidance from:

- Local Police (where skeletal remains have been discovered).
- Aboriginal Affairs and Reconciliation .
- The local Aboriginal community.
- An Archaeologist /Cultural Heritage Advisor

RESUME

- The Site Manager will advise contractors when work can resume.
- This decision will be made in consultation with the archaeologists
- There may be conditions that need to be followed to allow work to resume.

3/119 Hayward Avenue
Torrensville, SA 5031
www.ebsheritage.com.au
t. 08 7127 5607
f. 08 8352 1222

APPENDIX 10

Transport Impact Assessment

BUNGAMA SOLAR

TRANSPORT IMPACT ASSESSMENT

Prepared for Bungama Solar

Prepared by GTA Consultants

EPS ENERGY

Reference No. 11297

November 18

BUNGAMA SOLAR

www.bungamasolar.com.au

Bungama Solar Project

Bungama, SA

Transport Impact Assessment

Prepared by: GTA Consultants (SA) Pty Ltd for Energy Projects Solar (EPS) Pty Ltd on behalf of Bungama Solar 1 Pty Ltd on 27/11/18

Reference: S159810

Issue #: A

GTAconsultants

Bungama Solar Project

Bungama, SA

Transport Impact Assessment

Client: Energy Projects Solar (EPS) Pty Ltd on behalf of Bungama Solar 1 Pty Ltd

on 27/11/18

Reference: S159810

Issue #: A

Quality Record

Issue	Date	Description	Prepared By	Checked By	Approved By	Signed
A	27/11/2018	Final	Ian Bishop	Paul Froggatt	Paul Froggatt	

© GTA Consultants (GTA Consultants (SA) Pty Ltd) 2018
Use or copying of this document in whole or in part (including photographs) without the written permission of Bungama Solar 1 Pty Ltd constitutes an infringement of copyright. Notwithstanding anything to the contrary GTA Consultants has prepared this document for the sole us of Energy Projects Solar (EPS) Pty Ltd including their respective heirs, successors and assigns and vests copyright of all material produced by GTA Consultants (but excluding pre-existing material and material in which copyright is held by a third party) in Energy Projects Solar (EPS) Pty Ltd including their respective heirs, successors and assigns.

LIMITATION: GTA Consultants accepts no liability or responsibility whatsoever for or in respect of any use of or upon this report by any third party other than those listed in the accompanying documentation.

GTAconsultants

Melbourne | Sydney | Brisbane
Canberra | Adelaide | Perth

CONTENTS

1. INTRODUCTION

01

1.1. Background

A Development Application is currently being sought for a proposed solar project on land located at Bungama, approximately 6km east of Port Pirie, SA. The proposed development incorporates the construction of a Photovoltaic Energy Generation System (PVS) of approximately 280 MW (AC) generation capacity and Battery Energy Storage System (BESS).

GTA Consultants was commissioned by the EPS Energy in 2018 to undertake a transport impact assessment of the proposed development.

1.2. Purpose of this Report

This report sets out an assessment of the anticipated transport implications of the proposed development, including consideration of the following:

1. existing traffic conditions surrounding the site
2. traffic generation characteristics of the proposed development
3. heavy vehicle route to the proposed development
4. proposed access arrangements and sight distance for the site
5. transport impact of the development proposal on the surrounding road network.

1.3. References

In preparing this report, reference has been made to the following:

- Port Pirie Regional Council Development Plan (consolidated – 31 October 2017)
- AustRoads Guide to Road Design – Part 4A – Signalised and Unsignalised Intersections (2017)
- Locality plan and project boundary for the proposed development
- various technical data as referenced in this report
- other documents as nominated.

2. EXISTING CONDITIONS

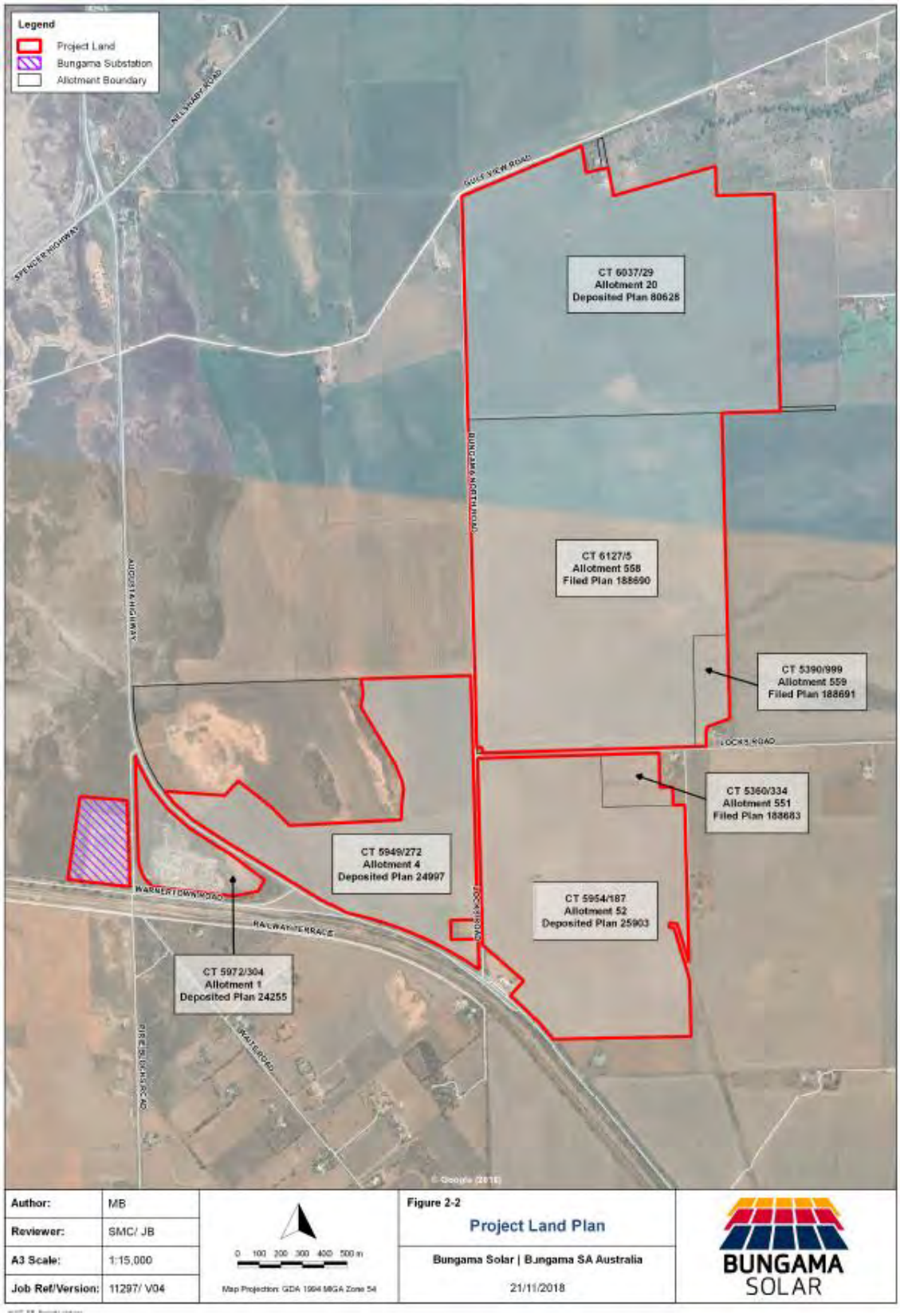
02

2.1. Project Area

The project area of approximately 530 hectares (ha) is located at Bungama, approximately 6km east of Port Pirie on the northeast of the Augusta (Princes) Highway.

The location of the project land, that includes the project area and the surrounding environs is shown in Figure 2.1.

Figure 2.1: Project Land and its Environs



2.2. Road Network

2.2.1. Adjoining Roads

Augusta Highway

The Augusta Highway forms part of the National Land Transport Network (NLTN) and is under the care and control of the Department for Planning, Transport and Infrastructure (DPTI). In the vicinity of the project area, the highway comprises a two-way carriageway approximately 8 metres wide with a single traffic lane in each direction and is set within a road corridor approximately 60 metres wide. A truck rest area is provided on the western side of the highway, opposite the intersection with Locks Road. A nature strip with a nominal width of approximately 3.8 metres separates the rest area from the highway. A left turn deceleration lane is provided at the intersection with Locks Road.

Augusta Highway carries approximately 4,800 vehicles per day[1] along the section adjacent to the project area and has a sign posted speed limit of 100km/h.

A service station is located on the south-eastern side of the intersection of Augusta Highway and Locks Road. At the service station, a short auxiliary left turn (AUL(S)) lane and a channelised right turn (CHR) lane are provided on Augusta Highway to facilitate access into the site.

Some other minor roads in the locality of the project area, including Scenic Drive to the south have basic right turn (BAR) treatments provided at their intersections with the Augusta Highway.

Locks Road

Locks Road is a sealed two-way local road under the care of Port Pirie Regional Council. Locks Road has a carriageway approximately 8 metres wide with a single lane of traffic in each direction and is aligned in a north/south direction. The carriageway is set within a road corridor approximately 22 metres wide. Locks Road is subject to the rural default speed limit of 100 km/h. GTA was unable to source traffic data for Locks Road to determine current traffic volumes, however an auxiliary left turn (AUL) treatment is currently provided into Locks Road from the Augusta Highway.

2.2.2. Surrounding Intersections

The following intersections currently exist in the vicinity of the site:

- Locks Road/ Augusta Highway (unsignalised)

2.2.3. Sight Distance

A desktop assessment of sight distance at the intersection of Locks Road and Augusta Highway has been undertaken in accordance with the requirements of the Austroads Guide to Road Design – Part 4A: Unsignalised and Signalised Intersections (Austroads, 2017). The assessment considers the Safe Intersection Sight Distance (SISD) and Minimum Gap Sight Distance (MGSD).

- Safe Intersection Sight Distance (SISD) – the sight distance for a vehicle travelling on a major road and approaching an intersection to observe a vehicle on the minor road approach moving into a collision situation and to decelerate to a stop before reaching the collision point; and
- Minimum Gap Sight Distance (MGSD) – sight distance for vehicles exiting the minor road to observe approaching vehicles on the major road and decide whether there is a sufficient gap to turn from the minor road.

[1] LocationSA – Traffic Volume Estimates, base year 2014.

Given the rural location of the project area, at a design speed of 110km/h and a reaction time of 2.5 seconds, an SISD of 300 metres is required.

MGSD is based on the critical gap acceptance time that drivers are prepared to accept when undertaking a crossing or turning manoeuvre at intersections. Depending on the types of turning movements, critical gap acceptance time has the following values:

- Right turn from major road – across one lane: 4 secs
- Right turn from minor road – two lane/two way: 5 secs
- Crossing – two lane/two way: 5 secs
- Left turn: 5 secs

A design speed of 110m and critical gap acceptance time of 5 secs requires a MGSD of 153m.

GTA has determined that both the SISD and MGSD at the intersection of Locks Road and Augusta Highway are satisfactory.

.

3. DEVELOPMENT PROPOSAL

03

3.1. Proposed Development

The proposal includes the construction of a Photovoltaic Energy Generation System (PVS) of approximately 280 MW (AC) generation capacity and Battery Energy Storage System (BESS). Construction of the development is proposed in stages. A construction scenario of 24 months is adopted for the assessment.

3.2. Vehicle Access

Access locations to the project are to be confirmed but will primarily be located on Locks Road. Where possible, options to utilise the existing crossovers will be adopted. Some access locations may be temporary to facilitate construction and may be closed once the solar facility is in operation.

4. TRAFFIC IMPACT ASSESSMENT

04

4.1. Heavy Vehicle Route Access to Project Area

During the construction phase of the project, heavy vehicles up to a 26 metre B-double (PBS Level 2) combination will access the project area and surrounding areas for solar PV module deliveries, BESS infrastructure deliveries, road upgrades associated with project area access, internal access tracks, sub-station, office and maintenance facility construction. During the operational phase, it is envisaged there will be very few heavy vehicle movements.

The indicative heavy vehicle route for the proposed project area at Bungama is as follows:

- From Port Adelaide via National Highway A9 (Port River Expressway, Salisbury Highway) and National Highway A1 (Port Wakefield Road, Port Wakefield Highway, Augusta Highway) and Locks Road

The existing DPTI approved restricted access vehicle routes are detailed on the DPTI RAVnet website and are reproduced in Figures 4.1 and 4.2, with the proposed route highlighted. Figure 4.3 shows the existing 26m B-Double (PBS Level 2) network in the locality of the project area.

With the exception of a small number of oversize vehicles used for delivery of transformers and substations, the maximum design vehicle proposed for project area access is a 26 metre B-Double (PBS Level 2) which is currently approved for travel on the proposed route, including Locks Road.

Over dimensional vehicles will require an application to be lodged with DPTI and require either private or police escort depending on the limits of the over dimensional load.

Figure 4.1: Existing 26m B-Double Approved Routes – Port Adelaide to Port Wakefield

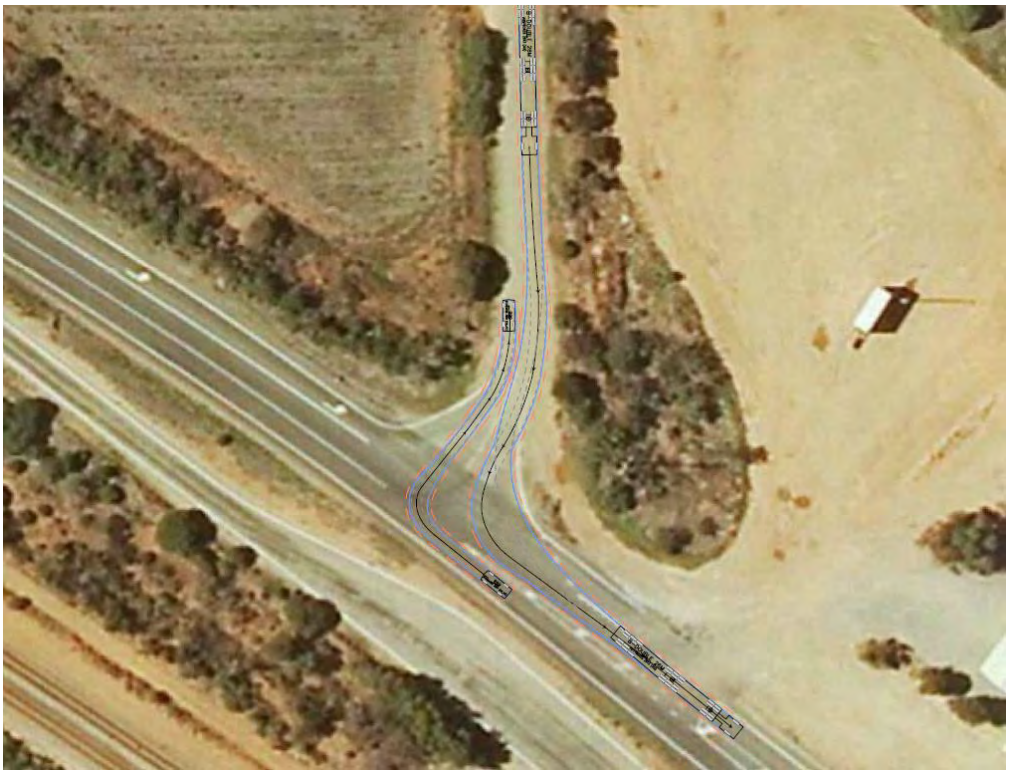
Figure 4.2: Existing 26m B-Double Approved Routes – Port Wakefield to the proposed project area

Figure 4.3: Existing 26m B-Double Approved Routes in vicinity of the project area

Turnpaths have been completed for a 26 metre B-double (PBS Level 2) combination turning between the Augusta Highway and Locks Road and are shown in Figures 4.4 and 4.5. The turn paths demonstrate that a 26 metre B-double will be able to turn simultaneously with other light traffic within the footprint of the existing intersection. Modifications to accommodate turning movements will not be required.

Figure 4.4: 26 Metre B-Double Right Turn into Locks Road

Figure 4.5: 26 Metre B-Double Left Turn from Locks Road



4.2. Traffic Generation

Traffic impacts of the proposed solar project on the surrounding road network during the construction phase are assessed based on the following two scenarios:

- Scenario 1 – considering all light vehicles and heavy vehicle movements during the construction phase
- Scenario 2 – a construction camp may be set up within the project area, which means construction light vehicles traveling to and from the site would be reduced.

Traffic in the operational phase will most likely be generated by light vehicles of staff to monitor operations and maintain the facility. It is envisaged there will be very few heavy vehicle movements, and these would likely occur on an ad hoc basis for equipment replacement.

4.3. Construction Phase Traffic Generation – Scenario 1

4.3.1. Design Rates

Traffic generation estimates during the construction phase for the project area were sourced from EPS Energy. Based on a 24-month construction period, the proposed project area is anticipated to generate a total of 4,606 heavy vehicle movements.. A summary of the anticipated heavy vehicle types and movements during the construction period is provided in Table 4.1. The average heavy vehicle and light vehicle movements per day during construction is shown in Table 4.2.

Table 4.1: Anticipated Heavy Vehicle Type and Movement Details [1]

Equipment		Delivery Vehicle	Movements
Major Equipment Delivery	Post Pounding Units and Piles.	Semi Trailer	417
	Tracking System, Framework	Semi Trailer	880
	PV Modules	B-Double Semi	840
	PCS, Inverters	L - Low Loader	56
	Combiner Boxes	Semi Trailer	16
	Other including cabling	Semi Trailer	305
Site Mobilisation / Set-up	Misc. Establishment Deliveries	L - Low Loader	12
	Earthmoving Equipment Deliveries	H - Low Loader	12
	Imported Materials for Office / Laydown	Truck and Dog	280
	Imported Materials for Roads	Truck and Dog	900
HV Trenching	Excavator Delivery	H - Low Loader	4
	Cable Laying Equipment	L - Low Loader	4
	Cable Bedding Sand	Truck and Dog	200
Substation Works	Misc. Building Materials etc	Semi Trailer	10
	Primary Transformer	O/D H-Low Loader	2
	Modular Substation	O/D L-Low Loader	2
	Switchboard	L - Low Loader	4
	Cabling	L - Low Loader	4
	Switchgear Components	Semi Trailer	10
General Construction	Waste Collection	Waste Truck	160

Equipment	Delivery Vehicle	Movements
Dust suppression	Water Trucks	488
	TOTAL	4,606

[1] Source: Estimated traffic movement data by EPS Energy, dated [28 August 2018].

Table 4.2: Traffic Generation Estimates

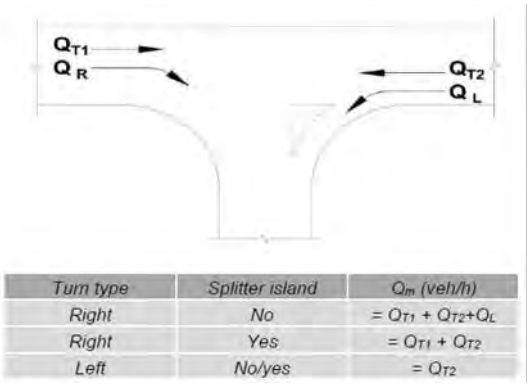
Construction Phase	Light Vehicles per day	Heavy Vehicles per day	OD Heavy Vehicles	Total movements per day
Months 1-2	10	9		19
Months 3-4	15	11		26
Months 5-6	23	13		36
Months 7-8	34	18		52
Months 9-10	32	12		44
Months 11-12	27	14	2	43
Months 13-14	30	14		44
Months 15-16	32	12		44
Months 17-18	26	13		39
Months 19-20	18	11		29
Months 21-22	15	0		15
Months 23-24	9	0		9

The estimated average vehicle movements per day across the construction scenario varies across different phases. However, a consistent level of daily movements averaging approximately 45 movements per day (31 light vehicles and 14 heavy vehicles) occurs between construction months 7 and 16.

4.3.2. Intersection Treatment Warrant Assessment

Based on the above traffic generation estimates, an assessment has been undertaken in accordance with the Guide to Road Design Part 4: Intersections and Crossings - General (Austroads, 2017) which considers the warrants for turning treatments at the intersection of Locks Road and Augusta Highway. Figure 4.6 shows the various traffic volume parameters calculated by the warrant.

Figure 4.6: Calculation of the Major Road Traffic Volume Parameter Qm



Turn type	Splitter island	Q_m (veh/h)
Right	No	$= Q_{T1} + Q_{T2} + Q_L$
Right	Yes	$= Q_{T1} + Q_{T2}$
Left	No/yes	$= Q_{T2}$

For a right turn movement, the major road traffic volume parameter (Q_M) consists of the traffic held up behind the right turning vehicles on the major road (Q_{T1}), and traffic impacting the right turn movement in the opposite direction of travel (Q_{T2} and Q_L). For a left turn movement, the major road traffic volume parameter (Q_M) considers only the traffic held up by the turning vehicle in the same lane (Q_{T2}).

The Augusta Highway has an Average Annual Daily Traffic (AADT) of 4,800 along the frontage of the project area. For this assessment a peak hour volume of 10% of the daily traffic was assumed. As such, the peak hour traffic volume is approximately 480, including 240 northbound movements and 240 southbound movements (50:50 directional split is assumed).

Turning movements into the Project Area

Given the proximity of the project area to Port Pirie, it is assumed that majority of the light vehicles would come from Port Pirie, west of the project area. It is also assumed that 30% of the light vehicles will likely arrive at the project area within a given peak hour correlating with shift work. Therefore, it is anticipated that the volume of light vehicles arriving at the project area in the peak hour is approximately 10 vehicles.

Heavy vehicles will travel westbound to the project area via the proposed route along the Augusta Highway. It is assumed that the arrival distribution of heavy vehicles is even over the hours of construction. As such a peak hour heavy vehicle volume equal to 10% of the total heavy vehicle volume has been adopted and equates to approximately 2 vehicles per hour in the peak hour.

The turning movement of vehicles at the intersection of Augusta Highway and Locks Road, excluding any existing traffic that uses Locks Road, is shown in Figure 4.7.

Figure 4.7: Turning movement in a peak hour

Warrants for turn treatments

Based on the traffic volume and distribution assumptions, Table 4.3 presents the left and right turn volume calculations with respect to the major road traffic volumes. Note that all existing traffic is shown as through traffic since turning count volumes are not available for the intersection. However, existing turning movements are expected to be low in comparison

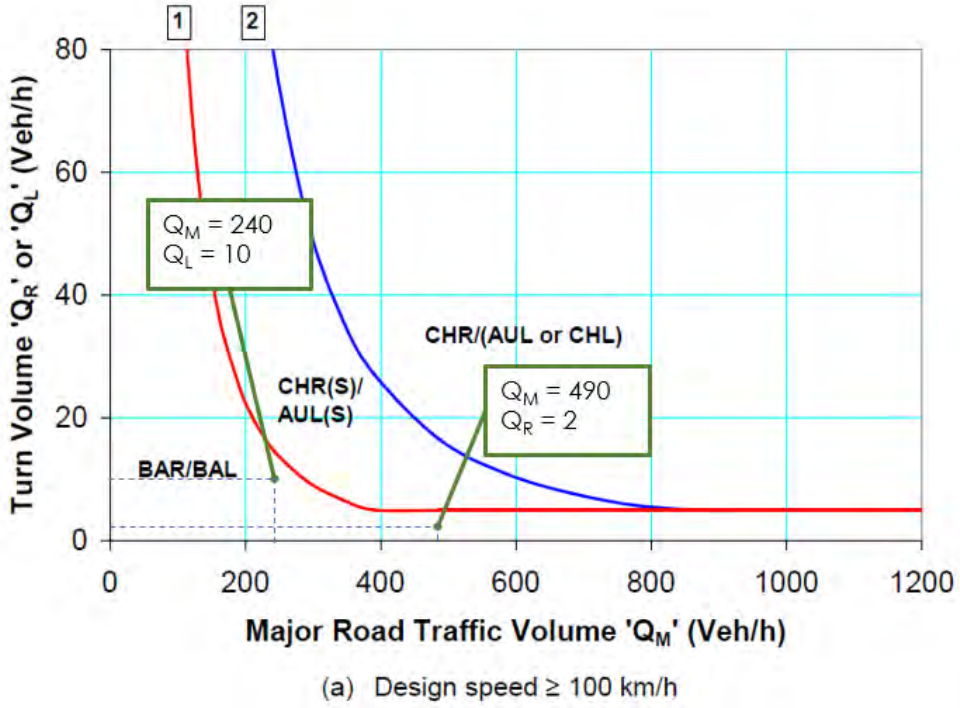
to the through traffic volumes on the Augusta Highway. The peak hour movements shown in Table 4.3 represent construction traffic volume only.

Table 4.3: Traffic Volume Parameters

Turn Type	Peak Hour Movements	Major Traffic Volume (Q_M)
Right (Q_R)	Q_R =2	$Q_M = Q_{T1} + Q_{T2} + Q_L$ = 490
Left (Q_L)	Q_L = 10	$Q_M = Q_{T2}$ = 240

Figure 4.8 outlines the warrant for turn treatments on the major road at unsignalised intersections for a design speed equal to or greater than 100km/h. The Peak Hour Movements (Q_R/Q_L) and corresponding Major Traffic Volumes (Q_M) are plotted on the graph to determine the type of turn treatment required.

Figure 4.8: Warrant for intersection treatment



(Reproduced based on Figure A 10b, Austroads, Guide to Road Design Part 4)

From the above assessment, it can be concluded that during the peak hour in the peak construction period, the intersection would meet the warrant for Basic Right-turn (BAR) treatment and Basic Left-turn (BAL) treatment.

Left turn treatment

Although existing intersection turning volumes are unknown, the provision of an Auxiliary Left Lane (AUL) at the intersection suggests that there is sufficient traffic from the north turning left into Locks Road to meet the AUL warrant. The AUL would therefore be able to accommodate the additional 10 left turn movements generated by the development.

Right Turn treatment

The additional 2 right turn movements into Locks Road generated by the development in the peak period is not expected to impact on the warrant for a formal right turn treatment beyond existing conditions. As the risk associated with 2 movements per hour is considered low, a formalised right turn treatment is not considered appropriate for the intersection.

4.4. Construction Phase Traffic Generation – Scenario 2

In this scenario, a construction camp is proposed within the project area so that light vehicle traffic generated during the construction phase will be reduced. The construction camp is anticipated to reduce light vehicle movements during the peak period by up to 90% compared to Scenario 1. This assumption considers that there will be some vehicle light vehicle movements during the peak period to access facilities at Port Pirie. During the busiest construction period (between months 7 and 16), the anticipated light vehicle movements will be reduced from 31 vehicles to approximately 4 vehicles per day.

Based on the assumption that 30% light vehicles will be accessing the project area during the peak hours, approximately 1 light vehicle will be accessing the site during the peak hour.

The anticipated heavy vehicle volume in this scenario will be consistent with that of Scenario 1, where approximately 2 heavy vehicles in the peak hour will travel to the project area via the proposed route from the east of the project area.

In this scenario, the increase in traffic generated by the project in the construction phase is anticipated to be marginal and will not generate any additional intersection treatment requirement.

4.5. Operational Phase Traffic Generation

Given the low trip rate generated by the operational staff, the development is unlikely to compromise the safety or function of the surrounding road network during operational phase.

4.6. Summary

In summary, the project is not anticipated to generate high volumes of traffic during both construction and operational phases. The intersection of Augusta Highway and Locks Road will not require any additional intersection treatments that it currently provides based on the low project-generated traffic volumes.

5. CONCLUSION

05

5.1. Conclusion

GTA has undertaken a transport feasibility assessment for the proposed Bungama Solar development and the following conclusions are made:

1. A Photovoltaic Energy Generation System (PVS) of approximately 280 MW (AC) generation capacity and Battery Energy Storage System (BESS) is proposed on land located 5km northeast of Robertstown SA.
2. Access to the project area will be provided primarily along Locks Road.
3. The project area has a direct connection via Locks Road to the Augusta Highway which carries approximately 4,800 vehicles per day.
4. The proposed heavy vehicle route will be from Port Adelaide via National Highway A9, National Highway A1, and Locks Road.
5. The proposed heavy vehicle route is currently gazetted for 26m B-Double combinations and therefore, with the exception of over dimensional loads, no further approvals are required.
6. Where over dimensional loads are proposed, an application to DPTI will be required and over dimensional loads will likely require a vehicle escort.
7. Turnpaths undertaken at the intersection of Augusta Highway and Locks Road demonstrate that a B-double will be able to turn in and out of Locks Road simultaneously with other light traffic within the existing footprint of the intersection and no further modification to the intersection is required to accommodate the turnpaths.
8. The proposed traffic generated by the project area during the construction phase and operational phase is low in comparison to existing traffic volumes and therefore is not expected to compromise the safety or function of the surrounding road network.
9. Review of the warrants for various intersection treatments suggests that the current intersection and traffic volume is likely to meet the warrant for a Basic right-turn (BAR) treatment and Basic Left-turn (BAL) treatment. An Auxiliary left turn lane (AUL) has been provided at the intersection.
10. The additional left turn movements associated with construction traffic will be accommodated by the existing AUL treatment at the intersection.
11. The additional right turn movements generated by the development are not expected to significantly elevate the warrant for a formal right turn treatment beyond existing traffic conditions. The risk associated with the right turn movements is low due to the low volumes, therefore a formalised right turn treatment on Augusta Highway is not considered necessary.
12. A desktop sight distance assessment at the intersection of Augusta Highway and Locks Road indicates that the SISD and MGSD meet the requirements of the AustRoads Guide to Road Design Part 4a.

GTAconsultants

www.gta.com.au

APPENDIX 11

Socio Economic Impact Assessment

BUNGAMA SOLAR

SOCIO-ECONOMIC IMPACT ASSESSMENT

Prepared for Bungama Solar

EPS ENERGY

Reference No. 11297 November 18

BUNGAMA SOLAR

www.bungamasolar.com.au

QUALITY ASSURANCE AND DECLARATION

Quality Assurance and Version Control Table		
Project:	Bungama Solar Project	
Client:	Bungama Solar 1 Pty Ltd and Bungama Solar 2 Pty Ltd	
Rev:	Date:	Reference:
V01	29.11.2018	11297_Bungama Solar – Socio- Economic Impact Assessment
Checked By:	D. Carruthers	
Approved By:	S. McCall/ J. Burns	
Declaration:	*The opinions and declarations in this document are ascribed to EPS Energy and are made in good faith and trust that such statements are neither false nor misleading.* *In preparing this document, EPS Energy has considered and relied upon information obtained from the public domain, supplemented by discussions between key EPS Energy staff, representatives from governing agencies and independents, including the client and specialist consultants.*	
Applicant:	EPS Energy PO Box 195 Charlestown NSW 2290 (02) 9258 1362	
Prepared By:	L. Bryson	
Reviewed By:	S. Duffy/ A. Tipper	

EXECUTIVE SUMMARY

The following Socio-Economic Impact Assessment (SEIA) examines the baseline social and economic characteristics of the Port Pirie Local Government Area and considers the likely outcomes of the proposed Bungama Solar project.

Bungama Solar is an integrated but separately operated grid connected Photovoltaic Energy Generation System (PVS) of approximately 280MW (AC) generation capacity and a 140MW capacity Battery Energy Storage System (BESS) with 560MWh of storage that will feed into the National Electricity Market via ElectraNet's Bungama Substation. The PVS element, the BESS element and associated infrastructure, together are "the Project".

The Project area is approximately 530ha located in the suburbs of Bungama, Napperby and Warnertown in South Australia. The Project area is situated approximately 6km east of Port Pirie, and 218km north of the State's capital, Adelaide. The Project is within the Local Government Area (LGA) of Port Pirie Regional Council.

The key findings of this assessment indicate that the proposal will:

- Deliver clean and renewable energy for Australia in the face of climate change;
- Assist in meeting renewable energy targets for the State and the Nation;
- For each year of its 30-year operational life, displace the equivalent of 497,000 tonnes of greenhouse gas emissions per annum, the equivalent of offsetting the impact of 195,000 cars or providing the equivalent benefit of 69,500 trees per annum;
- Provide clean energy to power an equivalent of 86,000 homes for each year of the project's operational life;
- Create industry diversity for the Port Pirie region;
- Create substantial employment opportunities during project construction phases;
- Be located in a suitable area with access to existing infrastructure;
- Provide a flexible, low-impact alternative to the existing agricultural land use;
- Generate an estimated economic benefit in the order of $292.5 million for the broader economy and approximately $164 million as direct domestic project expenditure;
- Generate up to an estimated 275 equivalent full-time jobs during construction, and a further 410 indirect full-time equivalent jobs;
- Generate up to an estimated 8 equivalent full-time jobs during operations; and
- Provide a direct benefit to the community in the form of a community fund.

A full analysis and discussion supporting the key findings is provided within.

CONTENTS

TABLE OF FIGURES

LIST OF TABLES

1. INTRODUCTION

EPS Energy has been engaged to examine the forecast social and economic outcomes of Bungama Solar an integrated but separately operated grid connected Photovoltaic Energy Generation System (PVS) of approximately 280MW (AC) generation capacity and a 140MW capacity Battery Energy Storage System (BESS) with 560MWh of storage that will feed into the National Electricity Market via ElectraNet's Bungama Substation. The PVS element, the BESS element and associated infrastructure, together are "the Project".

The focus of this socio-economic impact assessment (SEIA) is to identify and facilitate enhanced development outcomes as well as examine and ameliorate any perceived or unintended negative social outcomes. The purpose of this assessment is to assist the project, project community and related stakeholders in understanding the relative social and economic benefits of the proposal.

1.1. LIMITATIONS AND ASSUMPTIONS

This report is subject to the limitations, assumptions and data sources presented within. The following limitations need to be considered when interpreting this SEIA.

This SEIA is intended to accompany the Planning Report documentation as part of the proposal's development application and assessment. The context for this report is the project's proposal stage and while every effort has been undertaken to ensure the data represents project forecasts, any significant changes to data inputs should be referred to the author for review, and this report refreshed.

EPS Energy has based this impact assessment on the assumption that Bungama Solar Project will operate for its entire design life of 30 years. However, this operational duration may be shortened or lengthened depending on market influence. Additionally, there may be opportunities for project expansion in the future. This SEIA is limited to the project's anticipated operation period of 30 years and current project scale and design, including cost and employment estimates.

2. BUNGAMA SOLAR PROJECT

2.1. PROJECT DESCRIPTION

Bungama Solar is an integrated but separately operated grid connected Photovoltaic Energy Generation System (PVS) of approximately 280MW (AC) generation capacity and a 140MW capacity Battery Energy Storage System (BESS) with 560MWh of storage that will feed into the National Electricity Market via ElectraNet's Bungama Substation. The PVS element, the BESS element and associated infrastructure, together are "the Project".

The Project area is approximately 530ha located in the suburbs of Bungama, Napperby and Warnertown in South Australia. The Project area is situated approximately 6km east of Port Pirie, and 218km north of the State's capital, Adelaide. The Project is within the Local Government Area (LGA) of Port Pirie Regional Council.

The project is currently in the development application stage, with technical studies being undertaken to establish the relevant technical information required to seek development approval. This study is intended to form part of the suite of development application documents for the project.

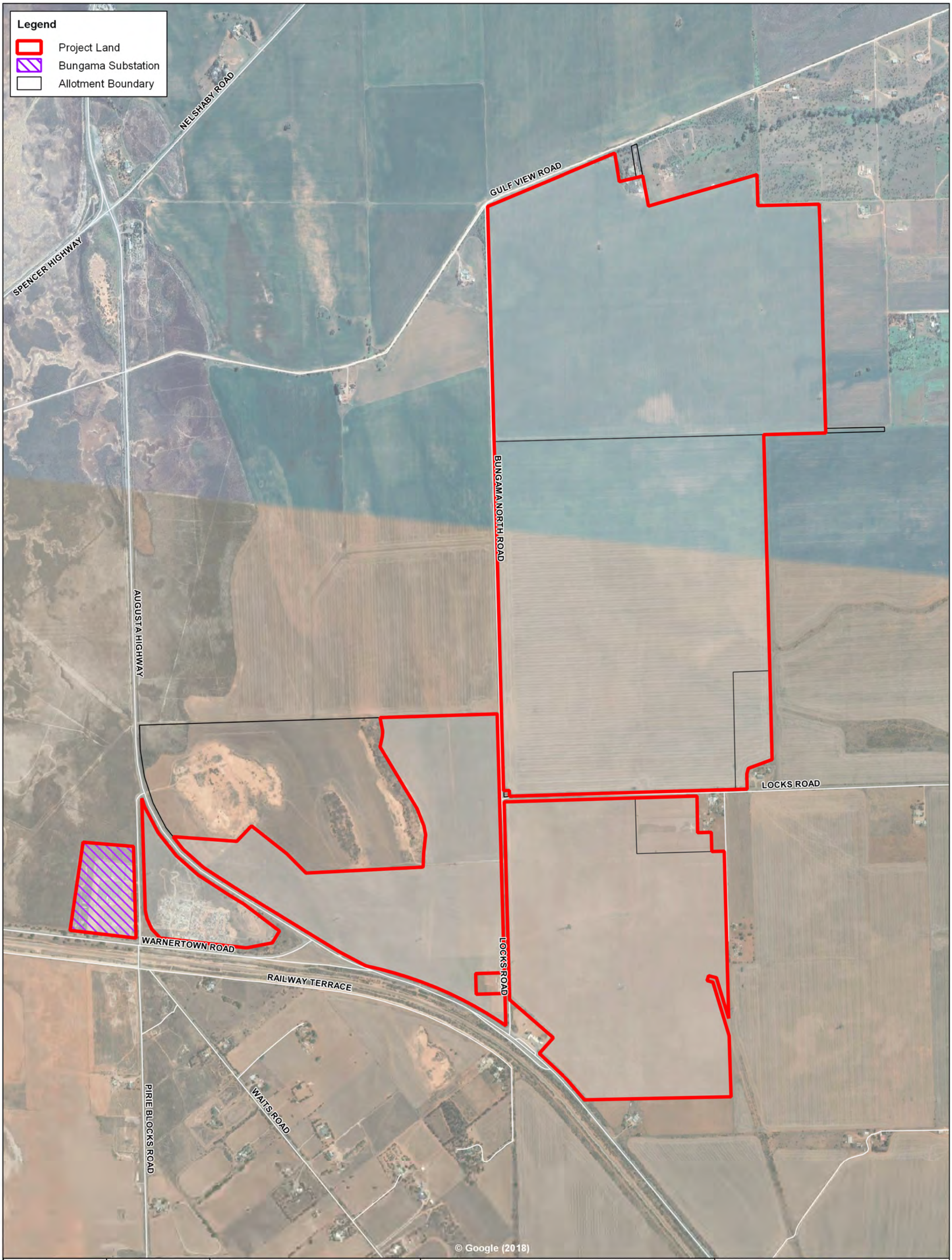
2.2. PROJECT AREA CONTEXT

The Project land comprises the Project area on which the PVS, BESS Project's substation, Operations and Maintenance buildings and associated infrastructure will be built and operated, and land required to connect the Project's elements to ElectraNet's Bungama Substation. The Project area is approximately 530 ha of cleared land, located in the suburbs of Bungama, Warnertown and Napperby, South Australia (refer to Figure 2-1). The Project area falls within the municipality of Port Pirie Regional Council.

2.3. STUDY AREA

The study area for this assessment is The Port Pirie Regional Council, in which the project is proposed to be located. Figure 2-2 as follows, demonstrates the Project area within the context of the Port Pirie Regional Council's Local Government Area (LGA).

The properties that comprise the Project area have historically been used for agricultural purposes including cereal cropping and grazing. Surrounding development is predominately agricultural land with cereal crops and pasture most prominent.



Author:	MB
Reviewer:	SMC/ JB
A3 Scale:	1:15,000
Job Ref/Version:	11297/ V04

0 100 200 300 400 500 m

Map Projection: GDA 1994 MGA Zone 54

Figure 2-1

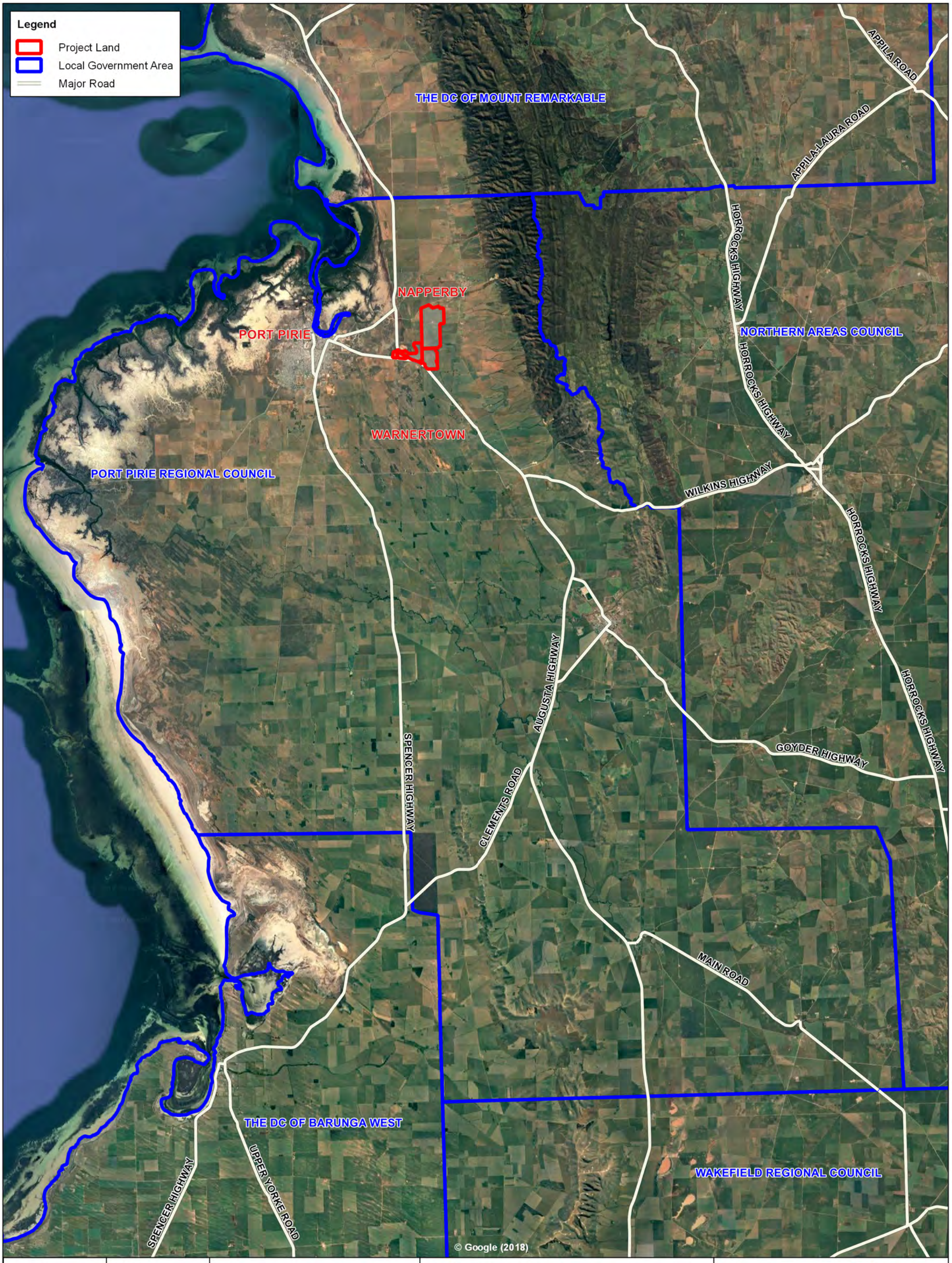
Project Land

Bungama Solar | Bungama SA Australia

21/11/2018

BUNGAMA SOLAR

11297_SEIA_Project Land.qgs



Author:	MB
Reviewer:	SMC/ JB
A3 Scale:	1:220,000
Job Ref:	11297/ V03

0 2.5 5 7.5 10 km

Map Projection: GDA 1994 MGA Zone 54

Figure 2-2

Study Area

Bungama Solar | Bungama SA Australia

21/11/2018

BUNGAMA SOLAR

11297_SEIA_Port Pirie LGA.qgs

3. REGIONAL PROFILE

Port Pirie Regional Council is located in the mid - north region of South Australia. The Project area is predominantly agricultural land, primarily associated with cereal crops, such as wheat and barley, as well as sheep grazing for merino wool. Port Pirie's main economic production is generated through resources and manufacturing, education, retail, hospitality and health care.

3.1. POPULATION AND GROWTH PROJECTIONS

Australian Bureau of Statistics (ABS) data re-published by South Australian Planning Portal (2018), provides population forecasting based on an analysis of growth trends considering assumptions of mortality, fertility and migration. Growth projections are not intended to predict the future, rather they provide an informed estimate of population movements.

The data indicates that the population of Port Pirie LGA is forecast to increase by 6% or 988 people (from a population of 17,627 to 18,615) between 2011 and 2031. The projection is equivalent to a + 0.3% annual projected population change. This is below the average annual growth rate of Regional South Australia of 0.4% recorded between the 2011 and 2016 census.

South Australia Planning Portal (2018) notes that growth in regional South Australia is typically dwarfed by those levels experienced in metropolitan Adelaide, generally as a result of increased housing densification in urban areas. It is noted that between the 2011 and 2016 census, 15 out of 44 regional LGA's (or 34% of regional councils) experienced population decline over that period. Low growth or population decline in regional areas can result from numerous factors including a downturn in a major industry, youth migration or an ageing population.

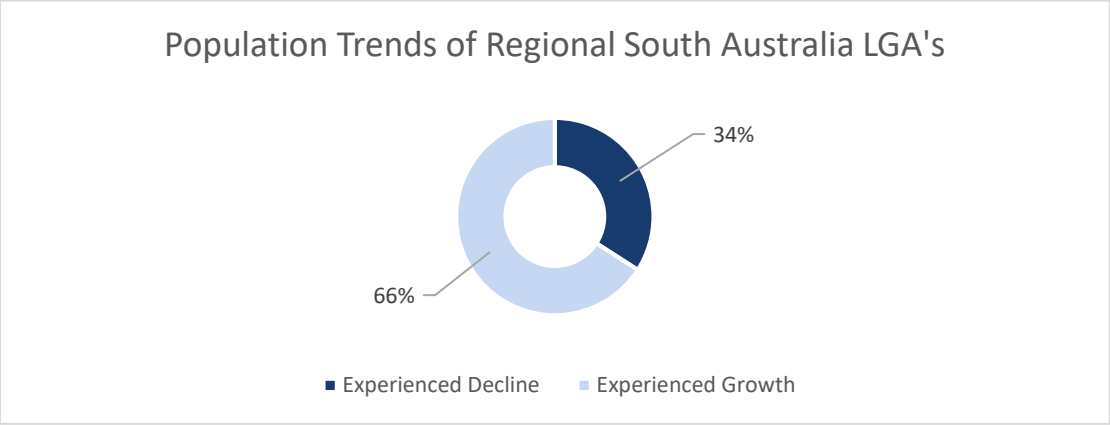


Figure 3-1: Population Trends of Regional South Australia LGA's (2011-16)

3.2. REGIONAL EMPLOYMENT CONDITIONS

The latest published data from the Small Area Labour Markets Publication, released by the Australian Department of Jobs and Small Business (2018), indicates that Port Pirie LGA has an unemployment rate of 11.6%.

This is substantially higher than the National and South Australian State averages of 5.4% and 5.6% respectively. This could be attributed the LGA's high proportion of agricultural lands as well as the recent decommissioning of proximate manufacturing and power plants.

As demonstrated in the previous aerial imagery, the immediate locality constitutes predominantly open rural and agricultural lands with the township of Port Pirie located west on the coast. Local context photos are provided at

Figure 3-2 Development Context Photos below. The LGA is serviced by several small townships, with the largest urban and employment bases located within the town of Port Pirie and further south in the Barossa Valley, and greater Adelaide.

Figure 3-2 Development Context Photos

4. SOLAR DEVELOPMENT CONTEXT

The recent momentum for large scale solar development in Australia has been predominantly driven by the improved feasibility of projects, through advances in technology and competitive construction costs. According to the Australian PV Institute (2018), there are over 1,000MW of solar projects currently commissioned and operational in Australia.

AEMO (2018) estimates that, as at the date of this report, almost 7,000MW of projects are currently proposed or in various stages of approval and development across the nation.

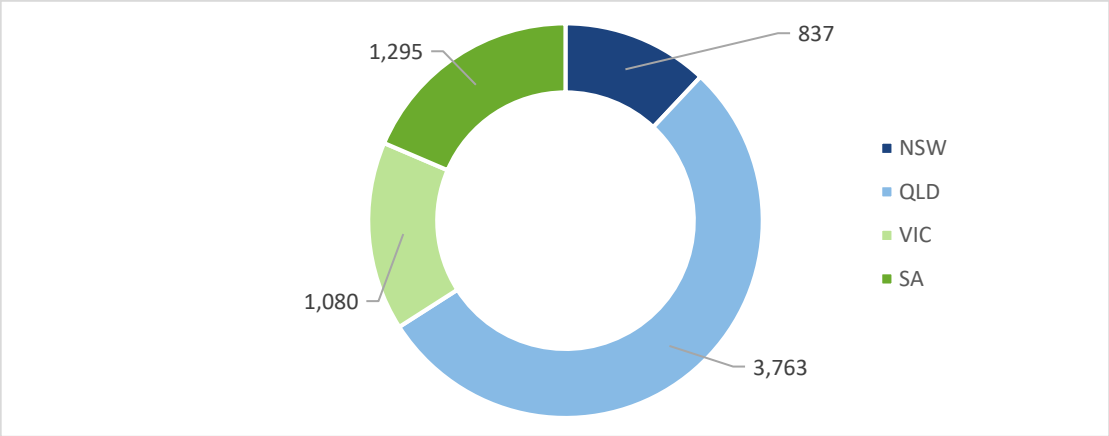


Figure 4-1: AEMO Estimate: Proposed Solar Development Pipeline Nationally (MW)

Recent growth in the industry has been encouraged by the increased focus on meeting clean energy targets, both nationally and internationally.

Solar farms, including the proposed Bungama Solar project, are considered to align with national and international policy as they:

- Fulfil the nation's commitment to reducing greenhouse gas emissions as a signatory to the Paris Agreement;
- Contribute to the Australian Commonwealth renewable energy target;
- Contribute to meeting South Australia's 50% Renewable Energy Production Target;
- Align with the Government of South Australia's, Renewable Energy Plan for South Australia; and
- Contribute to meeting the Government of South Australia's investment target of $10 billion in low carbon generation by 2025.

South Australia is considered to be a leader within the Australian market, in targeting and delivering renewable energy generation and storage, having recently met its 50% renewables target years before schedule.

4.1. SOCIAL LICENSE

A social license to operate is a concept that reflects a community's support of a development. A proposal may be able to satisfy legal requirements in order to gain approval, however attaining social support from the community can be vitally important to a project's longevity and sustainability.

Large scale solar is a relatively recent emerging industry for Australia. As such, relatively little data is available regarding community attitudes towards solar farms, in comparison to other more longstanding and prevalent types of energy projects. For this reason, long-term community attitudes towards individual solar projects, as well as the cumulative impact of projects across the Australian solar industry, are particularly difficult to gauge.

Research undertaken by the Australian Renewable Energy Agency (ARENA) suggests that the Australian public has a generally positive attitude towards the emerging large-scale solar industry. The study included a mix of the general Australian public as well as selected communities with a current or proposed large scale solar project.

Overall the ARENA research concluded that 78% of participants were either somewhat or strongly in favour of large-scale solar projects, with a small proportion (5%) being opposed to such projects. In other words, for everyone one person opposed to the solar industry in Australia, more than 15 people are in favour (ARENA 2015).

The survey suggests that the Australian community have generally demonstrated positive attitudes toward large-scale solar projects.

The community and government agency consultation undertaken to date for the Bungama Solar project, demonstrated a similar level of support, with most people consulted supporting the proposal.

5. STUDY METHODOLOGY

This report assesses both the social and economic impacts of the proposed Bungama Solar Project. The following section outlines the data sources and methodologies adopted.

5.1. SOCIAL IMPACT ASSESSMENT DATA

The social impact assessment data analysis identifies the social effects of the proposed development. The approach encourages the realisation of positive externalities and the mitigation of negative impacts. The purpose of the assessment is to ensure that decision makers have the necessary information available to promote socially responsible development. Accordingly, the social impact assessment methodology has included data sourced from a review of:

- Socio-demographic data from the Australian Bureau of Statistics (ABS);
- Additional published and publicly available social and demographic data; and
- Other strategic documentation, where relevant.

5.2. ECONOMIC IMPACT ASSESSMENT DATA

The economic impact assessment has adopted a methodology that identifies the economic effects of the proposal, allowing for the maximisation of positive externalities and mitigation of negative impacts. This assessment has considered the direct economic effects of the proposal, including employment, as well as the indirect broader effects such as investment and spending within the local economy. Accordingly, the economic impact assessment methodology has included:

- Economic and employment data from the ABS;
- Review of published and publicly available economic data; and
- Estimates provided by the project's Early Works Engineering Procurement and Construction Contractor (Early Works Contractor).

5.3. ASSESSMENT METHODOLOGY

The social and economic data provided below demonstrates the relative conditions of the study area. This SEIA assesses the opportunities and constraints of the study area and examines the likely outcomes of the Bungama Solar Project utilising published industry economic and employment multipliers.

6. SOCIAL CONTEXT

6.1. SOCIO-DEMOGRAPHIC PROFILE OF THE PROJECT AREA

6.1.1. Persons

At the time of the 2016 census, Port Pirie LGA had a population of 17,364 people, having experienced a slight increase of 31 people from the time of the 2011 census. As at the 2016 census, the population was closely divided between males and females, 49% to 51% respectively.

The average household size in Port Pirie LGA is 2.3 persons with 3.6% of the population identifying as Aboriginal or Torres Strait Islander.

6.1.2. Age

The largest proportion of the Port Pirie LGA population falls around the 40 to 59 years age brackets. There is an additional peak in population proportion around the early to mid-teen years (5 to 19 years). There is a distinct under-representation of young working-age population groups (20 to 39 years). The following figure demonstrates these trends.

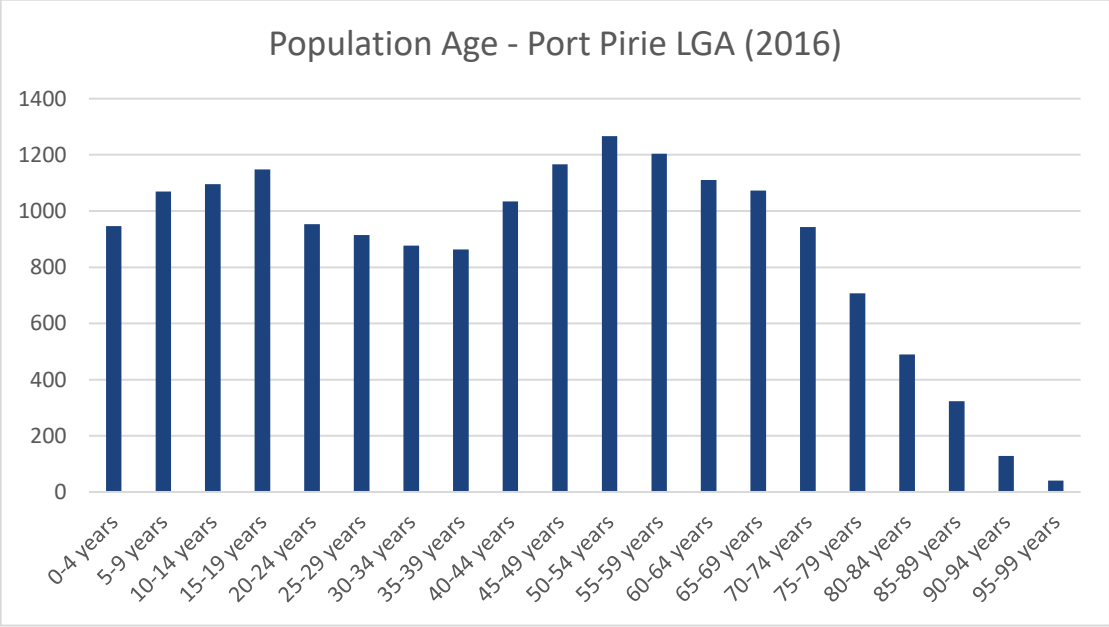


Figure 6-1: Population by Age (ABS 2016)

6.1.3. Household Types

The household type of an area is an indicator of the locality's function and role within the broader region. Household type gives significant insight into settlement patterns, demand for facilities and services and identifies opportunities for housing and employment.

The predominant household types in the Port Pirie LGA are 'lone person households' (27%), 'one family households with no children' (22%) followed by 'one family households with children' (19%). This data suggests an underrepresentation of 'traditional' settlement patterns, typified by family households which is likely a reflection of an ageing population as demonstrated above.

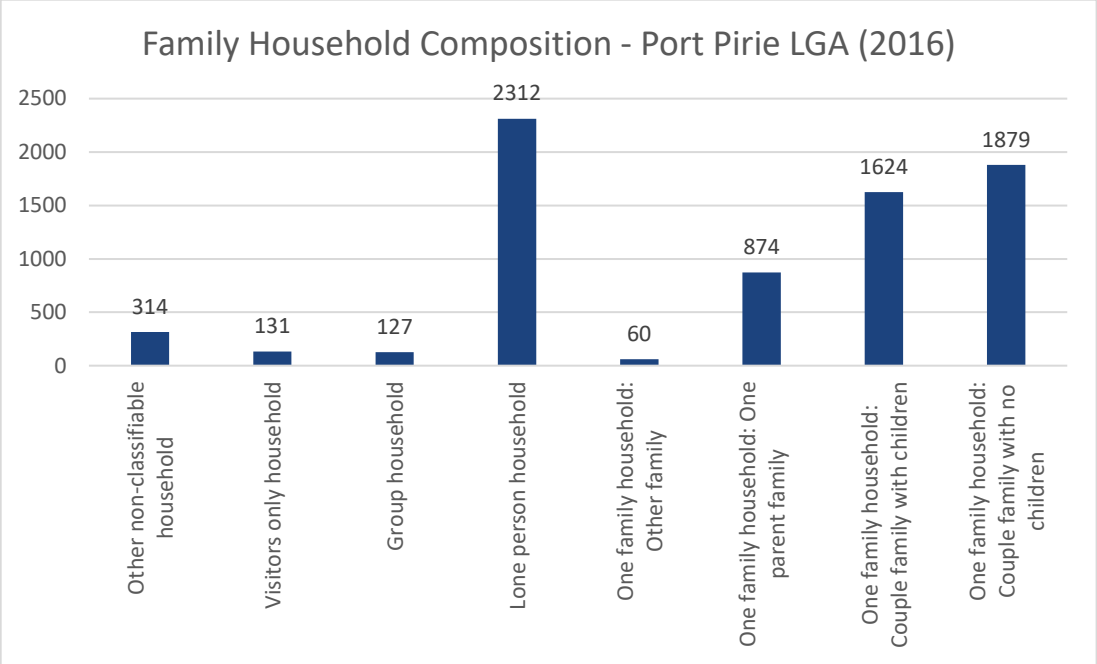


Figure 6-2: Household Composition (ABS 2016)

6.1.4. Tenure

Tenure data gives an indication of the socio-economic status of an area. Within the Port Pirie LGA, the largest proportion of residents own their residence outright (29% of the population), being slightly lower than the South Australian State average of 32%. There is a relatively even spread between those who own their home with a mortgage (26%) and those who rent (25%).

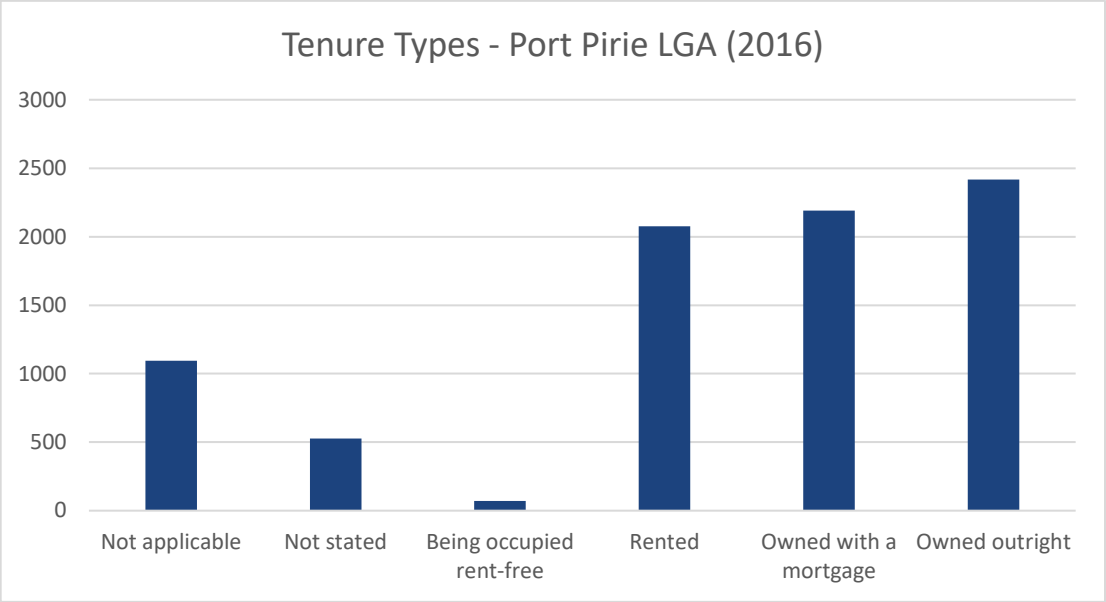


Figure 6-3: Tenure Type (ABS 2016)

6.1.5. Education

Educational levels are another important indicator of socio-economic status. Educational factors can help illustrate a regional population's skill set, work force capacity and working ambitions. Additionally, education levels can help to understand deficiencies in skill sets and help to guide strategies to nurture and retain a skilled workforce.

Within the Port Pirie LGA, approximately 8% of the population hold a bachelor's degree or higher, this is significantly lower than the South Australian state average of 18.5% (refer to Figure 6-4 below).

Of those participants who disclosed their highest educational level, the highest proportion had obtained a Year 10 (or above) high school certificate or a Certificate III or IV level training (44% and 22% respectively).

The large portion of local population with up to a Certificate III, could reflect the educational requirements of the predominant occupations in the area.

Furthermore, the low proportion of people with a higher level of education could indicate a lack of tertiary education opportunities for the locality as well as young adult migration trends.

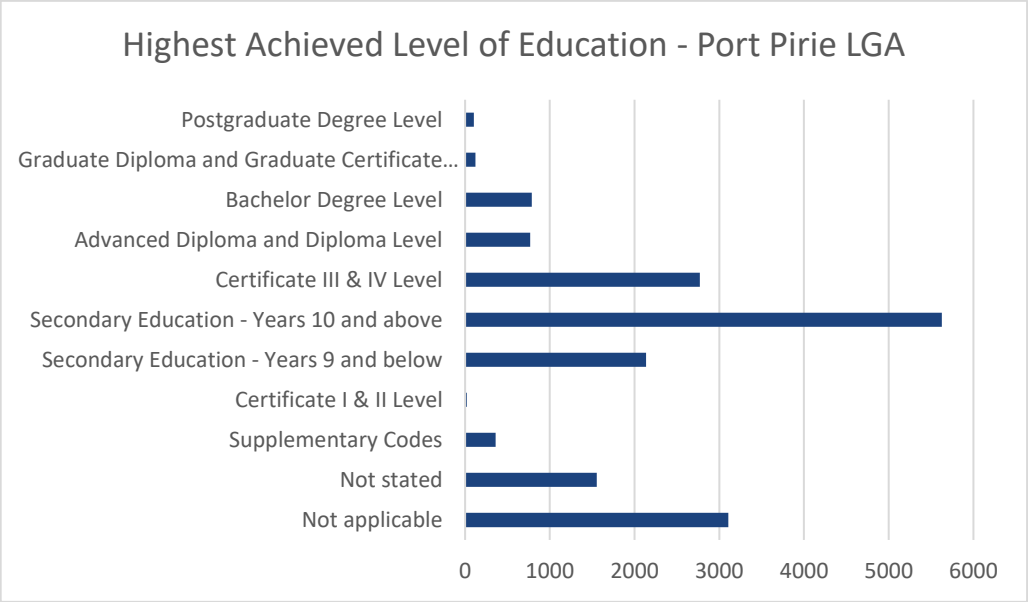


Figure 6-4 Highest Achieved Level of Education (ABS 2016)

6.1.6. Social Analysis Summary

To summarise, the data outlined above suggests that:

- Port Pirie LGA is experiencing relatively low population growth;
- Port Pirie LGA has a distinctive lack of a young working aged demographic;
- There is as a high proportion of single and family households with no children;
- There is a relatively even distribution of household tenure type; and
- The predominant level of education achievement is up to a Certificate III.

7. ECONOMIC CONTEXT

The economic statistics for an area provide valuable background information that, when combined with social considerations, allows for a robust understanding of the locality. This understanding can be used to quantify anticipated benefits to a community, as well as identify the socio-economic strengths and weaknesses of that locality, such as employment rates.

7.1. ECONOMIC PROFILE OF PORT PIRIE LOCAL GOVERNMENT AREA

The following information provides an overview of the economic and employment data for the Port Pirie Regional Council LGA. This data provides baseline information as to how the proposed development is likely to affect the community economically.

7.1.1. Gross Regional Profit

Gross Regional Product (GRP) is an objective measure of the economic output of a region. It is defined as the total market value of goods and services produced in the region within a given period, after deducting the cost of goods and services used up in the process of production, but before deducting allowance for the consumption of fixed capital.

For example, if a region manufactured a car, the GRP would equal the value of the car, less the cost of acquiring the parts or materials for the car, but no allowance is made for the depreciation in the car manufacturing plant and equipment.

Port Pirie Regional Council's Gross Regional Product is estimated at $703 million as at last financial year (June 2017) (National Institute of Economic and Industry Research 2017 data sited by Economy id).

7.1.2. Household Income

Household income can indicate the socio-economic status of an area, in particular the economic opportunities that are available to the labour force. Weekly household income depends on the number of workers in the household and their industry of employment. Income data is applicable only to persons aged 15 years and over.

Within the Port Pirie LGA, approximately 39% of households earn up to $1,000 per week, with the highest proportion of households earning between $400 to $499 total per week.

The following figure illustrates the weekly income of households in the Port Pirie LGA.

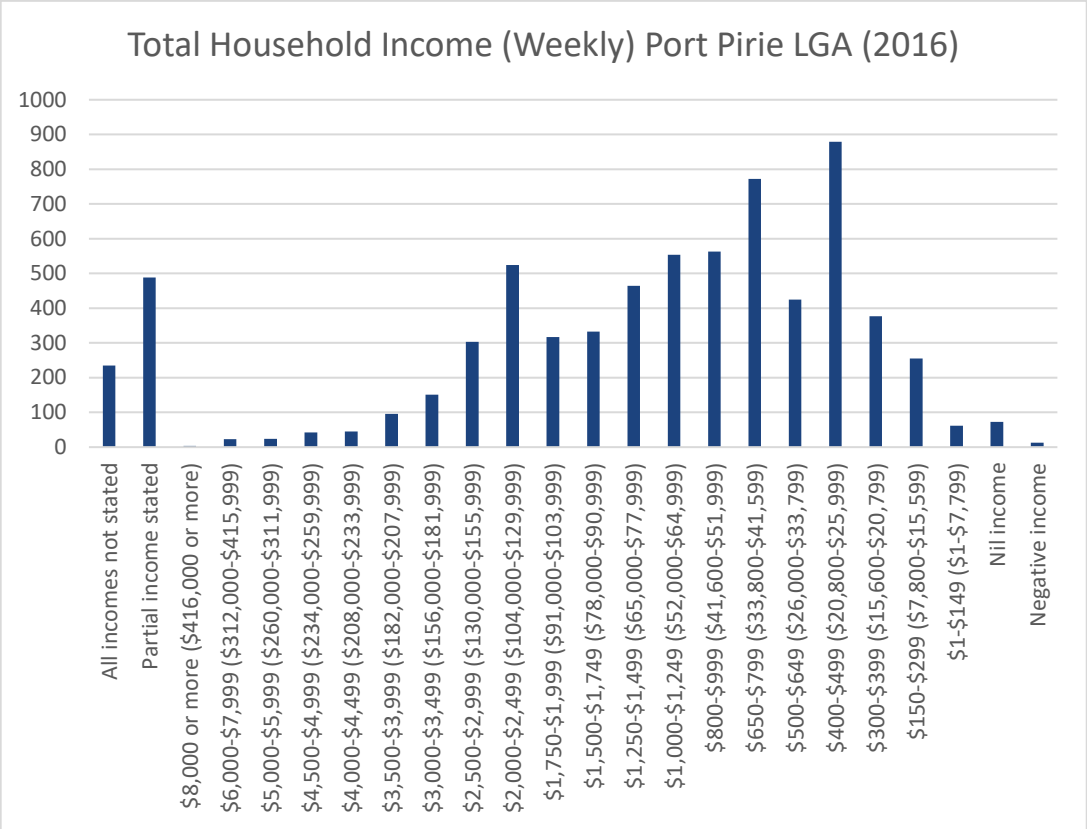


Figure 7-1: Total Household Weekly Income (ABS 2016)

The median weekly household income across South Australia at the time of the 2016 census was $1,206 with a slightly larger household size of 2.4 people.

Individual income measures can be indicative of educational qualifications and the type of employment undertaken. This data can be used to assist in the evaluation of an area's socio-economic status.

Within the Port Pirie LGA, the largest proportion of individuals earn between $300 and $399 per week. The following figure illustrates the weekly income of people in Port Pirie LGA aged 15 years and over.

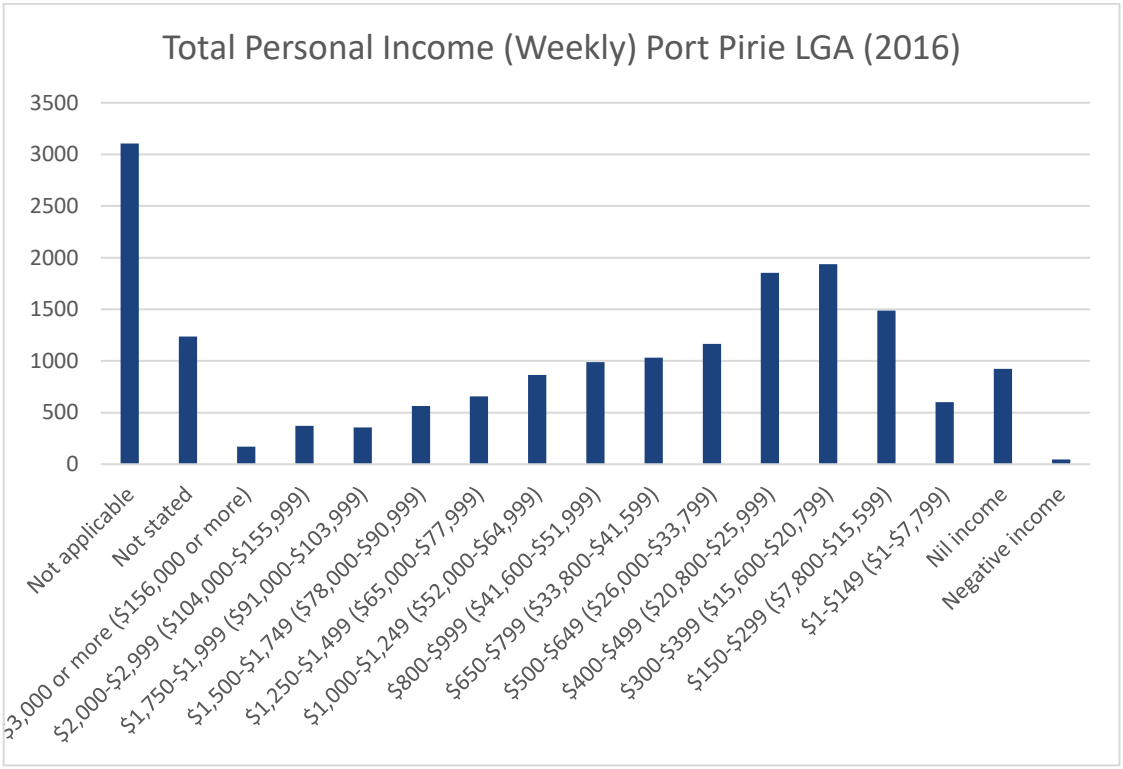


Figure 7-2: Individual Weekly Income (ABS 2016)

7.1.3. Labour Force

At the time of the 2016 census an estimated 6,112 people were reported as being currently employed in the labour force. It is noted that people who are aged 15 years and under who are either employed or unemployed, retirees, pensioners and people engaged solely in-home duties, are not classified as being in the labour force.

Information about employment type is important to determine the social and economic status of a region, and to determine the type of services that are in demand. Recognising Port Pirie's LGA's population as being 17,364 people (at 2016 census), approximately 35% of the total area is employed either fulltime or part-time.

The following figure illustrates the distribution of labour force characteristics, i.e. the spread of employment type of the working aged population only.

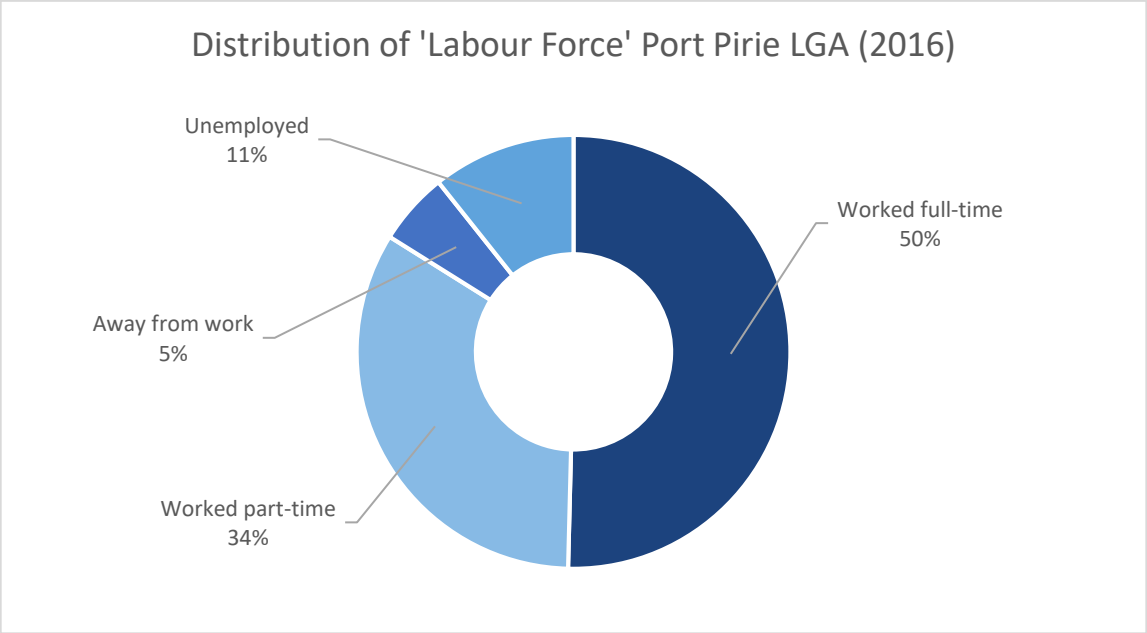


Figure 7-3: Distribution of Labour Force (ABS 2016)

7.1.4. Industry of Employment

The occupational structure of the workforce is an important indicator of the characteristics of the labour force. With other indicators, such as educational qualifications and income, occupation is a key component of evaluating the socio-economic status and skill base of an area. In general, the occupations held by a workforce are linked to a range of factors including:

- The economic base and employment opportunities available within the area;
- The educational qualifications of the population; and
- The working and social aspirations of the population.

The most common stated industry sectors within the Port Pirie LGA, as illustrated in the following figure, are:

- Health Care and Social Assistance (7%);
- Manufacturing (5%); and
- Retail Trade (5%).

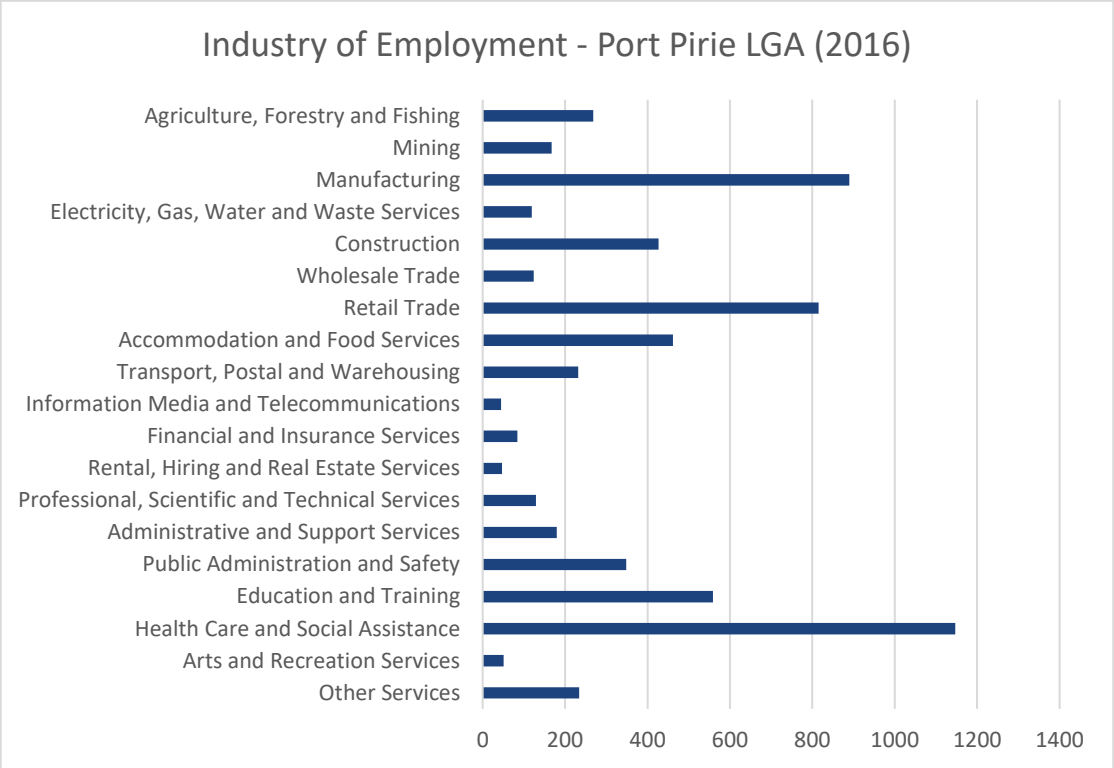


Figure 7-4: Industry of Employment (ABS 2016)

7.1.5. Occupation

The occupation of residents within an area is indicative of the opportunity for employment within the labour force, as well as the educational qualifications of a population. As demonstrated below there is a relatively even distribution of occupations types across the LGA.

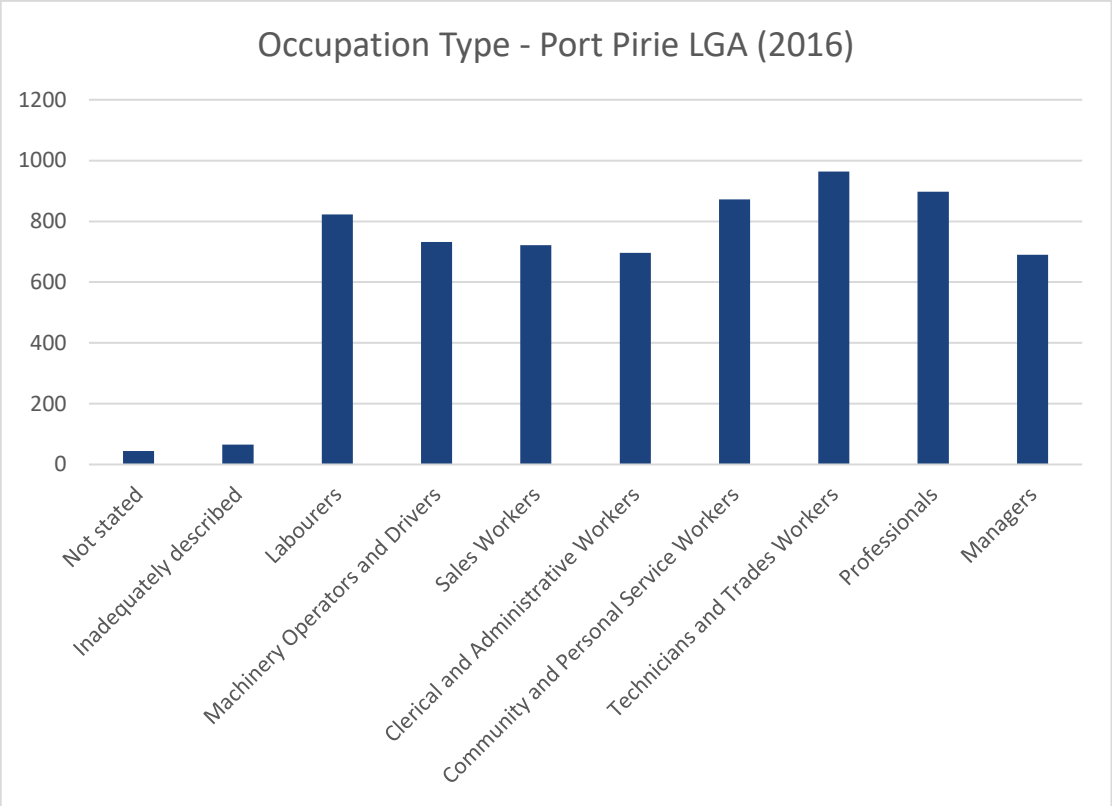


Figure 7-5: Occupation Type (ABS 2016)

7.1.6. Economic Analysis Summary

To summarise, the data provided above indicates that:

- Port Pirie LGA's GRP was approximately $703 million as at last financial year (June 2017);
- Household and individual incomes are less than the reported state average;
- Approximately 35% of the total population are in the labour force in either full-time or part-time work;
- Port Pirie LGA's largest employment provider is the manufacturing sector; and
- There is a relatively even distribution of occupation types across the LGA.

8. SOCIO-ECONOMIC IMPACT ASSESSMENT

8.1. LARGE SCALE SOLAR OPPORTUNITIES

The construction phase of a large-scale solar project offers the greatest opportunity for local/domestic employment. The project's construction requires site preparation, assembly, and installation of hundreds of thousands of Photo-Voltaic (PV) panels and over several hundred hectares of project area in addition to instillation of battery storage technology.

A typical project will also require landscaping, fencing, transportation services, electrical works, security, etc. Large scale solar projects have an innate high demand for a semi-skilled/unskilled workforce particularly for site preparation and assembly tasks, which constitute the largest aspects of construction.

Anecdotally, during the community consultation phase of the Bungama Solar Project, many community members and project neighbours indicated an eagerness to assist with the project, offering services, labour and equipment.

EPS Energy maintains a register of all interested individuals and businesses who have been in contact seeking employment opportunities. The Engineering Procurement and Construction Contractor will identify the opportunities for local engagement and employment for a variety of services and equipment required to construct the project. Where suitable local and or domestic employment will be preferred.

8.2. DIRECT DOMESTIC BENEFIT

The total cost of the project is estimated at $650 million AUD. Approximately 75% ($487,500,000) of expenditure will be used to acquire the plant and equipment internationally as the required technology is not locally manufactured and commercially available in Australia. Approximately 25% ($162,500,000) of expenditure is expected to be expended domestically, to construct the project.

The anticipated project construction cost of $162,500,000 is equivalent to approximately 23% of Port Pirie LGA's annual GRP to be spent domestically, as a direct result of the project.

In addition to this construction cost, ancillary development expenditure will occur in the form of the following:

- Legal Advice;
- Specialist Study and Design Consultants (such as engineering and ecological advice);
- Project Management Services; and
- Finance.

Typically, these costs run at up to approximately 1% of construction value, or an additional $1,600,000, which equates to a total estimated domestic spend equivalent to say $164,000,000.

Table 8-1: Estimated Total Domestic Spend

Estimated Total Domestic Spend	
Domestic Spend (Construction)	$162,500,000
Domestic Spend (Consultancy, Legal, etc.)	$1,600,000
Domestic Spend (Total Rounded)	$164,000,000

8.3. EMPLOYMENT OPPORTUNITIES

8.3.1. Development Phase Employment Benefits (Direct and Indirect)

As with economic output, the direct employment generated is only a part of the overall stimulation to employment which is created by a development project.

The production induced effect means that additional employment is created in the industries which supply goods and services to the construction project, while the consumption induced effect, means that further employment is created in all industries which benefit from the additional wages, taxes and profits generated by the project being spent throughout the economy.

Acknowledging the last published ABS input/output economic multipliers for the construction industry and making an allowance for inflation to the current day and considering the scale of the project, a fair estimation for general construction industry employment may equate to approximately: 1 full time equivalent job, and 1.5 indirect full-time equivalent jobs for each $590,000 in project value derived from domestic sources.

Adoption of these multipliers suggests that the $162.5 million domestic spend from the project's construction would yield employment generation, on an equivalent full-time basis, of up to approximately 275 direct construction jobs and 410 indirect jobs, over the intensive construction period.

It should be noted that Bungama Solar is not a traditional construction project and involves a lightweight construction typology, therefore requiring a lessened construction labour force. The employment estimates within have considered this fact.

Table 8-2: Construction Phase Employment

Construction Phase Employment - Full time equivalent (FTE)	
Domestic Project Value (Construction)	$162,500,000
Direct Employment (FTE positions)	~275
Indirect Employment (FTE positions)	~410
Total Employment	~685

8.3.2. Operational Phase Employment Benefits

Bungama Solar is expected to directly generate up to approximately 8 full time equivalent, long term jobs during the operational phase. These roles include management, maintenance and operations.

Based on the South Australian average weekly FTE earnings of $1,200/week (ABS 2016), this equates to some $500,000 in additional wages being generated in the local economy each year, or $15,000,000 over the life of the project.

Table 8-3: Operational Phase Employment

Operational Phase Employment	
Direct Employment (FTE positions)	8
South Australia Average Weekly FTE Earnings	$1,200
Wages Generated (pa)	**$500,000**
Wages Generated (project life)	**$15,000,000**

8.4. LOCAL EXPENDITURE

In addition to the direct contribution to the economy from the Project's construction and operations the Project will have 'flow-on' benefits to the activities of other industries.

An estimate of the extent of these impacts can be illustrated using published industry multipliers such as those created by the ABS. While not exact, this methodology is nonetheless useful in broadly demonstrating the magnitude of additional 'indirect' economic benefit.

Utilising the ABS input-output table for the construction industry, the total multiplier is 2.8; meaning that for every one dollar ($1.00) spent in the construction industry an additional one dollar and eighty cents ($1.80c) of value is added to other parts of the economy.

On this basis, the Project is estimated to contribute additional 'indirect' economic benefits in the order of $292 million to the wider economy.

This estimate encapsulates the entire stimulus to those sectors of the domestic economy that will contribute goods or services to the project or have an increase in employment/production as an indirect result of the project. This includes accommodation, transportation, food services, entertainment for construction workers, telecommunications etc.

8.5. DIRECT COMMUNITY FUND

In addition to the direct and indirect economic benefits afforded by the planning, construction and operation of the Project, Bungama Solar is committed to providing additional direct benefit to the community in the form of a 'Community Fund'.

A local Community Fund is proposed to be established, with the project making an annual financial contribution throughout the life of the Project. The Community Fund is intended for the local community who are hosting the Project; to assist with funding environmental, social, and economic development opportunities for the community.

Essentially the fund is envisioned to be managed by a committee, consisting of elected community members, a representative of Bungama Solar and the Local Council. The committee will be responsible for administering the fund.

The fund will be furnished with an annual monetary contribution from Bungama Solar for the duration of the operation of the project. Local community members and organisations can apply to receive funding for projects or activities that benefit the local community.

The committee will assess the merit of applications and govern the appropriate distribution of the fund.

9. RENEWABLE ENERGY AND CARBON EMISSIONS

In recent times South Australia has diversified its energy supply sources, as evidenced by its growing proportion of renewable energy sources. This transition has been significantly influenced by several coal-fired operations ceasing in the state. See relative energy generation mix by State below.

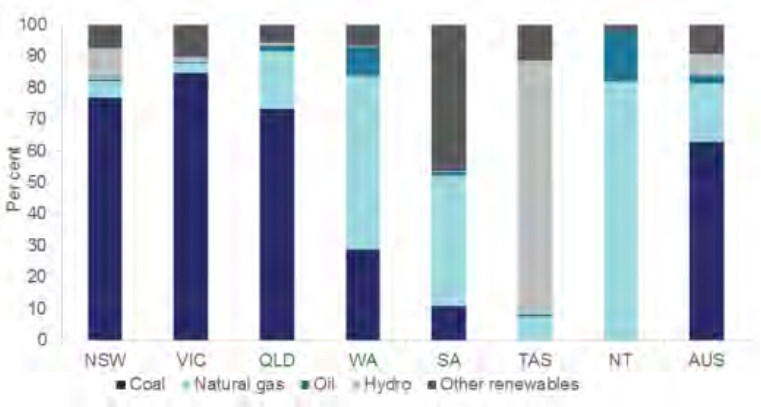


Figure 9-1: Australian Electricity Fuel Generation Mix for 2016

Source: Department of the Environment and Energy (2017)

Broadly, South Australia recognises that high levels of solar and wind generation, together with other generation sources and effective grid stability services have the potential to safely deliver affordable power. The Project will contribute to the delivery of affordable power from renewable energy.

Development of large-scale generation assets within South Australia will increase competition for dispatching power to the state's electrical network and hence assist in reducing electricity prices over the long term.

9.1. BUNGAMA SOLAR RENEWABLE ENERGY GENERATION

Based on the Project's current indicative design (including approximately 280MW single axis tracking system), the Project is anticipated to generate over 705,000MWh of renewable energy per year; enough to power 86,000 homes per annum.

This renewable energy generation equates to an annual equivalent 487,000 tonnes of Greenhouse Gas (GHG) emissions displaced, which may otherwise be sourced by non-renewable energy sources. Bungama Solar's approximate 280MW (AC) generating capacity, and GHG displacement is equivalent to offsetting the impact of 195,000 cars or the equivalent benefit of 69,500 trees per annum.

10. STRATEGIC CONSIDERATIONS

10.1. SOCIAL AND ENVIRONMENTAL ISSUES

Based on a review of the existing characteristics and profile of the Port Pirie LGA, the following impacts have been considered.

10.1.1. Port Pirie Regional Council Development Plan (Consolidated – 31 October 2017)

The Project area is zoned Primary Production. The Port Pirie Regional Council Development Plan notes Renewable Energy Facilities such as solar and ancillary development are envisaged within the Primary Production zone and constitute a component of the zone's desired character.

The Development Plan specifically contemplates the presence of Renewable Energy Facilities such as solar and ancillary development in the Council area and in the Primary Production Zone.

10.1.2. Positive Impacts

The Project will deliver clean and renewable energy in the face of climate change and will assist to meet renewable energy targets for the nation.

Climate change is arguably one of the most topical social and environmental issues of today, with the globalised unsustainable dependence on fossil fuels becoming ever more apparent. As described in sections above, large scale solar projects have the capability to contribute substantially to meeting renewable energy targets and improving sustainable energy generating practices. Bungama Solar will make a substantial contribution in providing renewable energy for the nation to meet renewable energy targets.

The Project will create employment opportunities for the study area.

The Project will generate considerable employment for the Port Pirie LGA, particularly during the construction phase and as a flow on effect from the heightened investment and spending in the locality. The economic impact assessment section of this report illustrates the anticipated employment generation.

Members of the community who attended the Bungama Solar information sessions identified that the project locality experiences high levels of unemployment. Many local individuals and businesses expressed interest in being involved in the Project.

The Project provides a suitable alternative land use for the Project area that meets the needs of the wider community and promotes industry diversity.

The Project is considered a suitable alternative land use for the Project area as it is temporary in nature, has minimal long-lasting effects, and upon project completion the land can be returned to its original condition. Further, the project site location is proximate to existing substation infrastructure, allowing the project to be localised and minimise adverse environmental impacts.

Bungama Solar provides an opportunity for the Port Pirie LGA to diversify its industry by adopting an innovative, high-tech industry such as solar. Further, the use of the Project area for the development does not preclude other concurrent agricultural uses, such as grazing of lambs on low-lying pasture underneath the solar panels.

Solar farms typically have a minor physical disturbance footprint. As such, investigations into co-agriculture opportunities are underway to ascertain opportunities within Bungama Solar for other forms of traditional agriculture such as sheep grazing and apiculture to co-exist with the Project.

The Project provides income diversification to Project land-holders, assisting land-holders to mitigate seasonal agricultural enterprise risk. Bungama Solar will provide Project land-holders with an income stream that is stable and defined for a significant period of time.

10.1.3. Perceived Negative Impacts

Notwithstanding the positive impacts noted above, a number of potentially negative impacts have also been identified, through the site assessment and community engagement process. These issues are identified below.

Perceived visual impacts including general amenity and glint/glare.

It is recognised that the Project area is exposed to Augusta Highway, Gulf View Road, Bungama North Road and neighbouring properties. A Visual Impact Assessment (VIA) attached as Appendix 7 considers the Project's potential visual impacts and appropriate mitigation measures. Based on the Visual Impact Assessment the Project's potential to adversely impact the existing and planned visual landscape is low.

A Glint and Glare Assessment attached as Appendix 12 considers the Project's potential glint and glare impacts and appropriate mitigation measures. Based on the Glint and Glare Assessment the Project's potential to adversely impact area beyond the Project area is minimal.

Perceived impact on agricultural land.

It is acknowledged that the Project on the Project area has the potential to impact on the agricultural viability of the Project area. However, given that the Project of this type is temporary in nature and has minimal long-lasting negative impacts, it is considered that Bungama Solar will not affect the long-term viability of agricultural land at the Project area.

Solar farms in general are considered a relatively 'non-invasive' development as the mounting system which connects the support frames to the ground are small in diameter.

Notwithstanding any perceived impacts, the change of use will act to provide diversity and security of income for farmers in this seasonally difficult agricultural area. Upon decommissioning the land use will revert back to dry land agriculture.

Impacts arising from construction phase including dust and noise.

It is recognised that development requiring construction works has the potential to generate noise and dust.

Noise and dust will be managed through a construction environmental management plan. Specific dust and noise impacts will be explored in more detail in the Project's Planning Report.

Health Impacts from electromagnetic fields and radio frequency interference.

Electromagnetic field (EMF) radiation is generated by all electrical appliances and other sources that carry an electrical current. Radio Frequency Interference (RFI) can be generated by a range of electrical apparatus.

EMF and RFI potential impacts are explored in in the Planning Report. The Project's potential to adversely impact the existing EMF and RFI environment is low.

11. CONCLUSION

This SEIA has been prepared to ascertain the social and economic outcomes of the construction and operation of Bungama Solar. The analysis concludes that the project will provide significant positive social, environmental and economic outcomes for both the LGA and the state of South Australia. The assessment has been framed by considering the existing social and economic conditions of the Port Pire LGA.

As examined, the most prevalent industry within the Port Pirie LGA is manufacturing. Income levels in the study area are lesser than that of the recorded state average, and the demographic profile indicates a predominantly semi-skilled workforce. These statistics potentially reflect the migration of skilled working age young adults away from region, the prevalence of agricultural-based employment or the decline of manufacturing in recent years.

This study revealed that Regional South Australia has recently experienced a general population decline and that the Port Pirie LGA is experiencing low population growth, possibly as a result of limited employment or study opportunities in addition to an ageing population.

The Project will provide significant economic stimulus and diversification of the region's economic base. Anecdotal evidence collected during community consultation for the project, indicates that the local community are generally supportive of the project and have expressed interested to participate in the Project's construction and operation. Based on the analysis, assumptions, discussion and data provided within, the following key findings are identified. The Project will:

- Deliver clean and renewable energy for Australia in the face of climate change;
- Assist in meeting renewable energy targets for the State and the Nation;
- For each year of its 30-year operational life, displace the equivalent of 497,000 tonnes of greenhouse gas emissions per annum, the equivalent of offsetting the impact of 195,000 cars or providing the equivalent benefit of 69,500 trees per annum;
- Provide clean energy to power an equivalent of 86,000 homes for each year of the project's life;
- Create industry diversity for the Port Pirie region;
- Create substantial employment opportunities during project construction phases;
- Be located in a suitable area with access to existing infrastructure;
- Provide a flexible, low-impact alternative to the existing agricultural land use;
- Generate an estimated economic benefit in the order of $292.5 million for the broader economy and approximately $164 million as direct domestic project expenditure;
- Generate up to an estimated 275 equivalent full-time jobs during construction, and a further 410 indirect full-time equivalent jobs;
- Generate up to an estimated 8 equivalent full-time jobs during operations; and
- Provide a direct benefit to the community in the form of a community fund.

REFERENCES

Australian Bureau of Statistics 2007, The Construction Industry's Linkages with the Economy, accessed 19 August 2018, http://www.abs.gov.au/Ausstats/abs@.nsf/94713ad445ff1425ca25682000192af2/ed6220072793785eca256b360003228f!OpenDocument

Australian Bureau of Statistics 2016, Port Pirie Local Government Area Census, accessed 29 August 2018, http://quickstats.censusdata.abs.gov.au/census_services/getproduct/census/2016/quickstat/LGA46450?opendocument

Australian Energy Market Operator (AEMO) 2018, Supply Outlook, accessed 13 July 2018, http://www.aemo.com.au/aemo/apps/visualisations/map.html

Australian Government Department of Jobs and Small Business 2018, LGA Data Tables – Small Area Labour Markets – March Quarter 2018, accessed 11 July 2018, https://docs.jobs.gov.au/documents/lga-data-tables-small-area-labour-markets-march-quarter-2018

Australian Government, Australian Renewable Energy Agency 2015, Establishing the social licence to operate large scale solar facilities in Australia: insights from social research for industry.

Australian PV Institute 2018, Large-Scale PV Systems, accessed 13 July 2018, http://pv-map.apvi.org.au/power-stations

Id. Community, Port Pirie Regional Council Area – Gross Regional Product, accessed 18 July 2018,

https://economy.id.com.au/rda-yorke-mid-north/gross-product?WebID=180

South Australia Planning Portal 2018, Population Projects and Demographics, accessed 2 July 2018,
https://www.saplanningportal.sa.gov.au/data_and_research/population_projections_and_demographics#small-area-population-projections-2011-2031

APPENDIX 12

Glint & Glare Assessment

BUNGAMA SOLAR

GLINT AND GLARE ASSESSMENT

Prepared for Bungama Solar

Prepared by BV Consulting

EPS ENERGY

Reference No. 11297

November 18

BUNGAMA SOLAR

www.bungamasolar.com.au

Glint & Glare Analysis

Bungama Solar
South Australia

Analysis of optical effects of solar panels onto air planes, cars, trains and houses

Prepared by **BV** Consulting

Client	Bungama Solar 1 Pty. Ltd.
Status	FINAL
Date	25 November 2018
Version	3.1
Classification	CONFIDENTIAL
Author	BERNHARD VOLL

BV CONSULTING | Nora-Platiel-Str. 4 | 34253 Lohfelden, Germany | ☎ +49 561 4751 3339
💻 Bernhard.voll@bdesolutions.com

CONTENTS

FIGURES

TABLES

1 DISCLAIMER AND CONFIDENTIALITY

DISCLAIMER

a) This report is intended for use by the Client and its heirs and successors and has been prepared based on the Client's instructions. BV Consulting shall have no liability to any third parties or users of this report other than liabilities set out in BV Consulting standard terms and conditions which have been accepted by the client. This report may only be copied and circulated at the discretion of the Client subject to any user other than the Client to enter into a Confidentiality Agreement with the Client and its heirs and successors. This report may not be disclosed to the public or form part of any public offering or investment memorandum other than for the purpose of the Development Application or the Due Diligence package the Development Application forms part of without the prior written consent of BV Consulting.

b) This report has been prepared based on information provided to BV Consulting by the Client and BV Consulting accepts no responsibility towards the accuracy or relevance of such information.

c) The results presented in this report have been based on input data provided by the Client and standard software available on the market. Whilst BV Consulting has taken great care in assessing such information and producing this report, no guarantee can be given towards the accuracy of the presented results and BV Consulting does not accept any liability towards the accuracy or representativeness of the results presented in this report.

CONFIDENTIALITY

This report uses proprietary data of BV Consulting. The report can therefore not be released without prior permission by BV Consulting unless to the Client or the Client's affiliates or legal advisors, heirs or successors or unless required by law.

COPYRIGHT

© BV CONSULTING. All rights reserved.

This document may only be transmitted, reproduced or disseminated in its entirety.

2 EXECUTIVE SUMMARY

The following report describes the results of a Glint & Glare calculation performed for the Bungama Solar Project in South Australia.

Bungama Solar is a Photovoltaic Energy Generation System (PVS) and Battery Energy Storage System (BESS) located approximately 6 km east of Port Pirie, directly North and East of the Augusta Highway (A1) passing east of the suburb of Bungama. The PVS will comprise of solar panels and associated equipment in single axis horizontal tracking arrangement tracking the movement of the sun from east to west.

The report has been prepared by BV Consulting upon request by the Client to assess the potential Glint and Glare impact of the PVS Solar Panels. To represent a worst case scenario this report has been based on the conservative assumption that the PVS Solar Panels will cover approximately 413 ha as shown in Figure 10.

The Glint & Glare Analysis ("GGA") determines the effect on both drivers on roads or railway tracks (Roads "RO") as well as airplanes approaching nearby airports (Flight Paths "FP") and houses (Observation Points "OP").

The Glint and Glare analysis categorises glint and glare into three major categories:

Hazard Level	Description
GREEN	Low potential for after image[1]
YELLOW	Moderate potential for after image
RED	Potential for permanent retinal damage

Table 1: Hazard levels SGHAT

Considering that Port Pirie Airport is approximately 10 km away from Bungama Solar it is unlikely that the proposed PVS solar panels will create any issues for pilots approaching this airport.

The Project area is traversed by Locks Road, a small local traffic road. Augusta Highway (A1) follows the southern and western project area boundaries. This is a major highway with significant traffic and it is therefore important to analyse potential Glint and Glare impact on drivers on this road. Any glint & glare for drivers on this road may also affect train drivers on the railway line to the south of the development. Also several houses in the immediate vicinity of the project area may be affected. Therefore glint & glare impact on these houses has also been analysed.

The worst case scenario calculation does not factor in any directional views and only assumes views of the whole of the PVS solar panels. It does not consider the actual geometry of the solar modules but assumes a continuous reflective surface within the project area boundaries. No existing vegetation or any other obstacles have been considered in the calculation to represent the absolute worst case.

The glint and glare analysis has provided the following overall results which are described in detail in this report.

Drivers on Roads (RO)	Train Drivers (RO)	Houses (OP)	Airplanes (FP)
GREEN	NO	GREEN	NO

Table 2: GGA Summary – Glare Results

The worst case scenario calculation has shown no impact on pilots, only some very minor impact on drivers and minimal impact on houses during the morning/evening hours of the day can be expected. When considering the existing vegetation, buildings or other existing obstacles in the PVS solar panel region these obstacles and vegetation are likely to substantially reduce potential glare.

[1] After image = lingering image of the glare in the field of view

Glint & glare for drivers can be easily mitigated by hedges, scrubs or small trees alongside the project boundaries and/or in the road reserves and/or private properties to prevent direct view onto the panels.

As the PVS solar panels will be built with single axis tracking systems glint & glare impact will be very low. In addition to the existing vegetation around the project area and some residences the Client proposes to incorporate a 50 m wide visual buffer including a 10 m wide and 4 m tall landscape screen around several parts of the Project Area boundary[2]. This visual buffer and landscape screen together with the existing vegetation surrounding many parts of the project area and adjacent residences is considered to ameliorate any GREEN GLARE calculated.

Therefore no additional mitigation measures are considered necessary.

[2] Landscape Masterplan – Bungama Solar 11297, presented by Client

3 GLINT & GLARE FROM SOLAR PANELS

Glare describes the difficulty seeing in the presence of bright light such as direct or reflected sunlight or artificial light such as car headlamps at night. Glare is caused by a significant ratio of luminance between the task (that which is being looked at) and the glare source. Factors such as the angle between the task and the glare source and eye adaptation have significant impacts on the experience of glare.

Glint is defined as a tiny quick flash of light that can cause discomfort to the viewer. Solar Panels are designed to absorb as much light as possible for power generation and therefore reflectivity of solar panels is minimised. Nevertheless the glass front and potential metal frames may cause some reflection of sunlight. However, compared to other objects such as sheds, ponds, railway tracks, windows, cars etc. solar panels reflect less light than even grass, crops, forest and water.

3.1 Reflectivity of Photovoltaic Panels

Photovoltaic panels (PV Panels) are commonly made of polysilicon covered with treated high transmission low iron glass allowing high absorption of light for power generation. Therefore standard solar PV modules[3] are considered to produce less glare and reflectance than standard window glass. Photovoltaic panels also reflect significantly less light than other common surfaces as shown below[4].

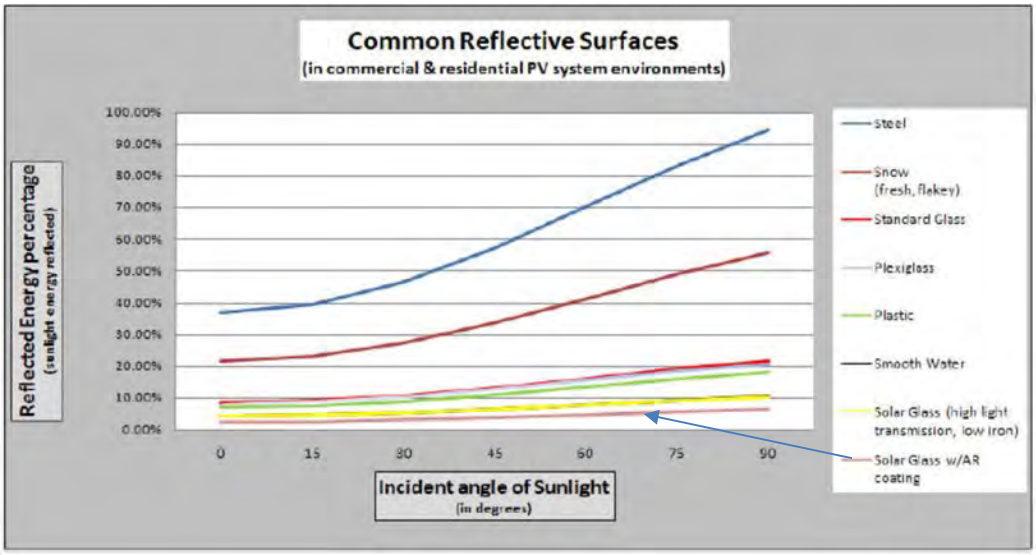


Figure 1: Reflected Energy in % of sunlight

[3] Module consists of a number of panels and a frame holding them
[4] Source: Sunpower Corporation Tech Note T09014, September 2009

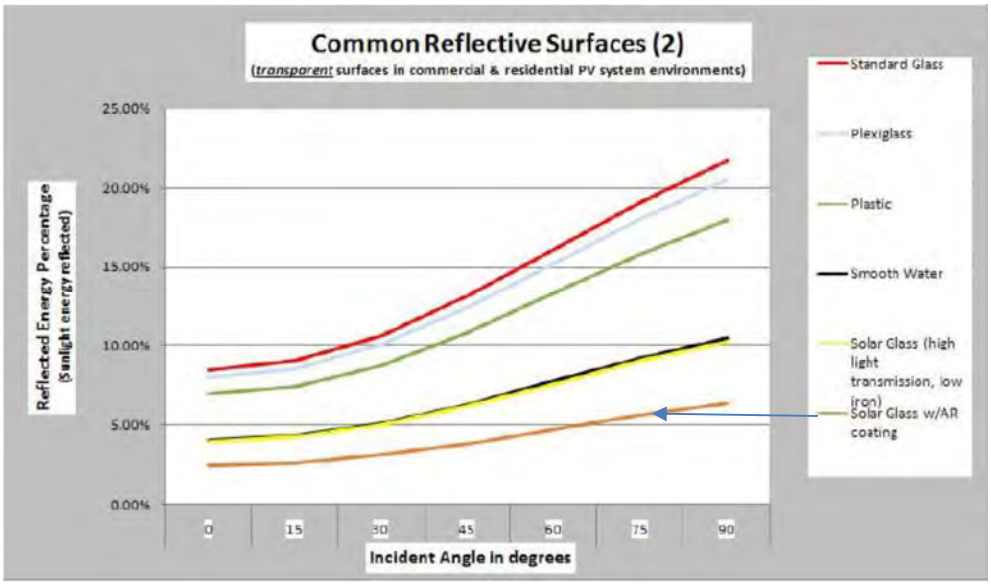


Figure 2: Reflected Energy in % of sunlight (Detail)

It can therefore be concluded that the maximum reflectance of a solar PV Panel can be considered as 11% (assuming uncoated glass) and as low as 6% when using anti-reflective coating. This is significantly below the maximum reflectance of a standard steel surface with 94.4%. Modern solar PV Panels use coated glass to further reduce reflection. Therefore impact will be significantly less. Such coated glass has been used for the calculation.

Compared to typical surfaces frequently occurring in rural areas this reflectivity (albedo = reflection coefficient) is considered very low and thus of no significant concern.

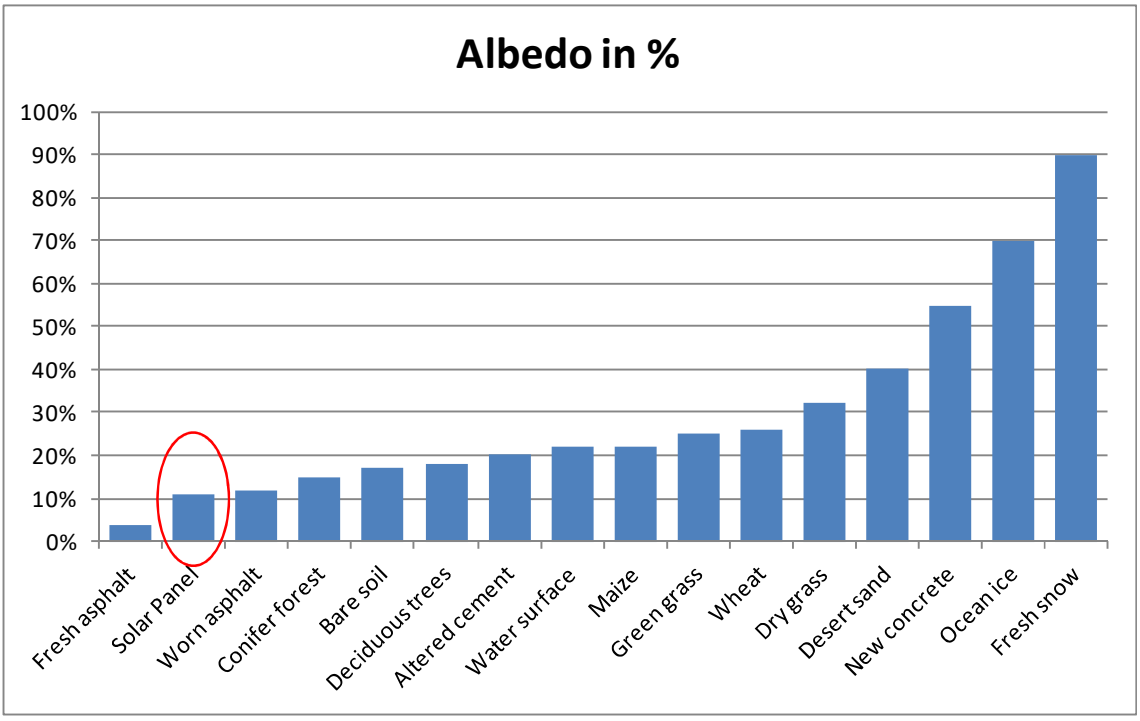


Figure 3: Sample albedos for various surfaces[5]

In a typical agricultural environment roof constructions are commonly made of corrugated steel. Whilst the corrugation itself reduces the glare potential of the surface such roofs still will reflect substantially higher amounts of light than solar PV panels considering the significant difference in reflectivity as shown in Figure 1 to Figure 3 above.

3.2 Glint

Glint results of the direct reflection of sunlight from a reflective surface when the sun reflects of the surface of the PV panels at the same angle as a person is viewing the PV panel surface. Considering the low reflectivity of solar PV panels and the requirement for direct reflection glint is not considered to be an issue for the proposed project area.

[5] Source: Wikipedia, www.apesimulator.org

3.3 Glare

Sunlight reflection from the solar PV Panels will be in a diffuse pattern potentially resulting in glare or difficulty seeing in the presence of a very bright light[6]. Glare may, depending on its intensity, result in slight irritation of view and temporary after images to permanent damage of the retina in case of prolonged intensive glare. A number of factors determine intensity and extent of glint and glare such as:

- distance between panels and viewpoint;
- horizontal tilt angle of panels;
- time of day and season;
- cloud cover;
- Screening vegetation.

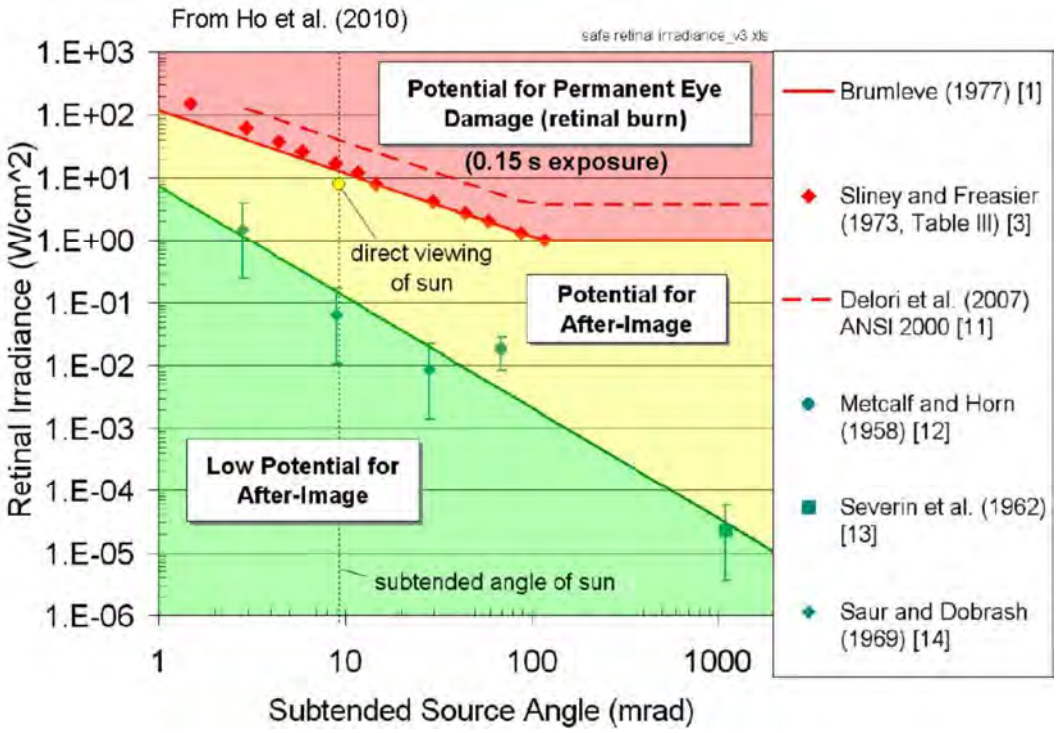


Figure 4: Hazard Plot for visual impact of glare[7]

Figure 4 shows the calculated hazard zones for various sunlight source angles and sunlight intensities as developed through studies commissioned by the US Department of Energy. This plot allows categorizing the glare hazard based on the calculated energy and angle of the projected image caused by the PVS solar panels. In the "low potential for after image zone" it is considered that glare within that range does not cause significant air traffic or other traffic related safety hazards.

[6] Source: Wikipedia
[7] Source: Sandia National Laboratories, US Department of Energy, subtended arc is a reflection of the image size experienced

4 METHODOLOGY

The Solar Glare Hazard Analysis Tool (SGHAT V3.0), developed by Sandia Laboratories and licensed by Forge Solar[8] has been used to calculate Glint & Glare impact for this study. This tool is considered industry standard and is also the software required by the US Federal Aviation Administration and recognised by the Australian Civil Aviation Safety Authority (CASA).

Once Glare can be found the tool calculates the retinal irradiance and subtended angle of the glare source to predict ocular hazards from temporary after images to permanent eye damage. Results are grouped into three categories:

Hazard Level	Description
GREEN	Low potential for after image[9]
YELLOW	Moderate potential for after image
RED	Potential for permanent retinal damage

Table 3: Hazard levels SGHAT

The model has some limitations resulting in the model describing a worst case scenario:

- Clear day solar irradiation is used;
- No trees of other obstacles between viewer and PVS solar panels are considered;
- No directional views, always views of the whole PVS solar panels;
- The model does not consider the actual geometry of the solar modules but assumes a continuous reflective surface within the project area boundaries.

4.1 Modelling

A number of observation points alongside the project area have been defined, described as “OP” in the detailed results section of this report. These observation points are generally set at 1.5 m above ground level representing the typical position of a person on a property.

Roads and railway tracks have been defined as Routes “RO” simulating the viewshed of a driver with a view angle of approximately 50° representing a driver looking at the road ahead.

Flight paths have been defined with typical approach angles. Flight paths are described as “FP” in the detailed results section of this report.

4.2 Modelling limitations

Several limitations exist due when simulating large arrays. Although this may limit the accuracy of the result the overall outcome is considered conservative and therefore represents a worst case scenario.

- Times associated with glare are denoted in Standard time. For Daylight Savings, add one hour.
- Glare analyses do not account for physical obstructions between reflectors and receptors. This includes buildings, tree cover and geographic obstructions.
- Detailed system geometry is not rigorously simulated.
- The glare hazard determination relies on several approximations including observer eye characteristics, angle of view, and typical blink response time. Actual values and results may vary.

[8] www.forgesolar.com
[9] After image = lingering image of the glare in the field of view

- Several calculations utilize the PV array centroid, rather than the actual glare spot location, due to algorithm limitations. This may affect results for large PV footprints. Additional analyses of array sub-sections can provide additional information on expected glare.
- The subtended source angle (glare spot size) is constrained by the PV array footprint size. Partitioning large arrays into smaller sections will reduce the maximum potential subtended angle, potentially impacting results if actual glare spots are larger than the sub-array size. Additional analyses of the combined area of adjacent sub-arrays can provide more information on potential glare hazards. (See previous point on related limitations.)
- Hazard zone boundaries shown in the Glare Hazard plot are an approximation and visual aid. Actual ocular impact outcomes encompass a continuous, not discrete, spectrum.
- Glare locations displayed on receptor plots are approximate. Actual glare-spot locations may differ.
- Glare vector plots are simplified representations of analysis data. Actual glare emanations and results may differ.

4.3 Model outputs

For each observation point a glare occurrence plot and glare hazard plot was developed. These plots are described below.

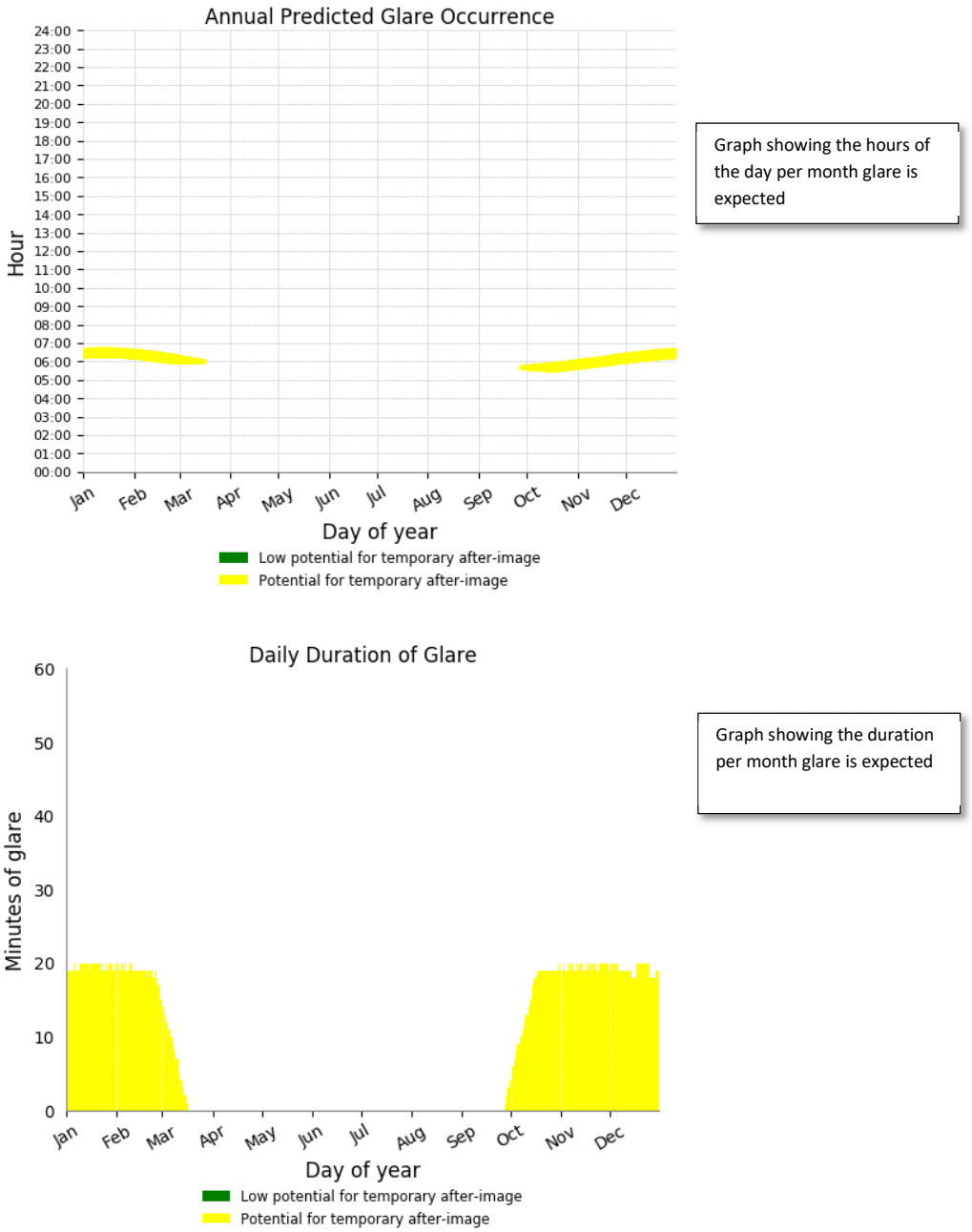


Figure 5: Glare Occurrence Plot (example)

Glare occurrence plots are a graphical depiction showing the expected glare hazard at any time throughout the day and for what duration.

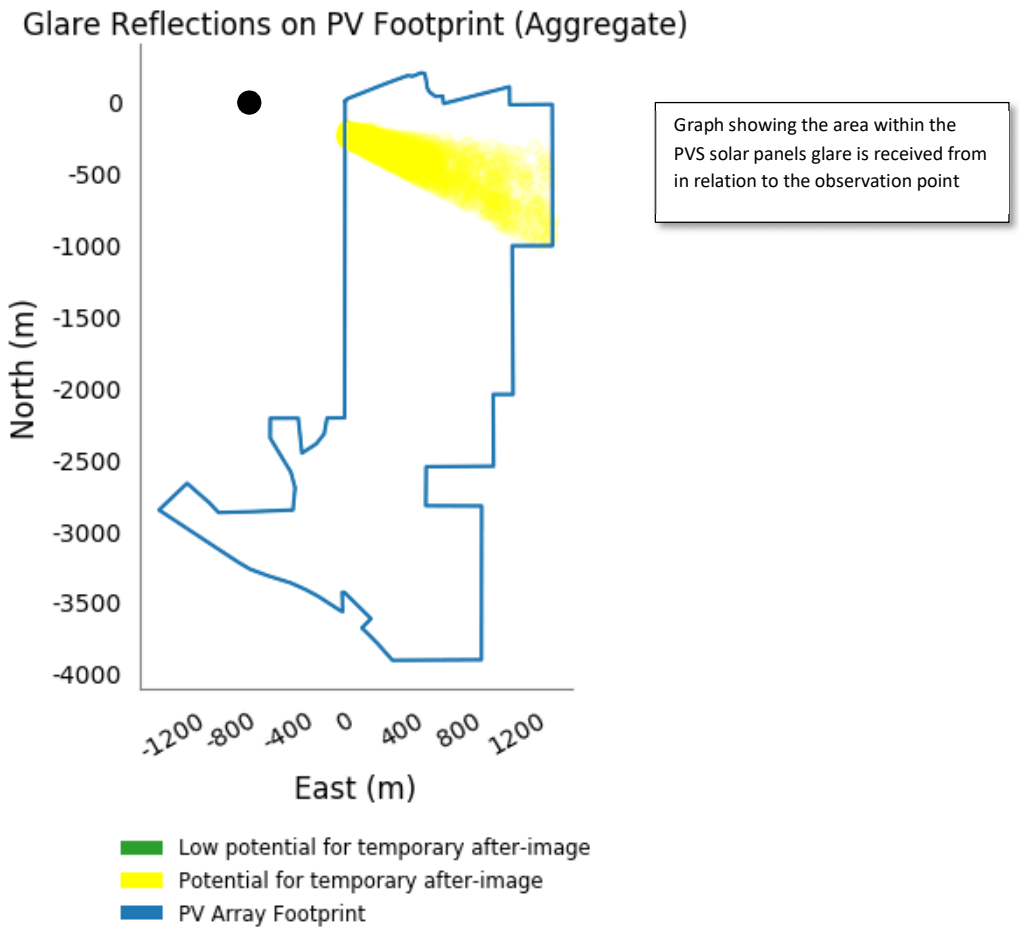


Figure 6: Glare reflection locations (example)

The Glare reflection location plot shows the parts of the PVS solar panels generating glare for the viewer at a specific observation point (marked by black dot).

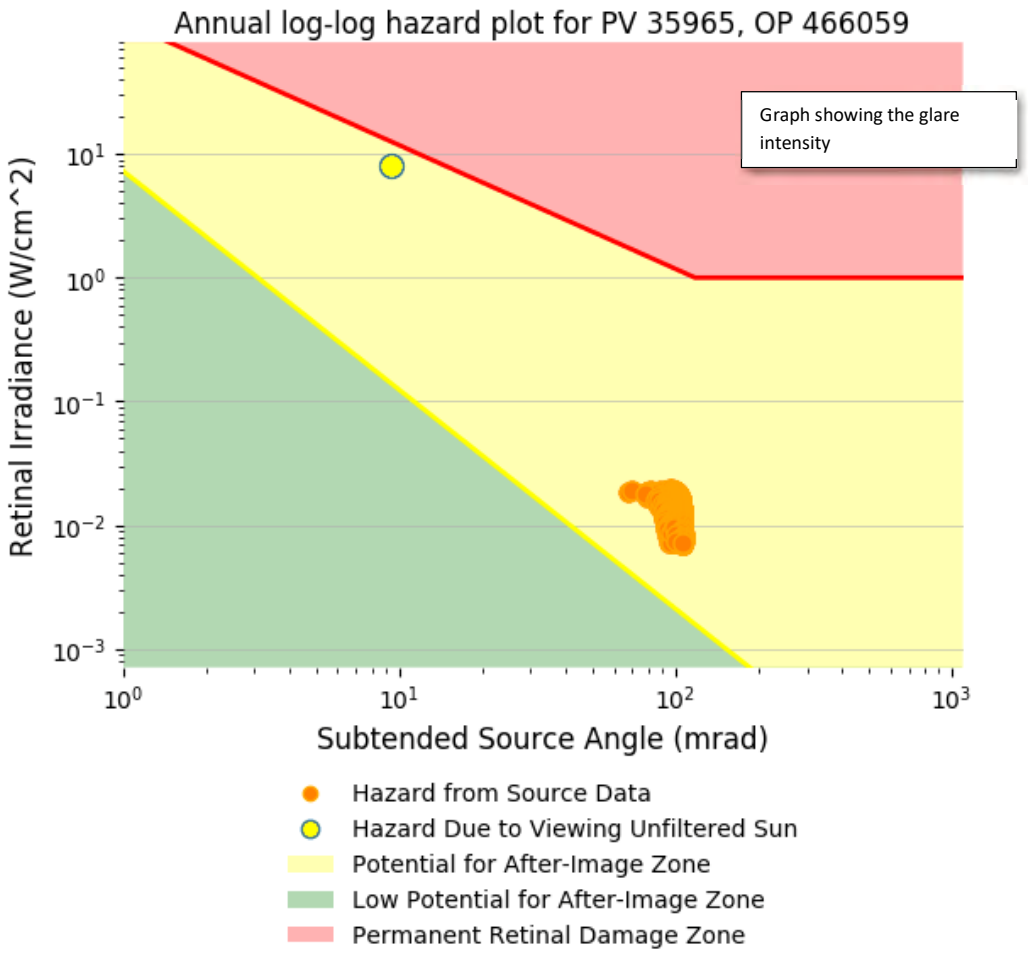


Figure 7: Glare hazard plot (example)

The Glare hazard plot shows the expected glare as compared to the hazard when viewing the unfiltered sun. It plots the intensity of light hitting the eye (retinal irradiance) as a function of size & distance (subtended source angle) to the Glare source.

For Routes a special plot has been developed showing the glare vectors for a driver. For clarity these vectors are placed at the PV centroid. The actual glare spot locations may vary.

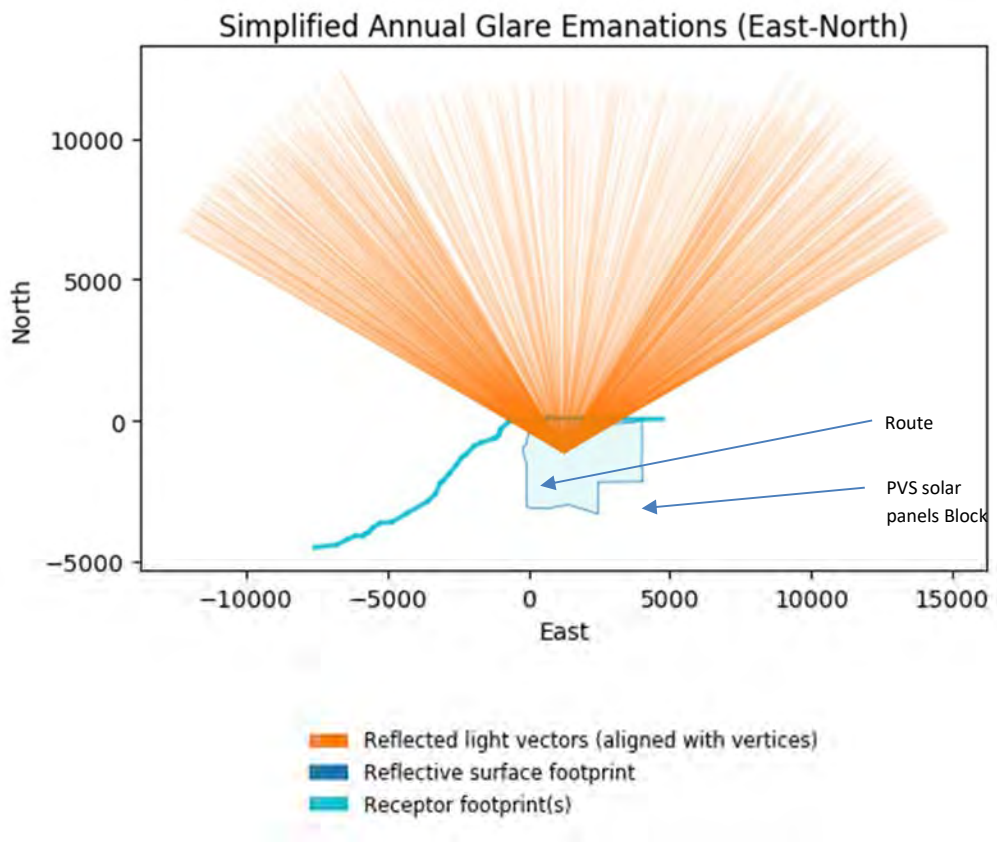


Figure 8: Route glare plot

4.4 Modelling Inputs

Bungama Solar is located just east of the suburb of Bungama in South Australia. The project area centre coordinates are approximately 33° 11.084' S, 138° 5.415' E with an average ground elevation of 24 m above sea level. The SGHAT model uses Google Earth to determine project area boundaries, elevation and Observation points for the calculation and then simulates the sun path during the day and year for the chosen location. A number of inputs is required to compute the solar calculation. The input data shown in Table 4 has been used for all calculations.

Input	Unit	Value	Comment
Time zone	h UTC	9	SA time zone[10]
Peak DNI	kW/m²	1,000	Typical peak irradiance based on generic data
Solar panel surface material	-	Smooth glass with Anti Reflective Coating	Industry standard
Time interval	min	1	
Single axis tracking system			
Tilt of tracking axis	deg	90	Horizontal
Orientation of tracking axis	deg	0	North
Offset angle of panel	deg	0	Angle between tracking axis and panel
Tracking range	deg	-60 ... 0 ... +60	Range of tracking system
Height of panel above ground	m	1.2	Centre of tracking axis above ground

Table 4: Modelling Inputs

The average height of the panels above ground was estimated to be 1.2 m based on client input and a design assumption using tables with one row of modules per module table.

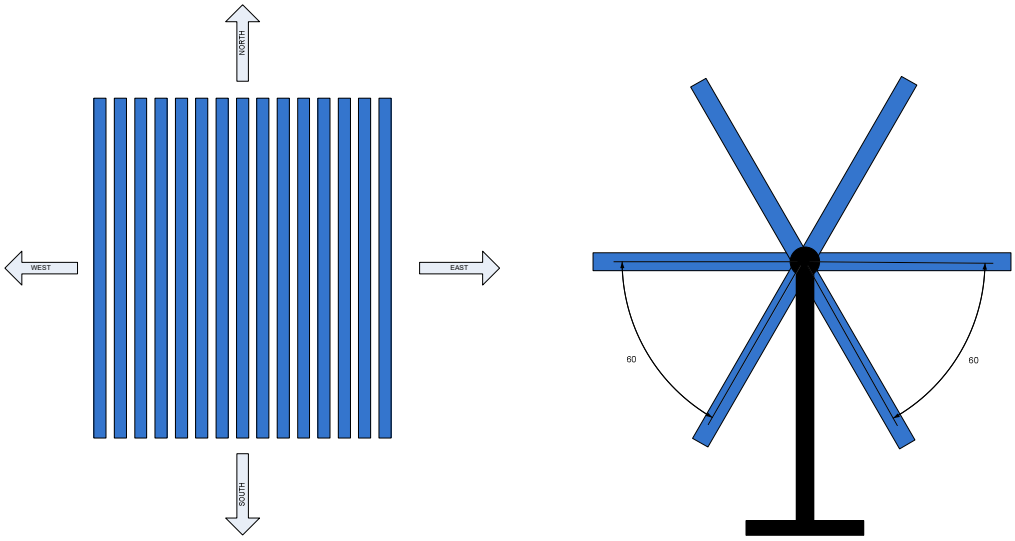


Figure 9: Depiction of input parameters (Panel Orientation and tracking system)

[10] Partial time zones are not possible, only full hours

4.5 Observation Point and Route locations

The observer locations (OP) are described in Table 5 and shown as white markers in Figure 12. The points were chosen to represent potential areas where the residents of houses may be confronted with Glint and Glare when looking towards the PVS solar panels. Glare was calculated for typical viewing heights of 1.5 m.

Route locations (RO) are described in Table 6 and shown as orange lines in Figure 12. Routes were chosen to represent potential areas where the public (car or train drivers) may be confronted with Glint and Glare when looking towards the PVS solar panels. Glare was calculated for typical viewing heights of 1.5 m for all roads and 2.5 m for the Railway track.

5 RESULTS

5.1 Project Area

Bungama Solar is proposed to be located just east of the suburb of Bungama in South Australia. The project area occupies an area of approx. 530 ha. Average elevation of the project area is approx. 25 m above mean sea level.

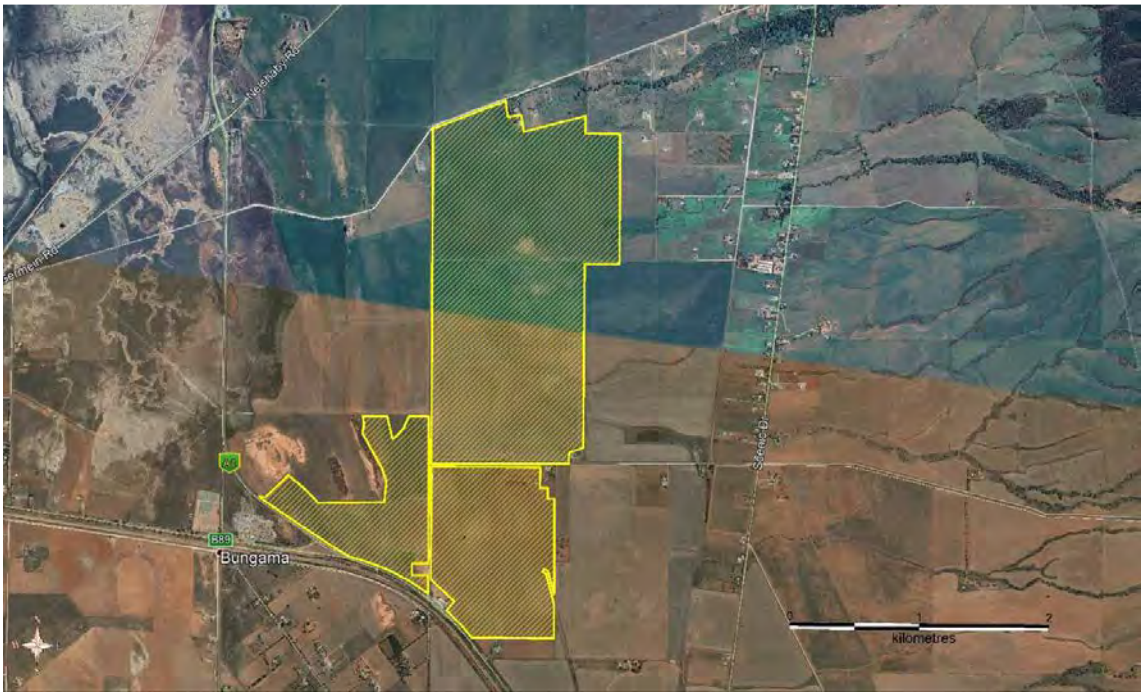


Figure 10: Bungama Solar Project Area

To allow accurate calculation of this very large array, the PVS Solar Panels area was split up into four different sub-arrays as shown in Figure 11. They are subsequently being called according to their colours.

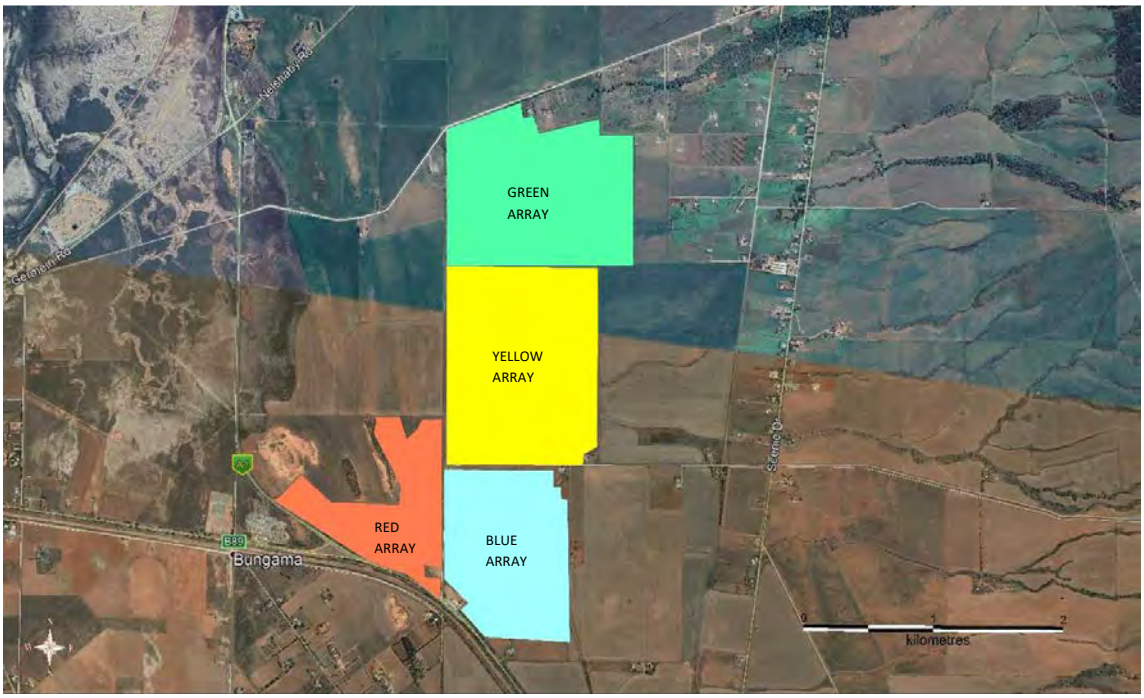


Figure 11: Sub Arrays

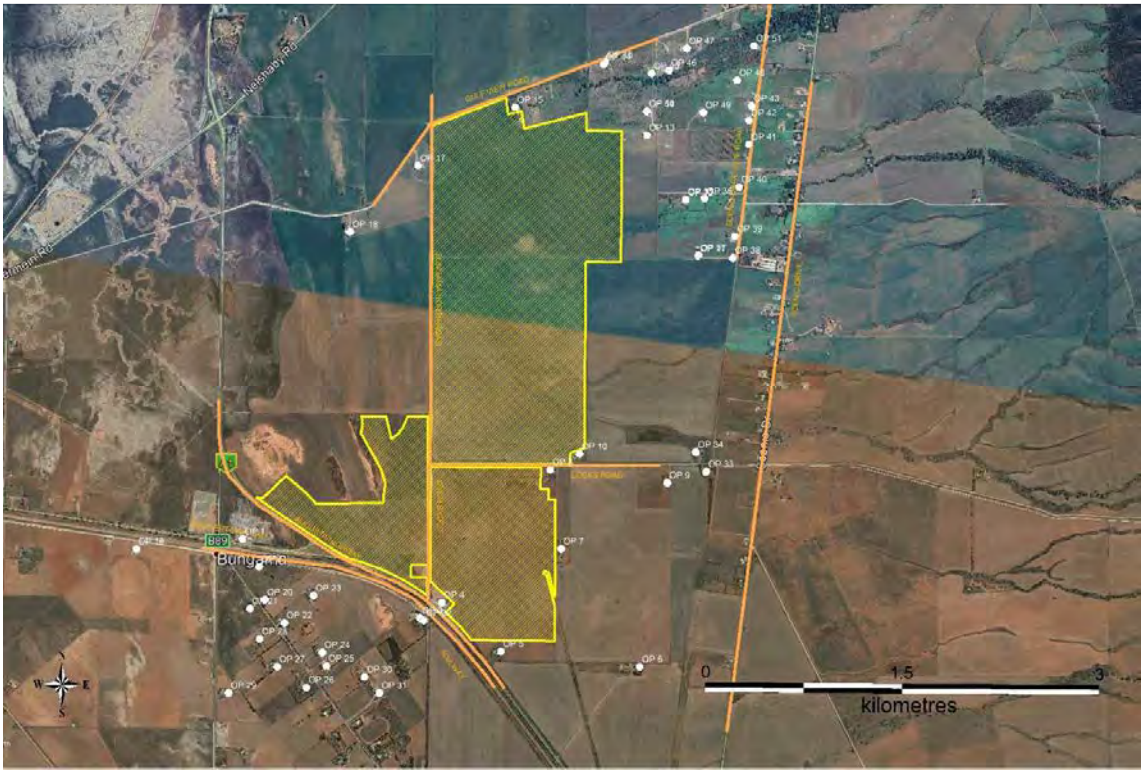


Figure 12: Observation Points (OP) and Roads (Orange lines), yellow lines mark a worst case development footprint

Observation Point	Latitude (deg)	Longitude (deg)	Elevation (m)	Height Above Ground (m)
OP 1	-33.196350	138.070070	9.41	1.5
OP 2	-33.198234	138.071440	12	1.5
OP 3	-33.201664	138.084637	19.33	1.5
OP 4	-33.200586	138.086418	18.95	1.5
OP 5	-33.203908	138.091267	22.29	1.5
OP 6	-33.204895	138.102640	35	1.5
OP 7	-33.196852	138.096159	29.42	1.5
OP 8	-33.191465	138.095237	27.77	1.5
OP 9	-33.192309	138.104807	39.98	1.5
OP 10	-33.190369	138.097618	29.98	1.5
OP 11	-33.176732	138.107239	49.04	1.5
OP 12	-33.172888	138.106209	50.88	1.5
OP 13	-33.168470	138.103011	44.34	1.5
OP 14	-33.166835	138.102990	49.35	1.5
OP 15	-33.166638	138.092218	31.74	1.5
OP 16	-33.163476	138.099578	44.18	1.5
OP 17	-33.170661	138.084279	17.86	1.5
OP 18	-33.175241	138.078764	14.71	1.5
OP 19	-33.197093	138.061397	10.23	1.5
OP 20	-33.200493	138.071941	13.6	1.5
OP 21	-33.201104	138.070718	10.48	1.5
OP 22	-33.202055	138.073550	16.01	1.5
OP 23	-33.200188	138.075910	19.34	1.5
OP 24	-33.204066	138.076662	18.07	1.5
OP 25	-33.205000	138.077005	20.02	1.5
OP 26	-33.206454	138.075353	18.04	1.5
OP 27	-33.205054	138.072971	14.66	1.5
OP 28	-33.203168	138.071512	11.78	1.5
OP 29	-33.206867	138.069001	10.46	1.5
OP 30	-33.205718	138.080116	23.67	1.5
OP 31	-33.206795	138.081339	23.95	1.5
OP 32	-33.201822	138.084944	19.77	1.5
OP 33	-33.191524	138.107982	44.88	1.5
OP 34	-33.190195	138.107124	43.14	1.5
OP 35	-33.172834	138.106201	50.85	1.5
OP 36	-33.172789	138.107757	52.38	1.5
OP 37	-33.176659	138.107274	49.27	1.5
OP 38	-33.176839	138.110085	54.52	1.5
OP 39	-33.175348	138.110235	56.51	1.5
OP 40	-33.171972	138.110565	61.17	1.5
OP 41	-33.169062	138.111359	66.26	1.5
OP 42	-33.167418	138.111338	68.31	1.5
OP 43	-33.166430	138.111574	69.99	1.5
OP 44	-33.163666	138.099416	43.81	1.5
OP 45	-33.164241	138.103365	55.16	1.5

Observation Point	Latitude (deg)	Longitude (deg)	Elevation (m) (m)	Height Above Ground (m)
OP 46	-33.164026	138.104781	59.95	1.5
OP 47	-33.162517	138.106240	62.25	1.5
OP 48	-33.164672	138.110360	69.7	1.5
OP 49	-33.166899	138.107613	57.93	1.5
OP 50	-33.166828	138.102978	49.35	1.5
OP 51	-33.162301	138.111733	75.26	1.5

Table 5: Observation Points

The following roads were assessed as Routes (RO):

Augusta Highway (1.5 m)		Railway (2.5 m)	
Warnertown Road (1.5 m)		Locks Road (1.5 m)	
Bungama North Road (1.5 m)		Scenic Drive (1.5 m)	
Side road off Scenic Drive (1.5 m)		Gulf View Road (1.5 m)	

Table 6: Routes

5.2 Calculation Results

The PVS solar panels are proposed to operate as single axis tracking system. Only this operation has therefore been assessed.

Observation Point	Green Glare (min/year)	Yellow Glare (min/year)	Red Glare (min/year)	Summary
OP: OP 1	-	-	-	NO GLARE
OP: OP 2	-	-	-	NO GLARE
OP: OP 3	-	-	-	NO GLARE
OP: OP 4	313	-	-	GREEN
OP: OP 5	-	-	-	NO GLARE
OP: OP 6	-	-	-	NO GLARE
OP: OP 7	-	-	-	NO GLARE
OP: OP 8	-	-	-	NO GLARE
OP: OP 9	-	-	-	NO GLARE
OP: OP 10	11	-	-	GREEN
OP: OP 11	-	-	-	NO GLARE
OP: OP 12	1,618	-	-	GREEN
OP: OP 13	4,309	-	-	GREEN
OP: OP 14	3,123	-	-	GREEN
OP: OP 15	7,791	-	-	GREEN
OP: OP 16	1,738	-	-	GREEN
OP: OP 17	4,121	-	-	GREEN
OP: OP 18	786	-	-	GREEN
OP: OP 19	-	-	-	NO GLARE
OP: OP 20	-	-	-	NO GLARE
OP: OP 21	-	-	-	NO GLARE
OP: OP 22	-	-	-	NO GLARE
OP: OP 23	-	-	-	NO GLARE
OP: OP 24	-	-	-	NO GLARE
OP: OP 25	-	-	-	NO GLARE
OP: OP 26	-	-	-	NO GLARE
OP: OP 27	-	-	-	NO GLARE
OP: OP 28	-	-	-	NO GLARE
OP: OP 29	-	-	-	NO GLARE
OP: OP 30	-	-	-	NO GLARE
OP: OP 31	-	-	-	NO GLARE
OP: OP 32	-	-	-	NO GLARE
OP: OP 33	-	-	-	NO GLARE
OP: OP 34	-	-	-	NO GLARE
OP: OP 35	1599	-	-	GREEN
OP: OP 36	577	-	-	GREEN
OP: OP 37	-	-	-	NO GLARE
OP: OP 38	-	-	-	NO GLARE
OP: OP 39	-	-	-	NO GLARE
OP: OP 40	123	-	-	GREEN
OP: OP 41	374	-	-	GREEN
OP: OP 42	281	-	-	GREEN
OP: OP 43	10	-	-	GREEN
OP: OP 44	1,779	-	-	GREEN
OP: OP 45	-	-	-	NO GLARE
OP: OP 46	-	-	-	NO GLARE
OP: OP 47	-	-	-	NO GLARE
OP: OP 48	-	-	-	NO GLARE
OP: OP 49	1,394	-	-	GREEN
OP: OP 50	3,038	-	-	GREEN
OP: OP 51	-	-	-	NO GLARE

Observation Point	Green Glare (min/year)	Yellow Glare (min/year)	Red Glare (min/year)	Summary
RO: Gulf View Road	2	-	-	GREEN
RO: Locks Road	-	-	-	NO GLARE
RO: Railway	-	-	-	NO GLARE
RO: Scenic Drive	-	-	-	NO GLARE
RO: Scenic Drive Side Road	-	-	-	NO GLARE
RO: Warnertown Road	66	-	-	GREEN
RO: Augusta Highway	-	-	-	NO GLARE
RO: Bungama North Road	-	-	-	NO GLARE

Table 7: Glare Calculation Results

No YELLOW GLARE or RED GLARE has been calculated and therefore no issues with glare are expected.

Only some observation points and Warnertown Road experience measurable GREEN GLARE. This is considered acceptable. With a maximum of 7,791 min or 130 h per year only OP15 on Gulf View Road may experience considerable GREEN GLARE. However, this property is surrounded by vegetation providing sufficient screening so no glare is expected to be relevant at the actual house.

With effectively only one hour of GREEN GLARE on Warnertown Road during the late afternoon hours separate screening is not considered necessary from a glare & glint point of view. Gulf View Road experiences two minutes per year of GREEN GLARE which is negligible.

5.3 Air Traffic

The Australian Civil Aviation Safety Authority (CASA) provides guidelines to planning authorities in relation to referring solar projects for assessment to ensure there is no likelihood of any glare and glint issues for pilots on approach to or on departure from an airport or as impact on traffic controllers.

Bungala Solar is approximately 10 km from Port Pirie Airport and it is therefore considered unlikely that any glint or glare issues will be created for pilots on approach to or departure from Port Pirie Airport. However, CASA requires an assessment for any solar farm within a distance of around 5 nautical miles from an airport and therefore a calculation for potential glint and glare issues was performed.

Figure 13: Port Pirie Airport

Port Pirie Airport (YPIR[11]) is located at 33° 14.3' S and 137° 59.7' E. It consists of three runways of which the east west facing runway 80/26 is sealed and used for commercial aircrafts. The two other runways facing SW/NE, 35/17 and 03/21 are unpaved and most likely only used for private airplanes. All three runways have been assessed using the approach parameters shown in Table 8 and an approach length of two nautical miles.

Runway	Type	Orientation (deg)	Glide Slope (deg)	Threshold Crossing height (m)
03 SW	Grass	43.4	3	15.24
21 NE	Grass	222.3	3	15.24
17 N	Sand	180	3	15.24
35 S	Sand	0	3	15.24
26 E	Sealed	270	3	15.24
80 W	Sealed	90	3	15.24

Table 8: Flight Paths Port Pirie

5.3.1 Result of Calculation

The calculation for all six approach paths did not indicate any Glint or Glare issues for pilots.

[11] Data sourced from AIP Australia Port Pirie AVFAX Code 5032

6 CONCLUSIONS

6.1 Houses, Railway and Roads

With single axis tracking systems only GREEN GLARE can be expected for a small section of Warnertown Road.

Some houses in the surrounds of the project area may experience limited GREEN GLARE. These houses are located at Gulf View Road and Scenic Drive and are mostly surrounded by trees so while there may be some GREEN GLARE the vegetation likely ameliorates the potential glare.

GREEN GLARE is not considered to be critical and therefore no mitigation measures for houses are required.

6.2 Port Pirie Airport

No glint & glare is created for the Port Pirie Airport Control Tower nor for any flight paths during approach to or departure from Port Pirie Airport for any of the three runways.

7 RECOMMENDATIONS

No higher levels of glare can be expected and only a few properties may theoretically be affected by some levels of GREEN GLARE. As properties are mostly surrounded by vegetation this is not considered to affect the actual property itself as vegetation screens all potential glare. As only minimal glare can be expected for Warnertown Road for approximately 1 h per year no additional screening is considered necessary.

Figure 14: View onto house OP15 from Gulf View Road[12]

House OP15 is already surrounded by trees therefore limiting the view towards the PVS solar panels. No further screening is considered required with regards to Glint & Glare. However, in addition to the existing vegetation the Client proposes to incorporate a 50 m wide visual buffer including a 10 m wide and 4 m high landscape screen around the boundary of the Project Area adjacent to OP15. This visual buffer and landscape screen in combination with the existing vegetation surrounding many parts of the project area and adjacent residences will substantially ameliorate any GREEN GLARE.

[12] Photo taken from Google Earth™ Street View

Figure 15: View onto house OP17 from Gulf View Road[13]

House OP17 is surrounded by some trees and scrub towards the PVS solar panels therefore limiting the view. No further screening is considered required with regards to Glint & Glare. However, in addition to the existing vegetation the Client proposes to incorporate a 50 m wide visual buffer including a 10 m wide and 4 m high landscape screen around the boundary of the Project Area adjacent to OP17. This visual buffer and landscape screen in combination with the existing vegetation surrounding many parts of the project area and adjacent residences will substantially ameliorate any GREEN GLARE.

[13] Photo taken from Google Earth™ Street View

8 OBSERVATION POINTS

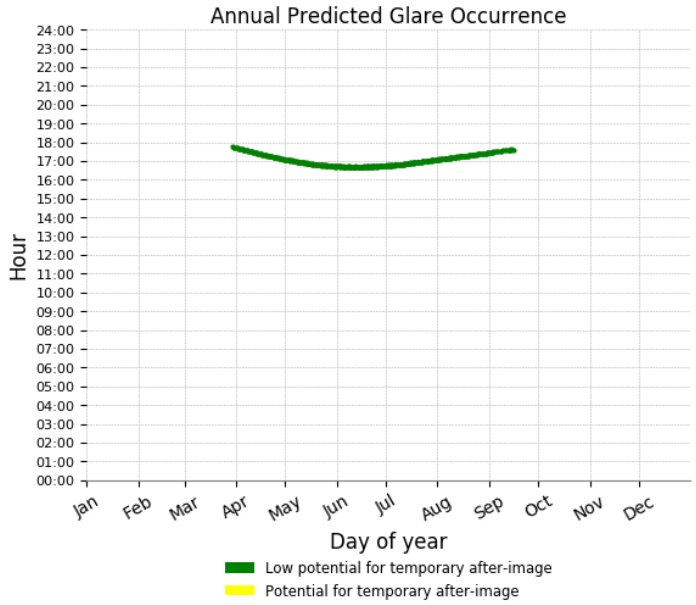
In the following section typical observation points with higher Glare impact are shown.

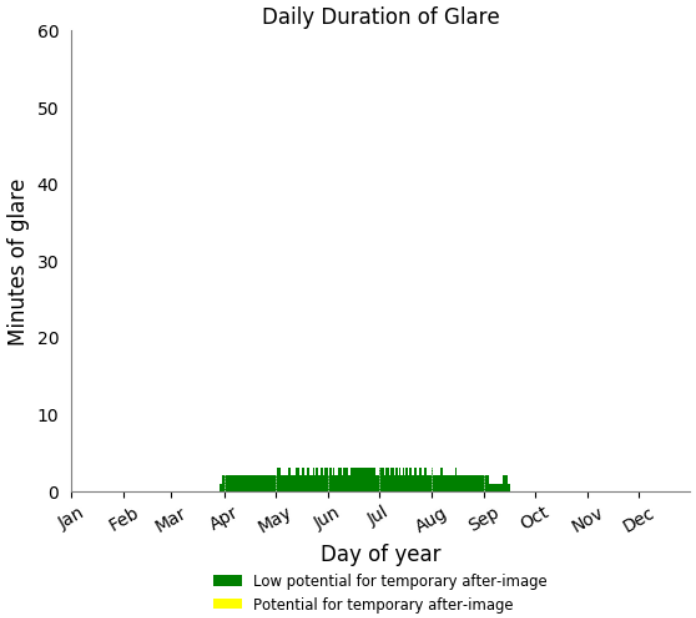
8.1 OP04 Warnertown Road[14]

Figure 16: OP04 Warnertown Road Petrol Station looking NORTH

With only a few minutes of potential GREEN GLARE per day for this location impact is considered negligible. In addition some trees at the back of the property help screening the PVS solar panels and therefore further reduce any glare impact.

[14] All road images downloaded from Google Earth™ Street View


Annual Predicted Glare Occurrence
Hour
24:00
23:00
22:00
21:00
20:00
19:00
18:00
17:00
16:00
15:00
14:00
13:00
12:00
11:00
10:00
09:00
08:00
07:00
06:00
05:00
04:00
03:00
02:00
01:00
00:00
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
Day of year
Low potential for temporary after-image
Potential for temporary after-image


Daily Duration of Glare
Minutes of glare
60
50
40
30
20
10
0
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
Day of year
Low potential for temporary after-image
Potential for temporary after-image

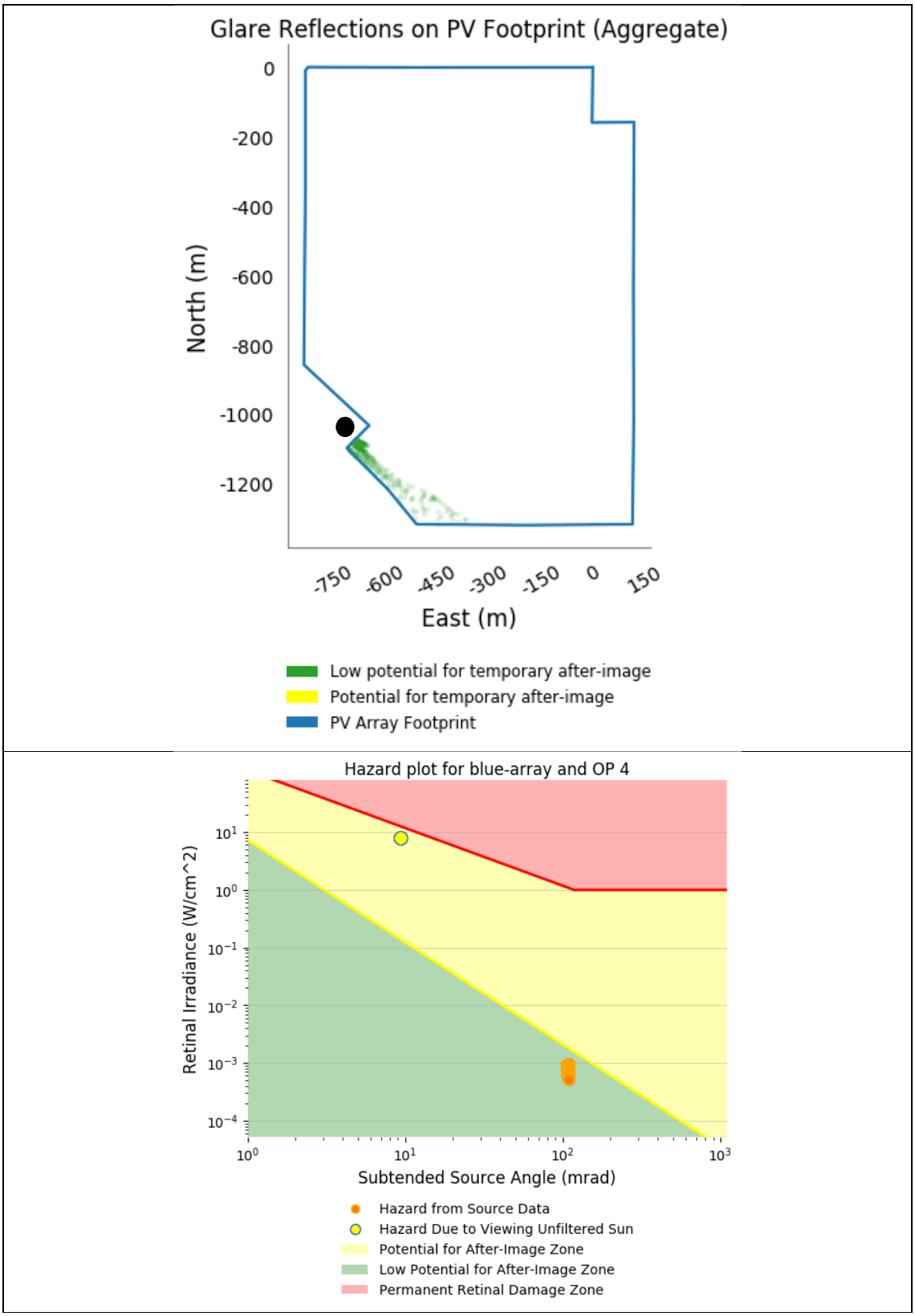
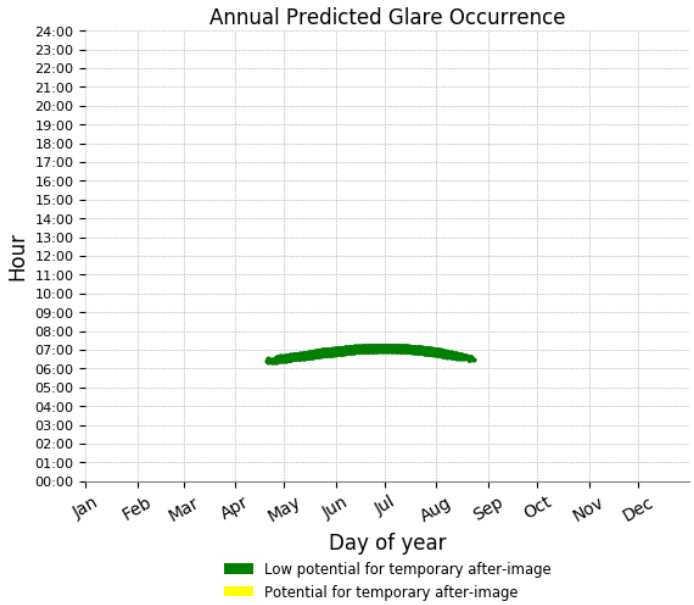
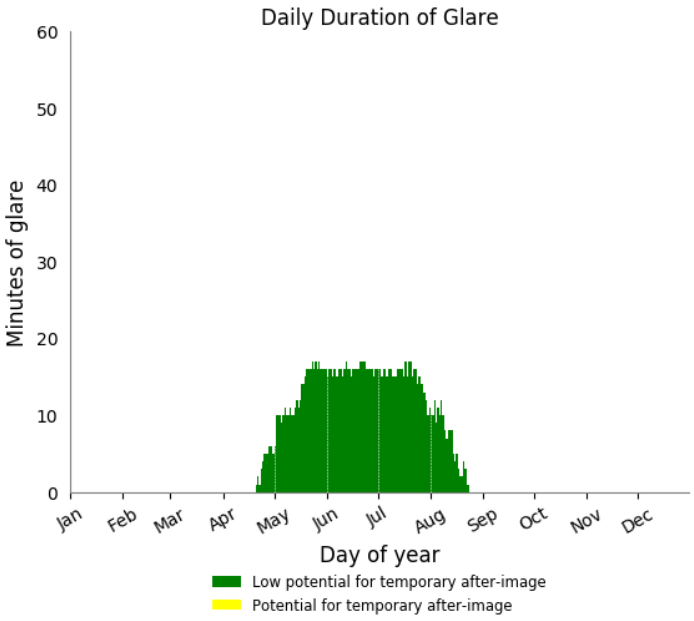


Figure 17: SGHAT Results OP05 Warnertown Road Petrol Station[15]

8.2 OP12 Side Road off Scenic Drive

This property may experience some very limited GREEN GLARE during the early morning hours of each day for up to 18 min/day. This is however not considered to be an issue and is easily screened by the existing vegetation on this property. However, in addition to the existing vegetation the Client proposes to incorporate a 50 m wide visual buffer including a 10 m wide and 4 m high landscape screen around the boundary of the Project Area adjacent to OP12. This visual buffer and landscape screen in combination with the existing vegetation surrounding many parts of the project area and adjacent residences will substantially ameliorate any GREEN GLARE.





[15] Black dot marks approximate location of Observation Point

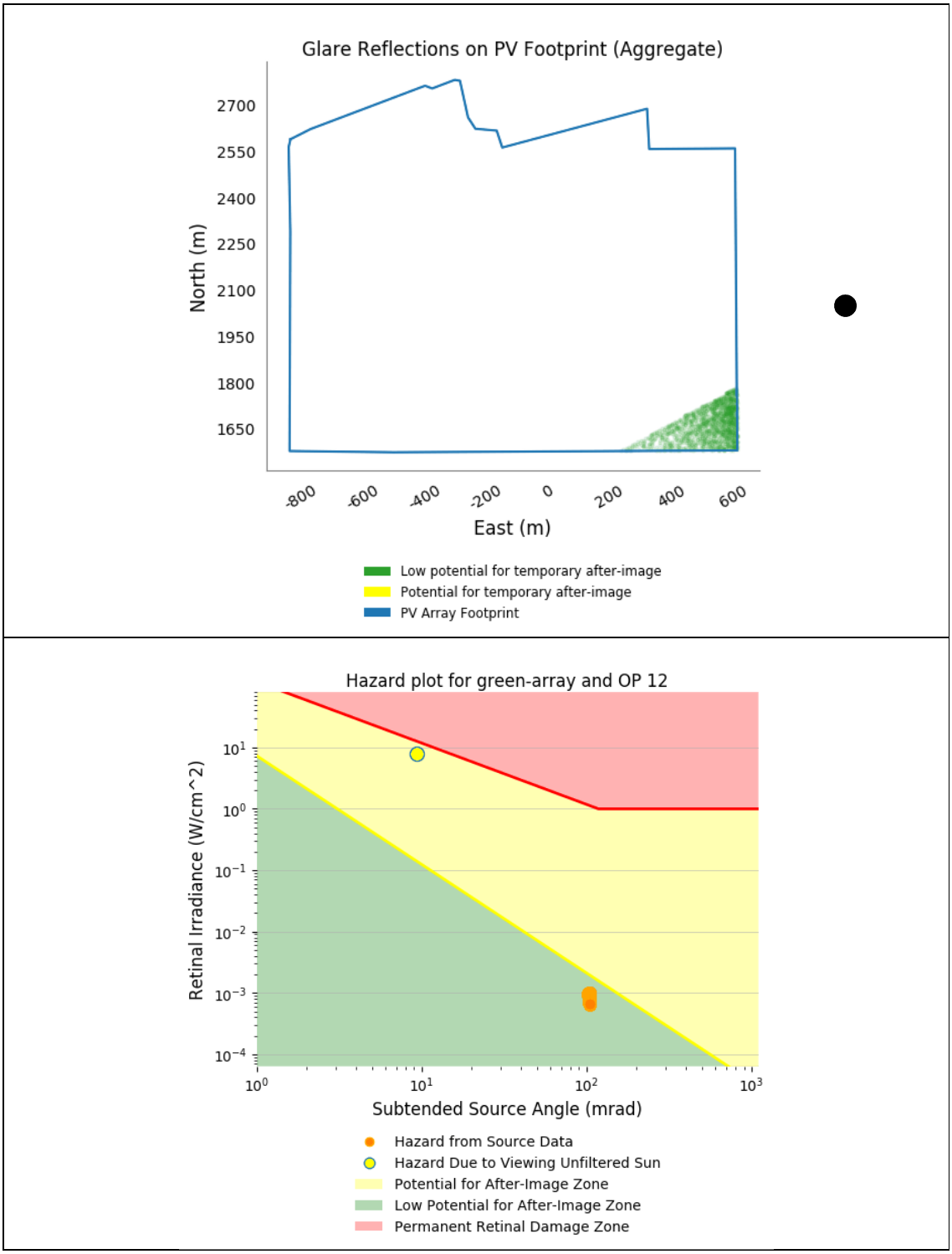
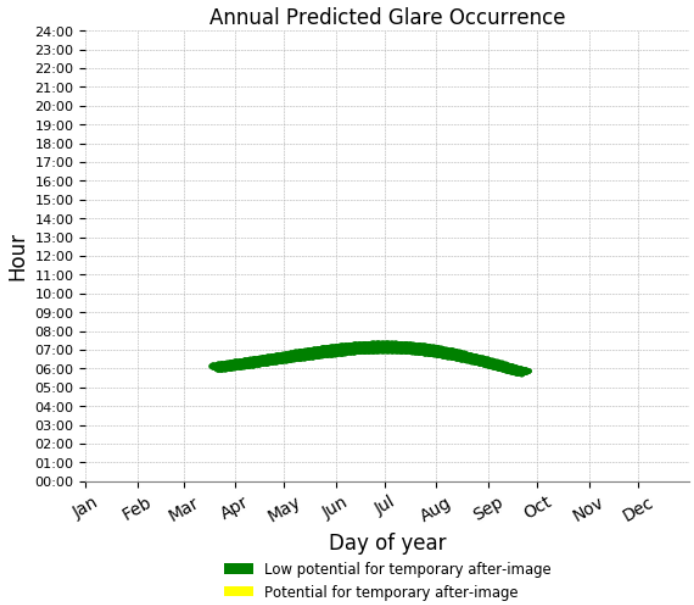
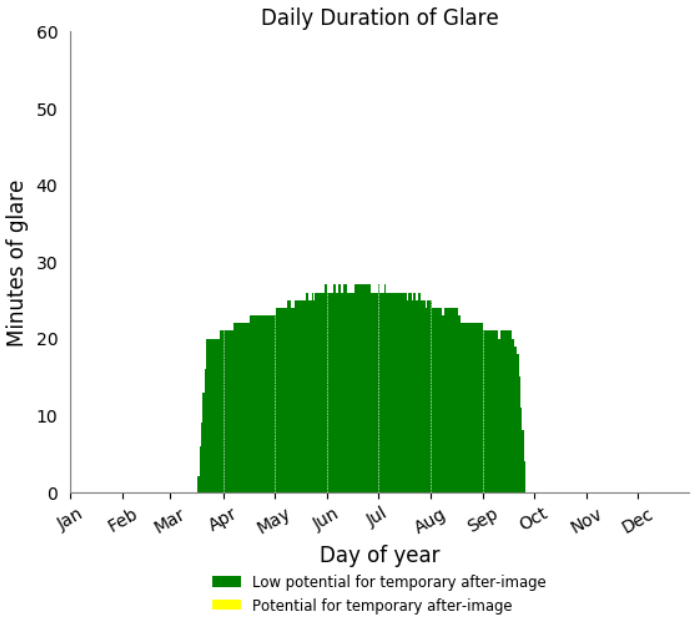


Figure 18: SGHAT Results for OP12

8.3 OP13 off Gulf View Road

This property may experience some very limited GREEN GLARE during the early morning hours of each day for up to 30 min. This is however not considered to be an issue and is easily screened by the existing vegetation on this property. However, in addition to the existing vegetation the Client proposes to incorporate a 50 m wide visual buffer including a 10 m wide and 4 m high landscape screen around the boundary of the Project Area adjacent to OP13. This visual buffer and landscape screen in combination with the existing vegetation surrounding many parts of the project area and adjacent residences will substantially ameliorate any GREEN GLARE.





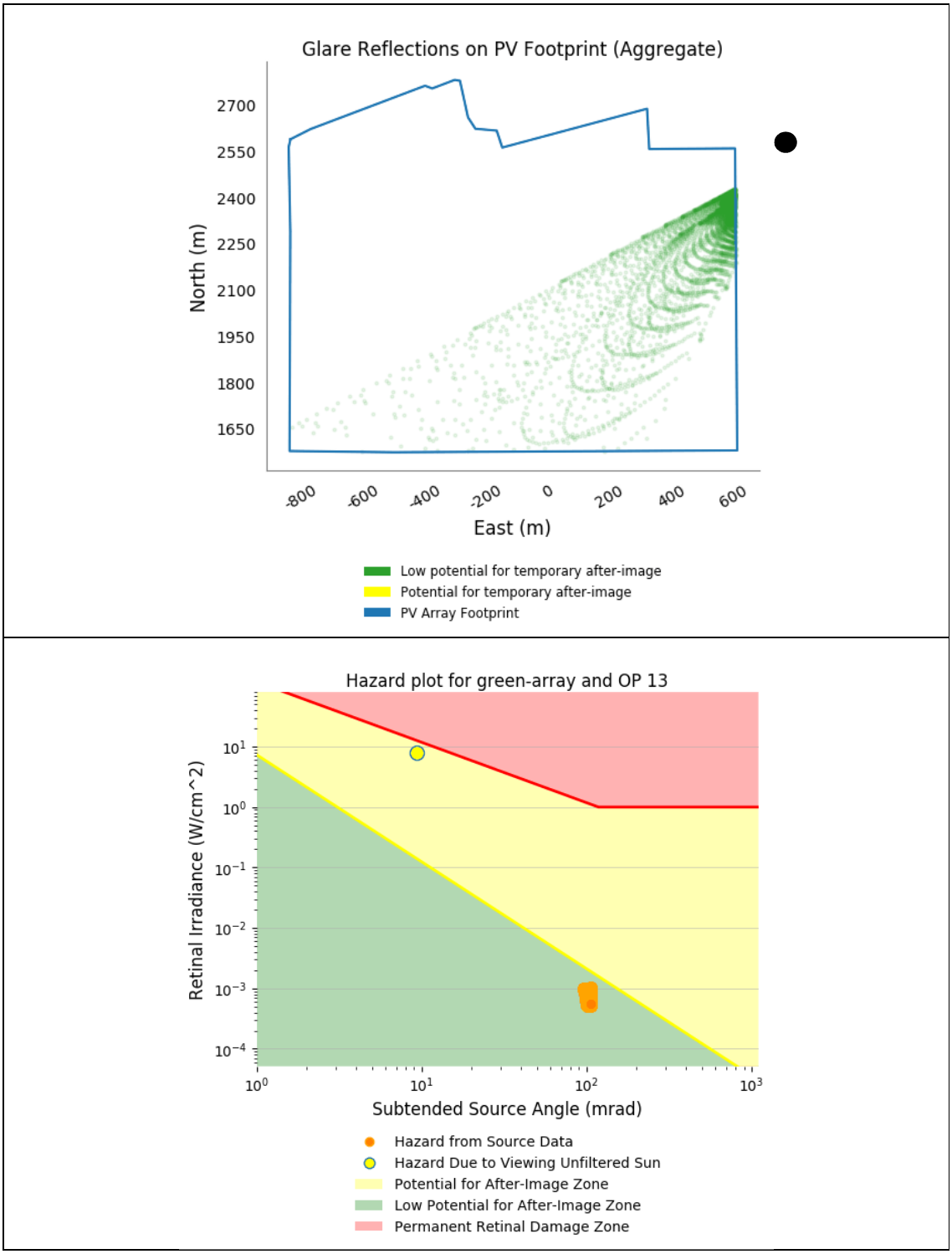
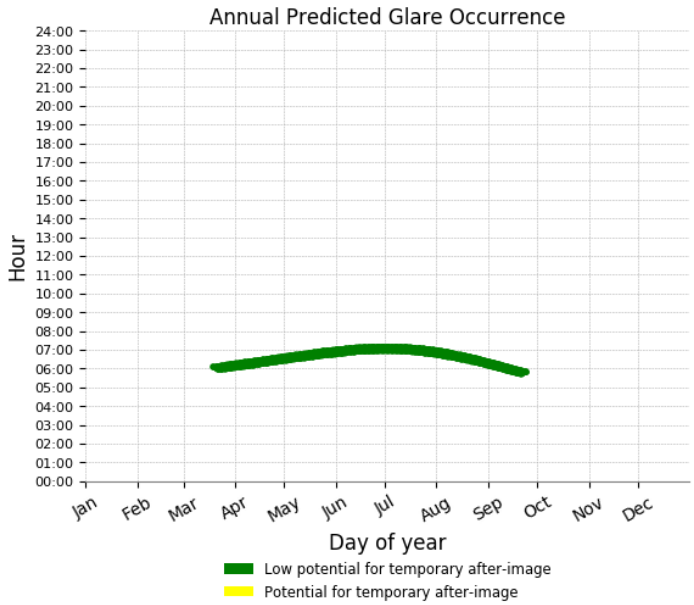
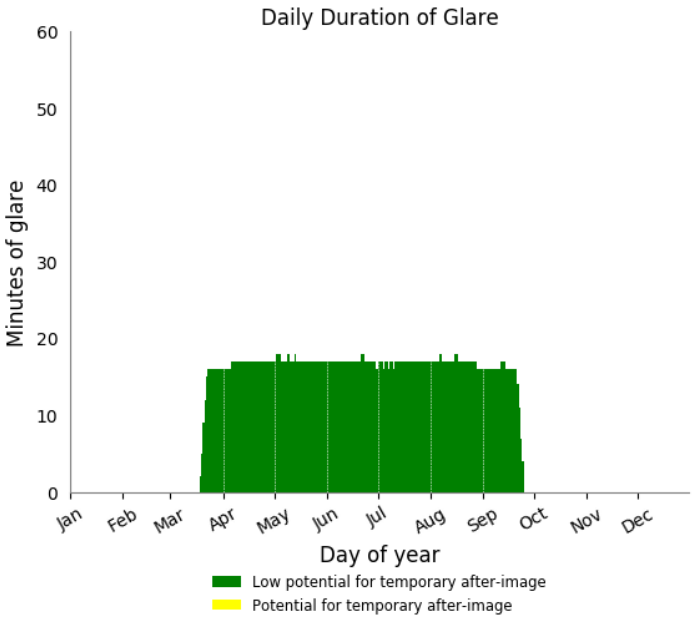


Figure 19: SGHAT Results OP13

8.4 OP14 – off Gulf View Road

This property may experience some very limited GREEN GLARE during the early morning hours of each day for up to 20 min. This is however not considered to be an issue and is easily screened by the existing vegetation on this property. However, in addition to the existing vegetation the Client proposes to incorporate a 50 m wide visual buffer including a 10 m wide and 4 m high landscape screen around the boundary of the Project Area adjacent to OP14. This visual buffer and landscape screen in combination with the existing vegetation surrounding many parts of the project area and adjacent residences will substantially ameliorate any GREEN GLARE.





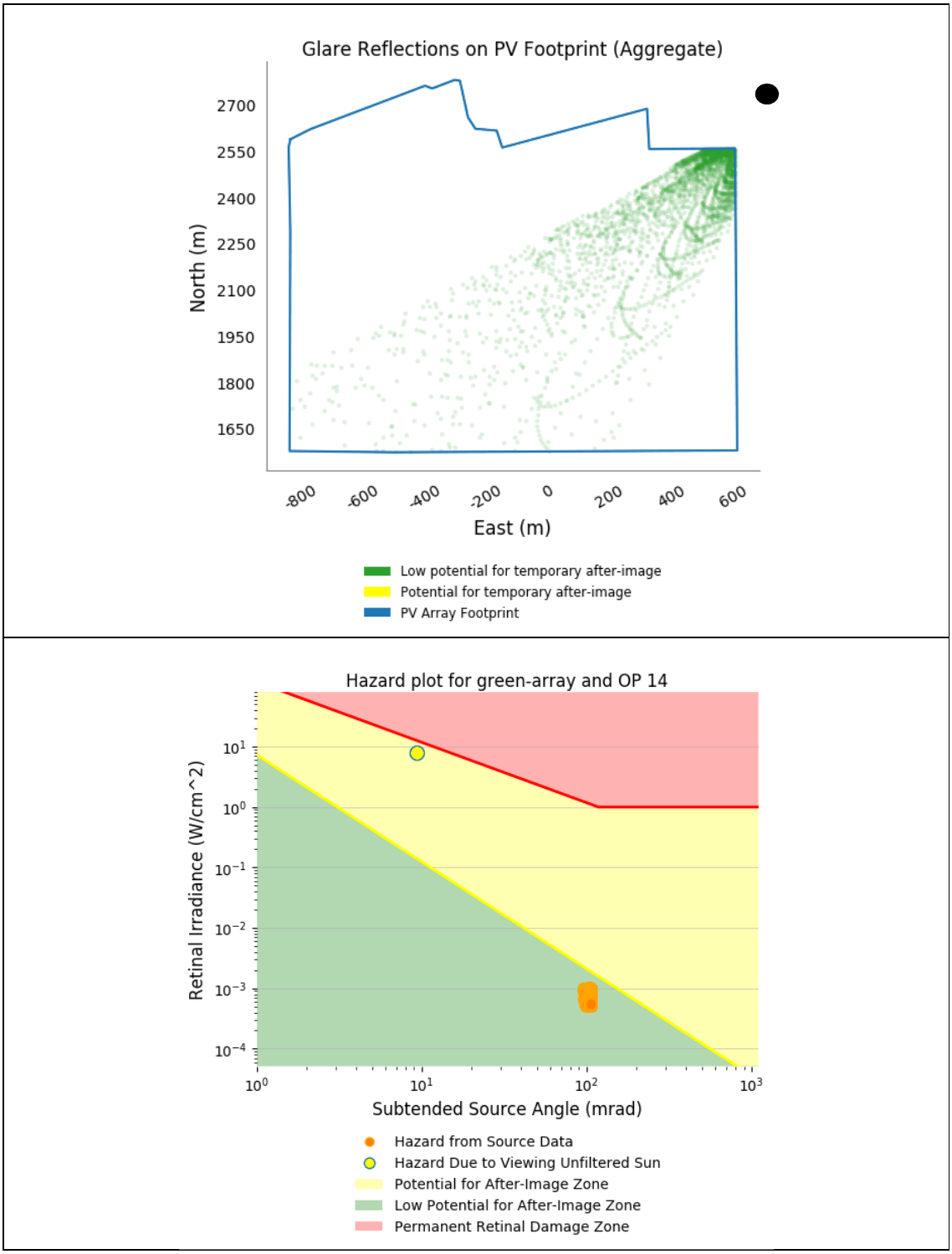
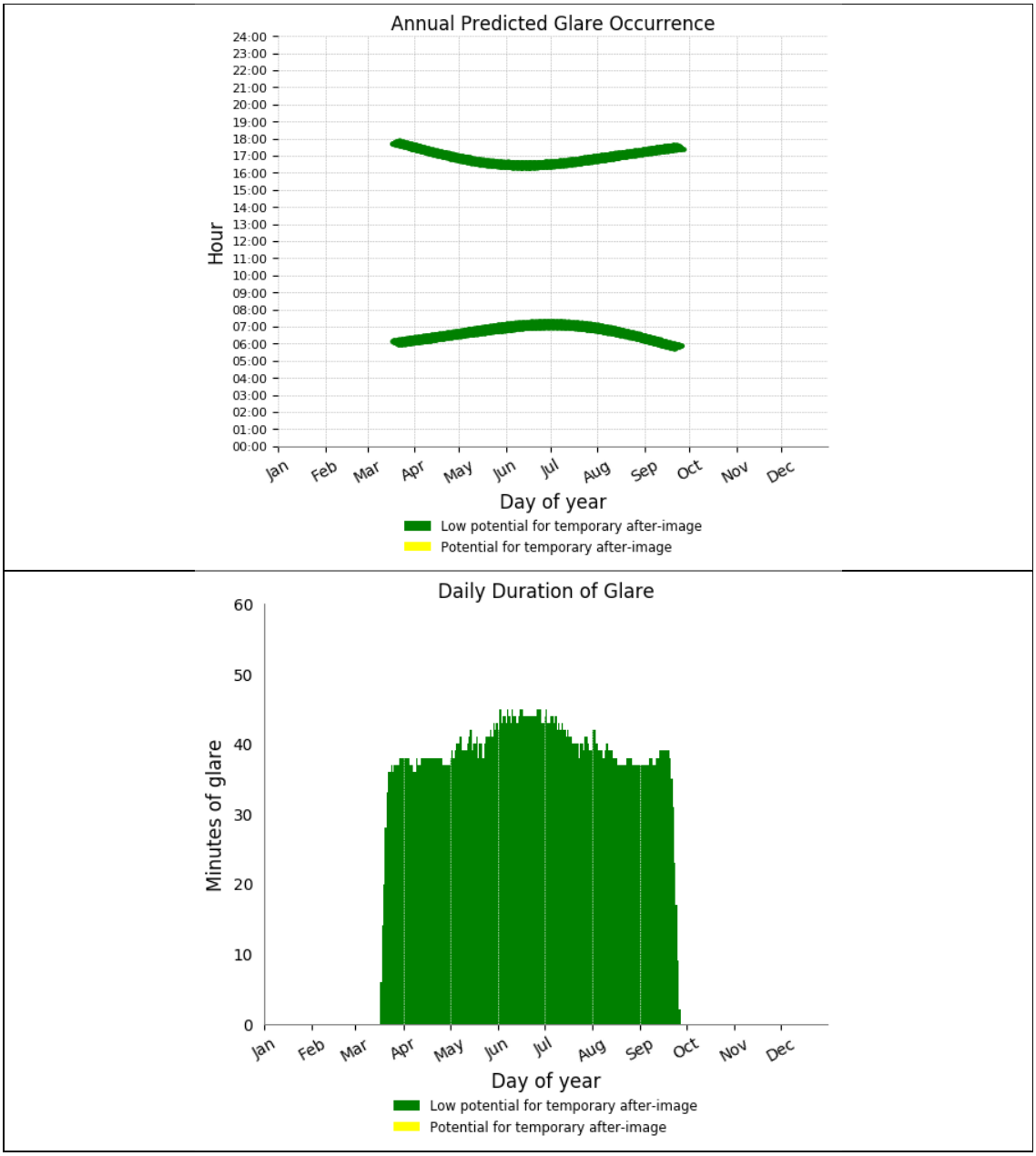


Figure 20: SGHAT Results OP14

8.5 OP15 – Gulf View Road

This property may experience some GREEN GLARE during the early morning hours and later afternoon of each day for up to 45 min. This is however not considered to be an issue and is easily screened by the existing vegetation on this property.



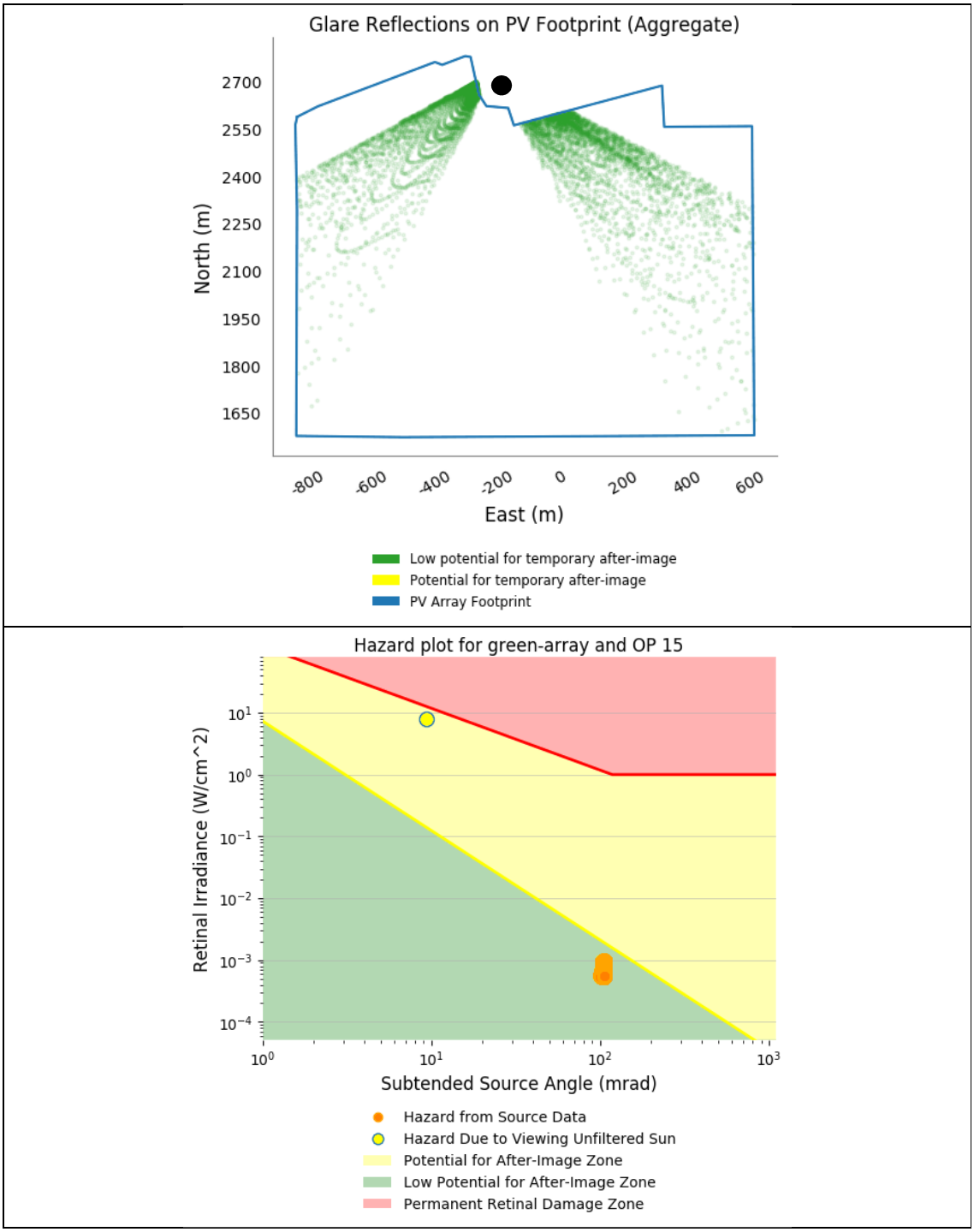
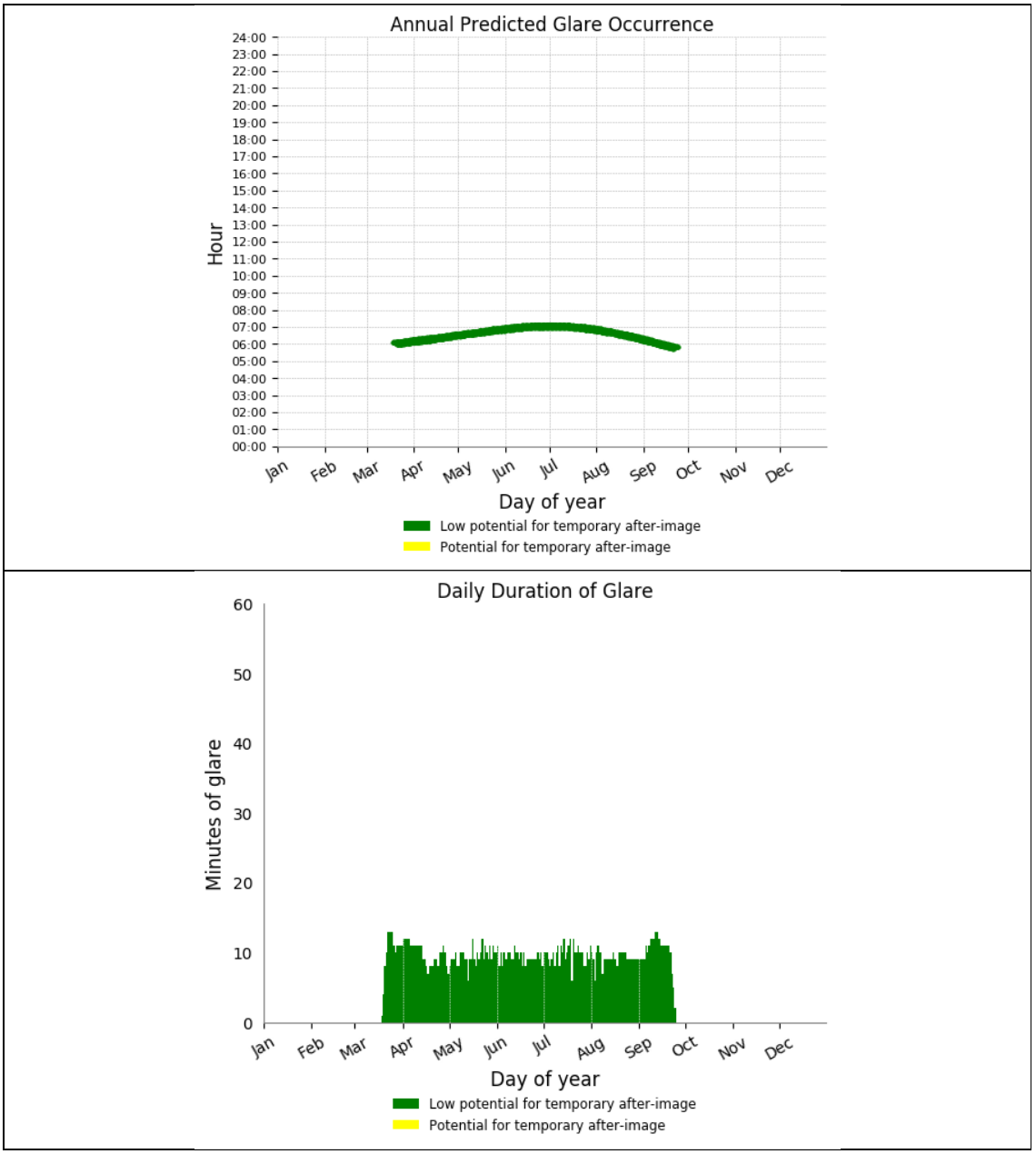


Figure 21: SGHAT Results OP15

8.6 OP16 – Gulf View Road

This property may experience some very limited GREEN GLARE during the early morning hours of each day for up to 15 min. This is however not considered to be an issue and is easily screened by the existing vegetation on this property. However, in addition to the existing vegetation the Client proposes to incorporate a 50 m wide visual buffer including a 10 m wide and 4 m high landscape screen around the boundary of the Project Area adjacent to OP16. This visual buffer and landscape screen in combination with the existing vegetation surrounding many parts of the project area and adjacent residences will substantially ameliorate any GREEN GLARE.



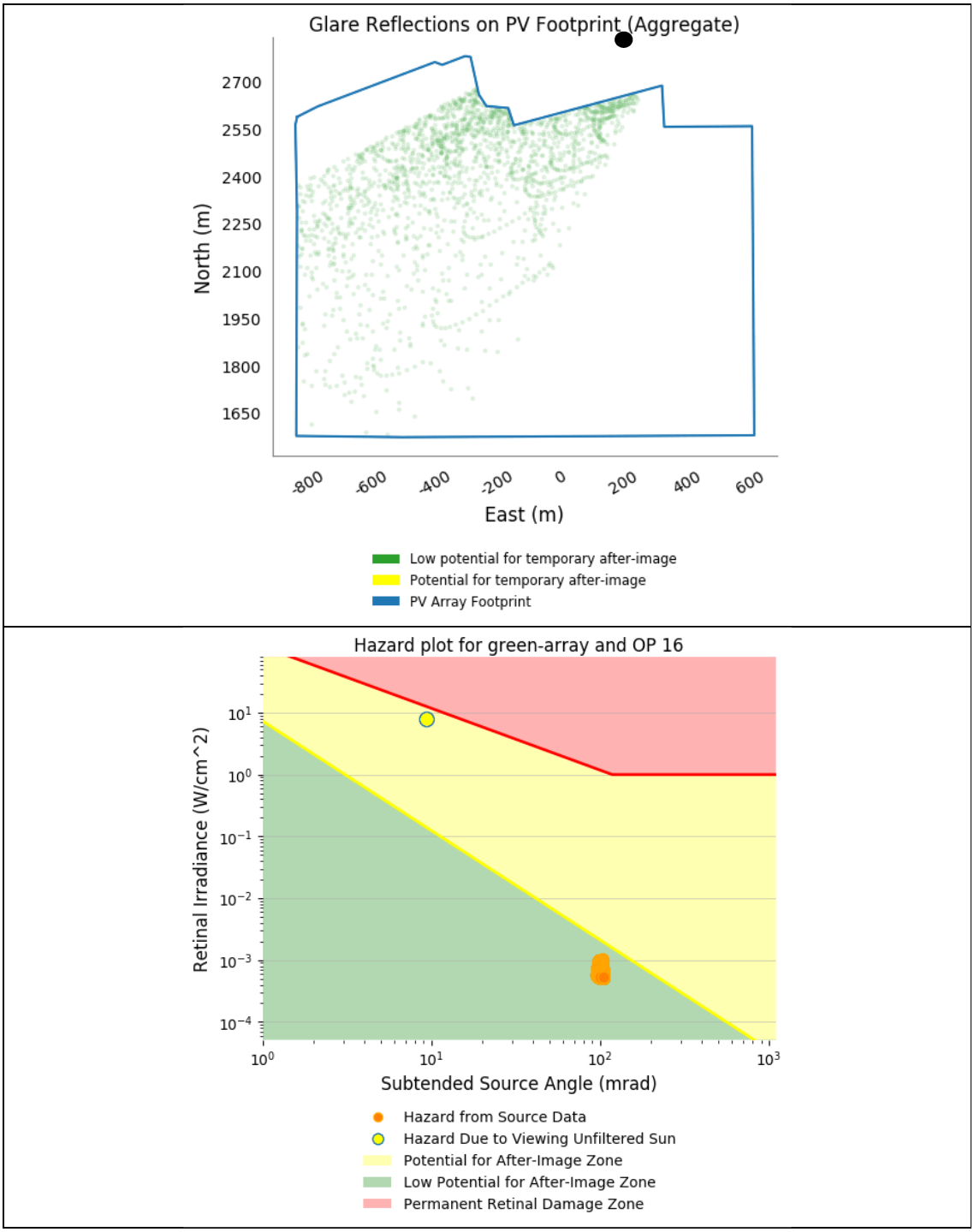
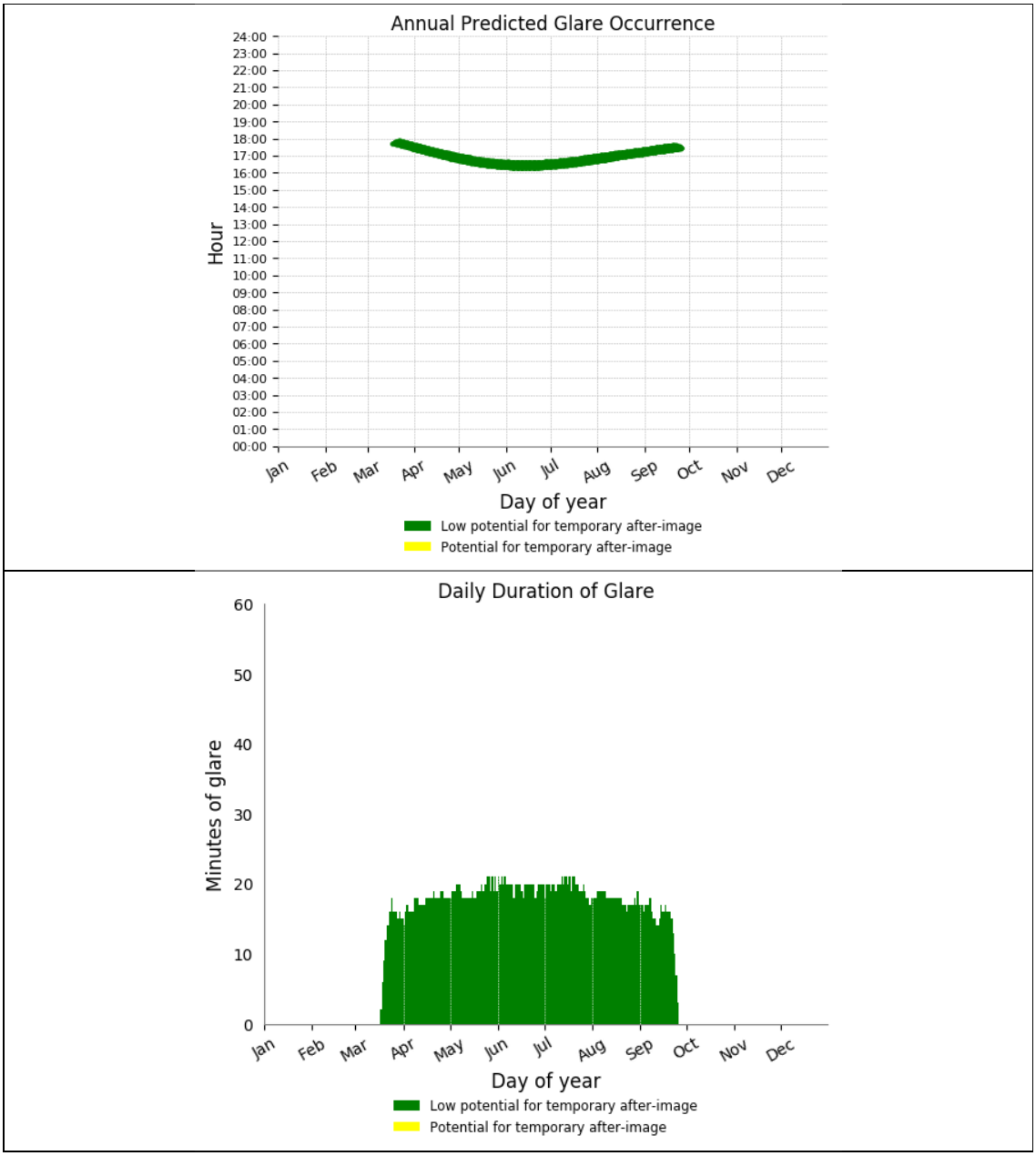


Figure 22: SGHAT Results OP16

8.7 OP17 – Gulf View Road

This property may experience some very limited GREEN GLARE during the late afternoon hours of each day for up to 20 min. This is however not considered to be an issue and is easily screened by the existing vegetation on this property.



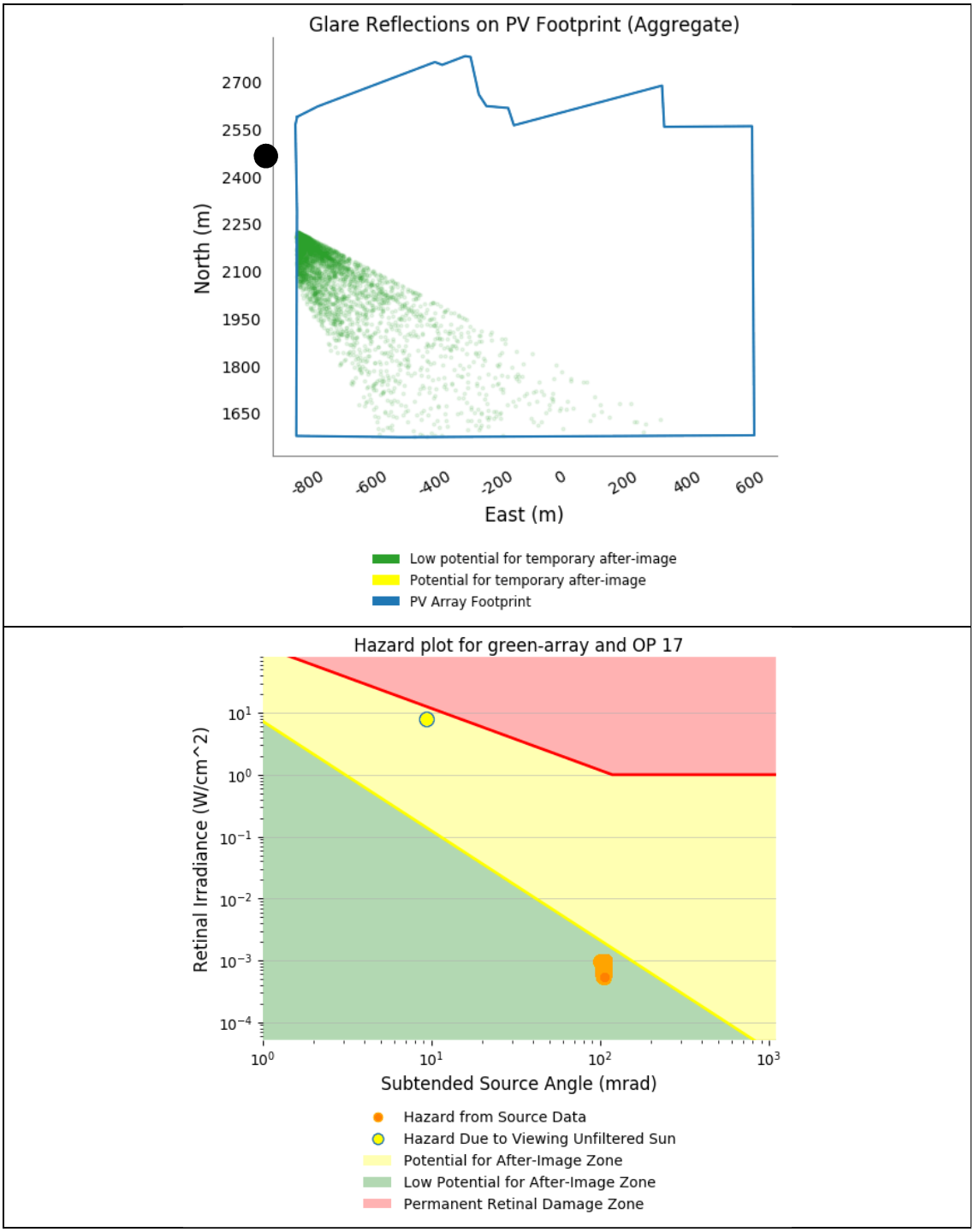
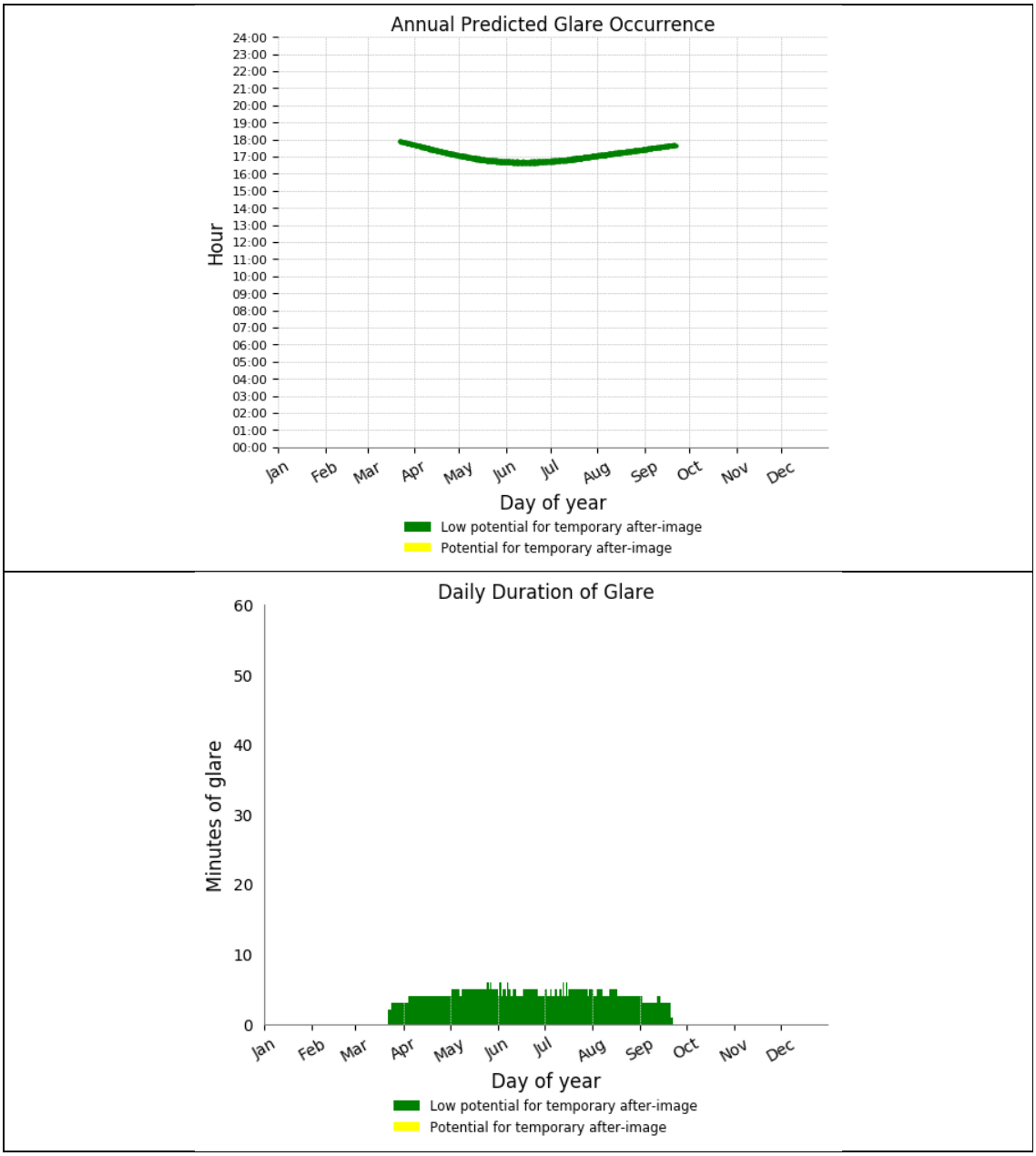


Figure 23: SGHAT Results OP17

8.8 OP18 – Gulf View Road

This property may experience some very limited GREEN GLARE during the late afternoon hours of each day for up to 5 min. This is however not considered to be an issue and is easily screened by the existing vegetation on this property. However, in addition to the existing vegetation the Client proposes to incorporate
visual buffer including a 10 m wide and 4 m high landscape screen around the boundary of the Project Area adjacent to OP18. This visual buffer and landscape screen in combination with the existing vegetation surrounding many parts of the project area and adjacent residences will substantially ameliorate any GREEN GLARE.



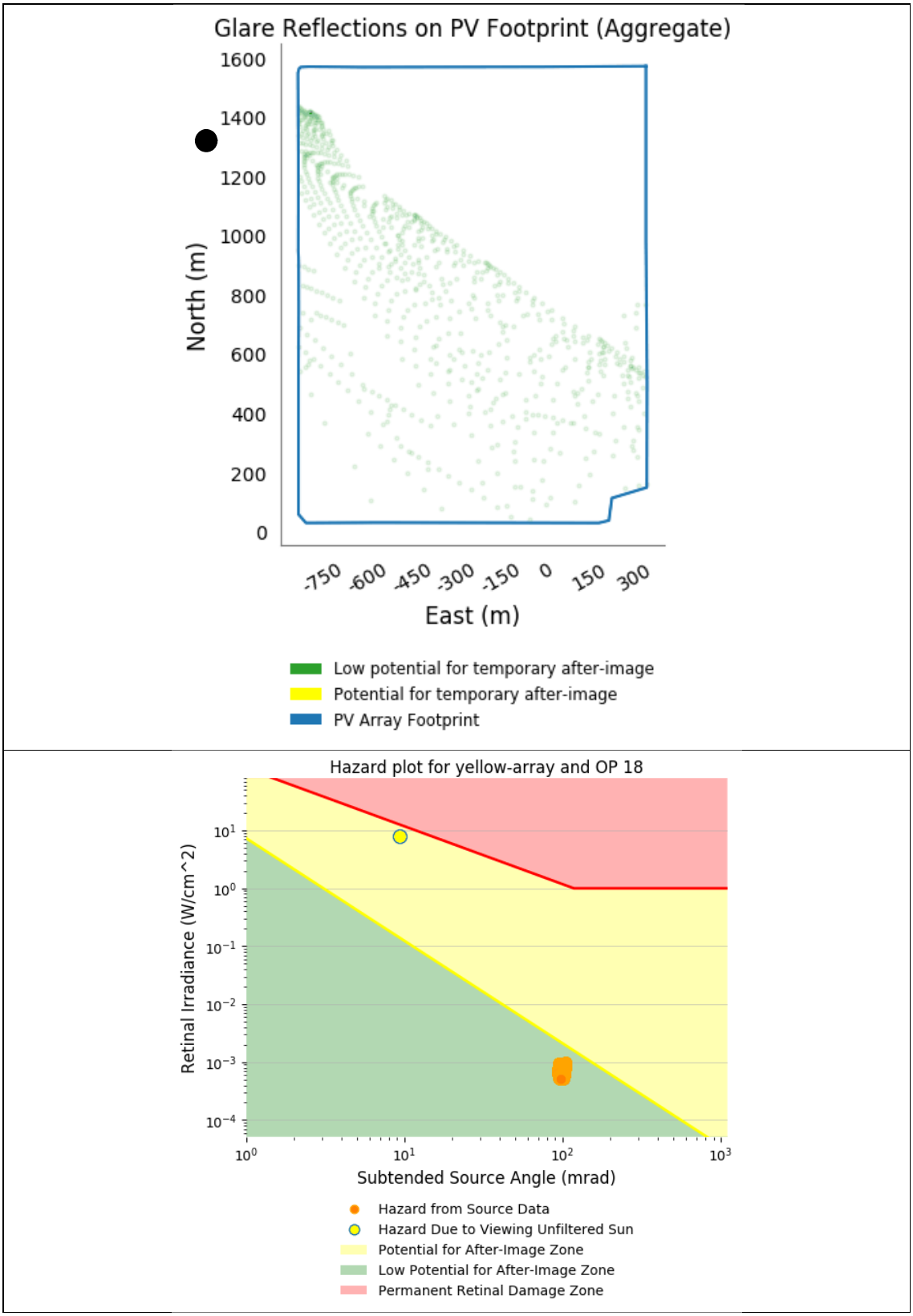
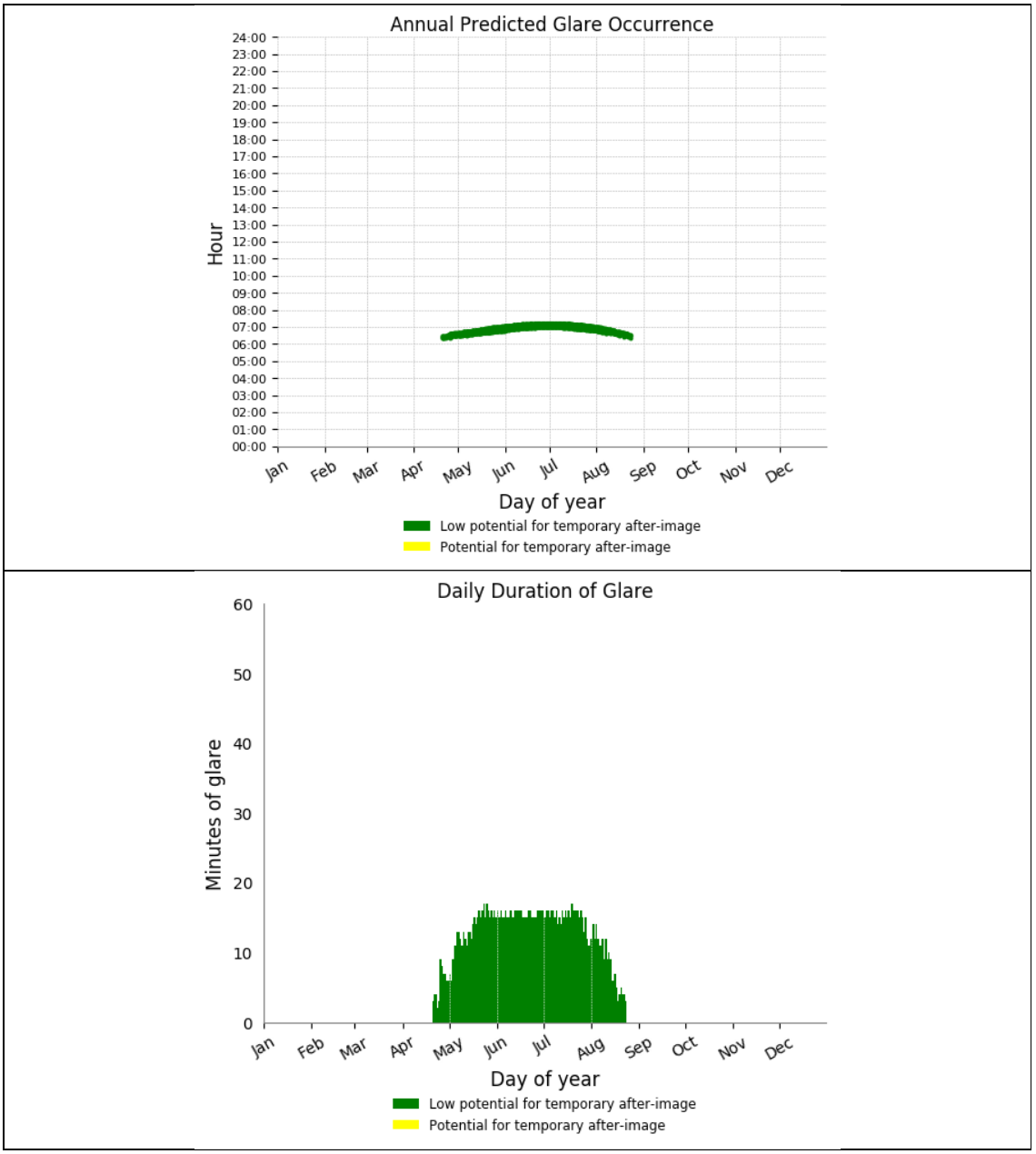


Figure 24: SGHAT Results OP18

8.9 OP35 – Scenic Drive Side Road

This property may experience some very limited GREEN GLARE during the early morning hours of each day for up to 20 min. This is however not considered to be an issue and is easily screened by the existing vegetation on this property. However, in addition to the existing vegetation the Client proposes to incorporate a 50 m wide visual buffer including a 10 m wide and 4 m high landscape screen around the boundary of the Project Area adjacent to OP35. This visual buffer and landscape screen in combination with the existing vegetation surrounding many parts of the project area and adjacent residences will substantially ameliorate any GREEN GLARE.



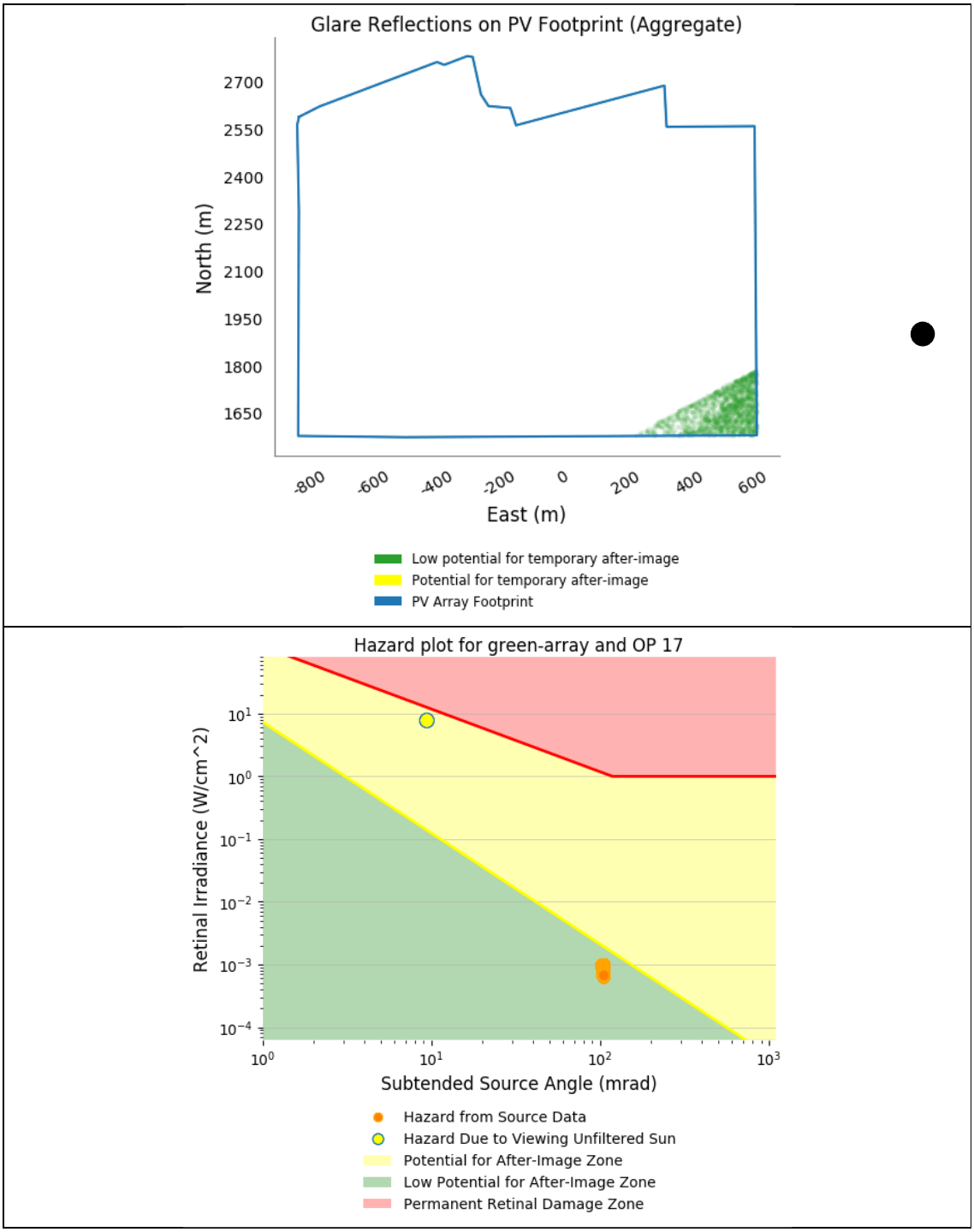
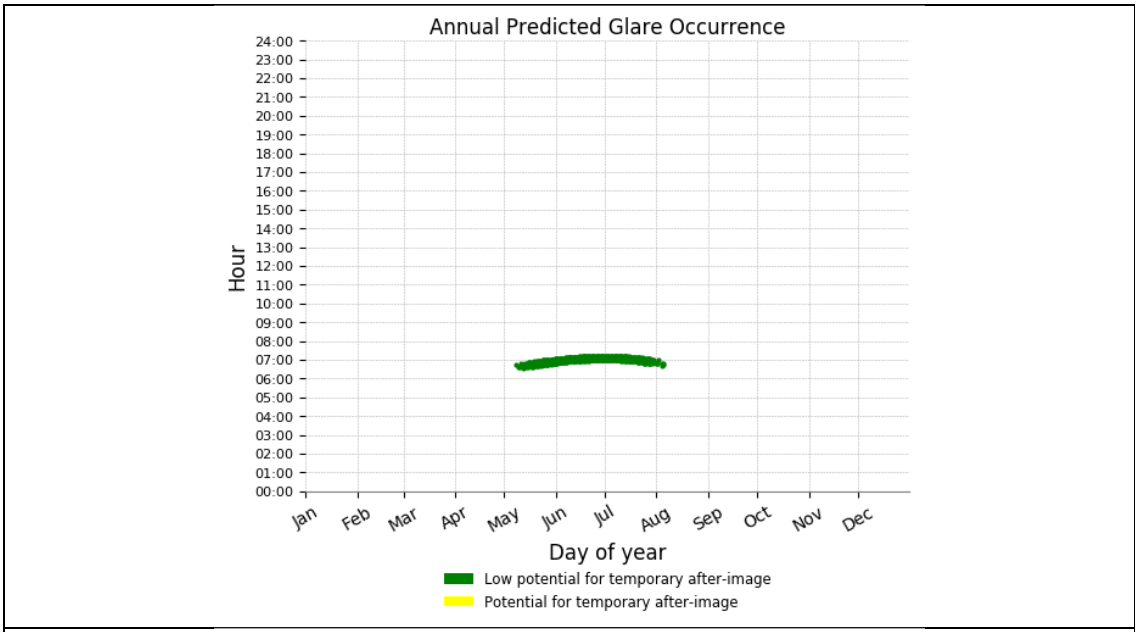


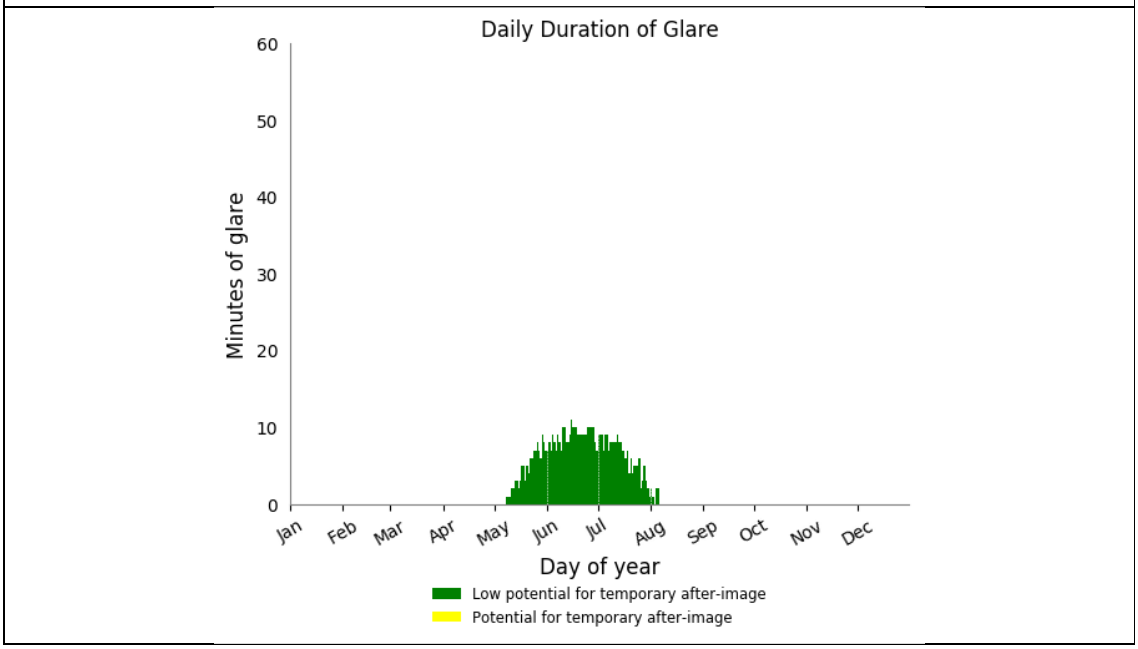
Figure 25: SGHAT Results OP35[16]

[16] OP number shown in Hazard Plot is incorrect due to calculation requirement to split into blocks

8.10 OP36 – Scenic Drive Side Road

This property may experience some very limited GREEN GLARE during the early morning hours of each day for up to 10 min. This is however not considered to be an issue and is easily screened by the existing vegetation on this property. However, in addition to the existing vegetation the Client proposes to incorporate a 50 m wide visual buffer including a 10 m wide and 4 m high landscape screen around the boundary of the Project Area adjacent to OP36. This visual buffer and landscape screen in combination with the existing vegetation surrounding many parts of the project area and adjacent residences will substantially ameliorate any GREEN GLARE.





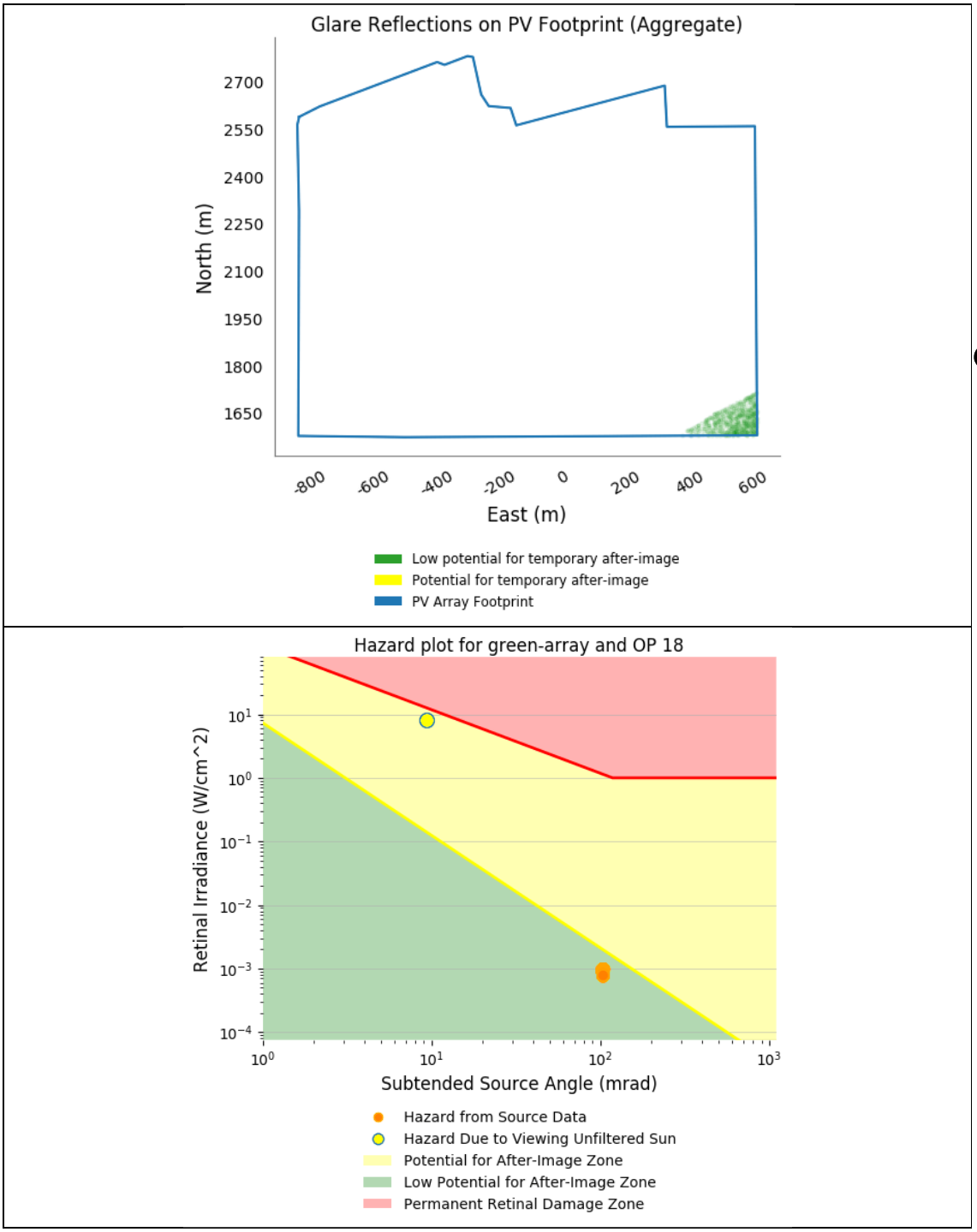
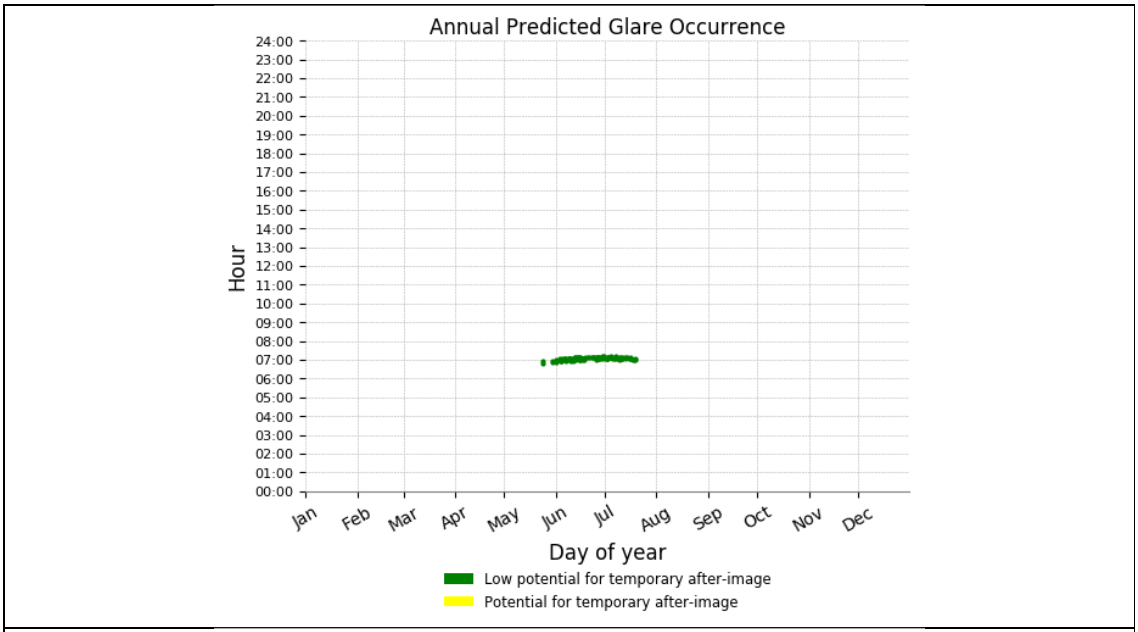


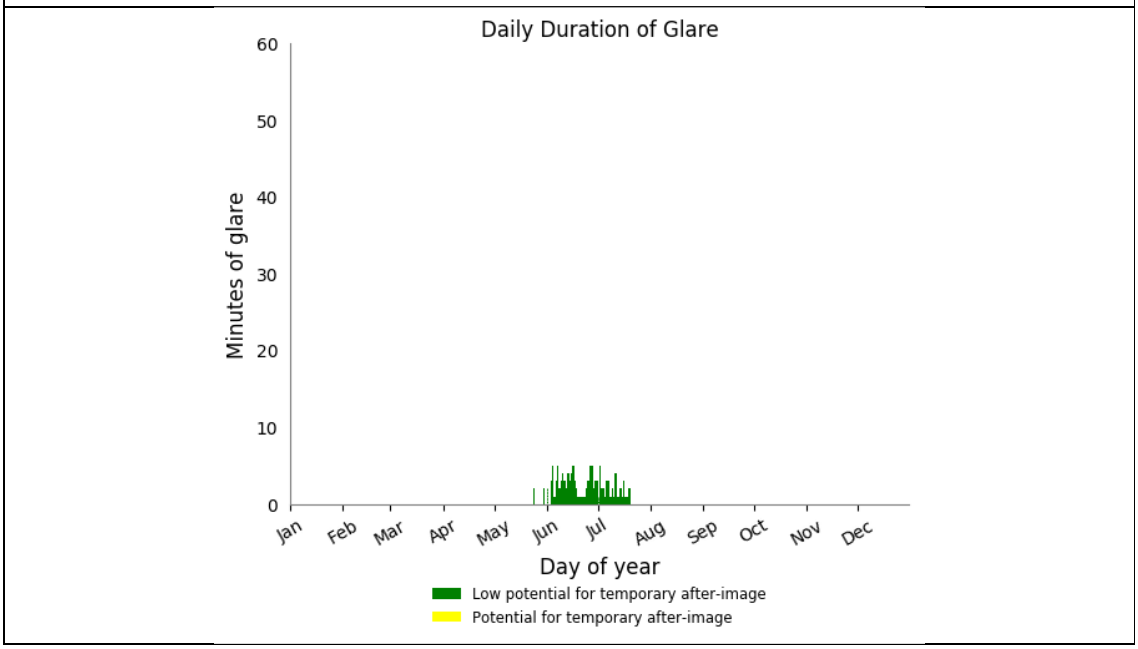
Figure 26: SGHAT Results OP36[17]

[17] OP number shown in Hazard Plot is incorrect due to calculation requirement to split into blocks

8.11 OP40 – Scenic Drive Side Road

This property may experience some very limited GREEN GLARE during the early morning hours of each day for up to 5 min. This is however not considered to be an issue and is easily screened by the existing vegetation on this property. However, in addition to the existing vegetation the Client proposes to incorporate a 50 m wide visual buffer including a 10 m wide and 4 m high landscape screen around the boundary of the Project Area adjacent to OP40. This visual buffer and landscape screen in combination with the existing vegetation surrounding many parts of the project area and adjacent residences will substantially ameliorate any GREEN GLARE.





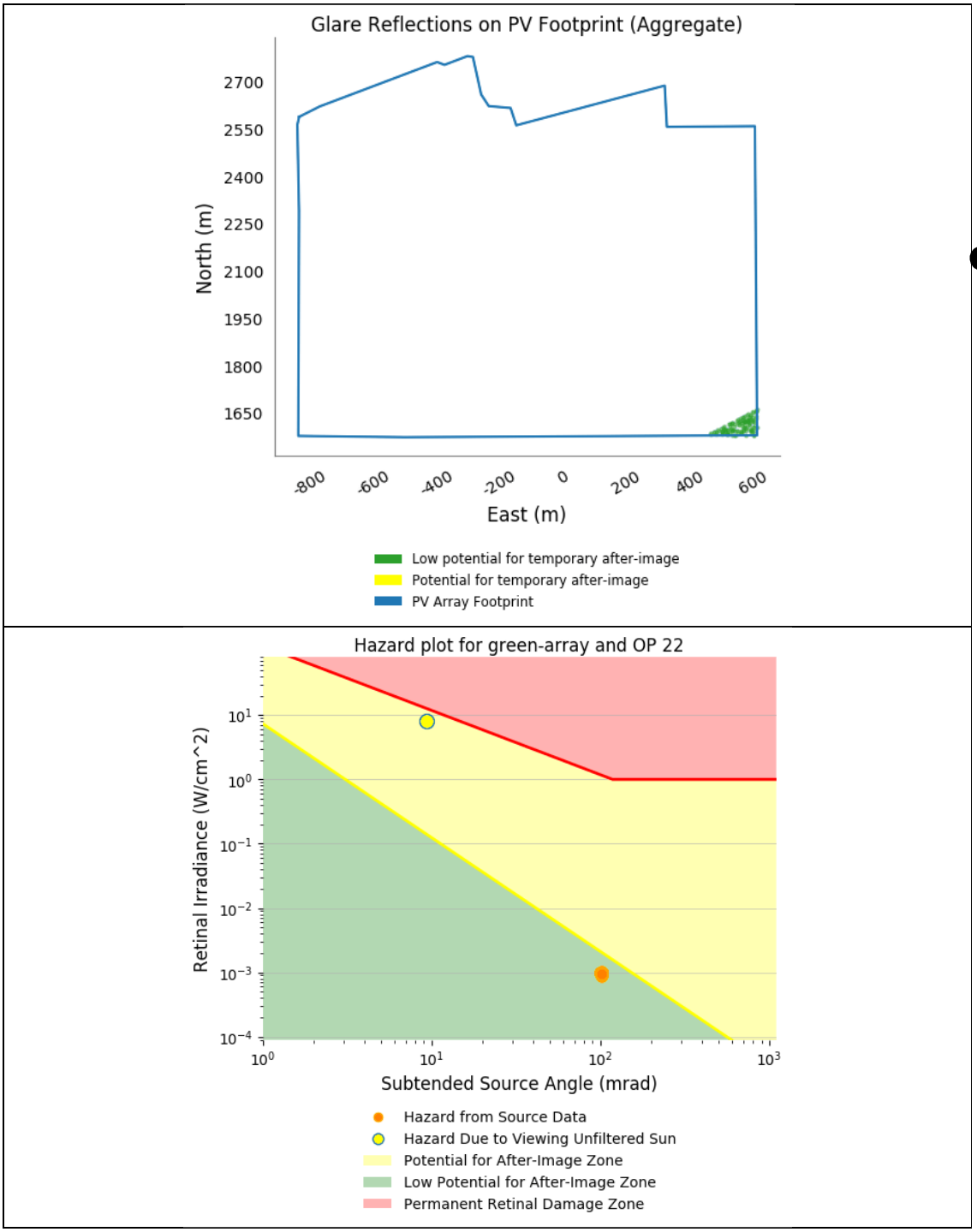
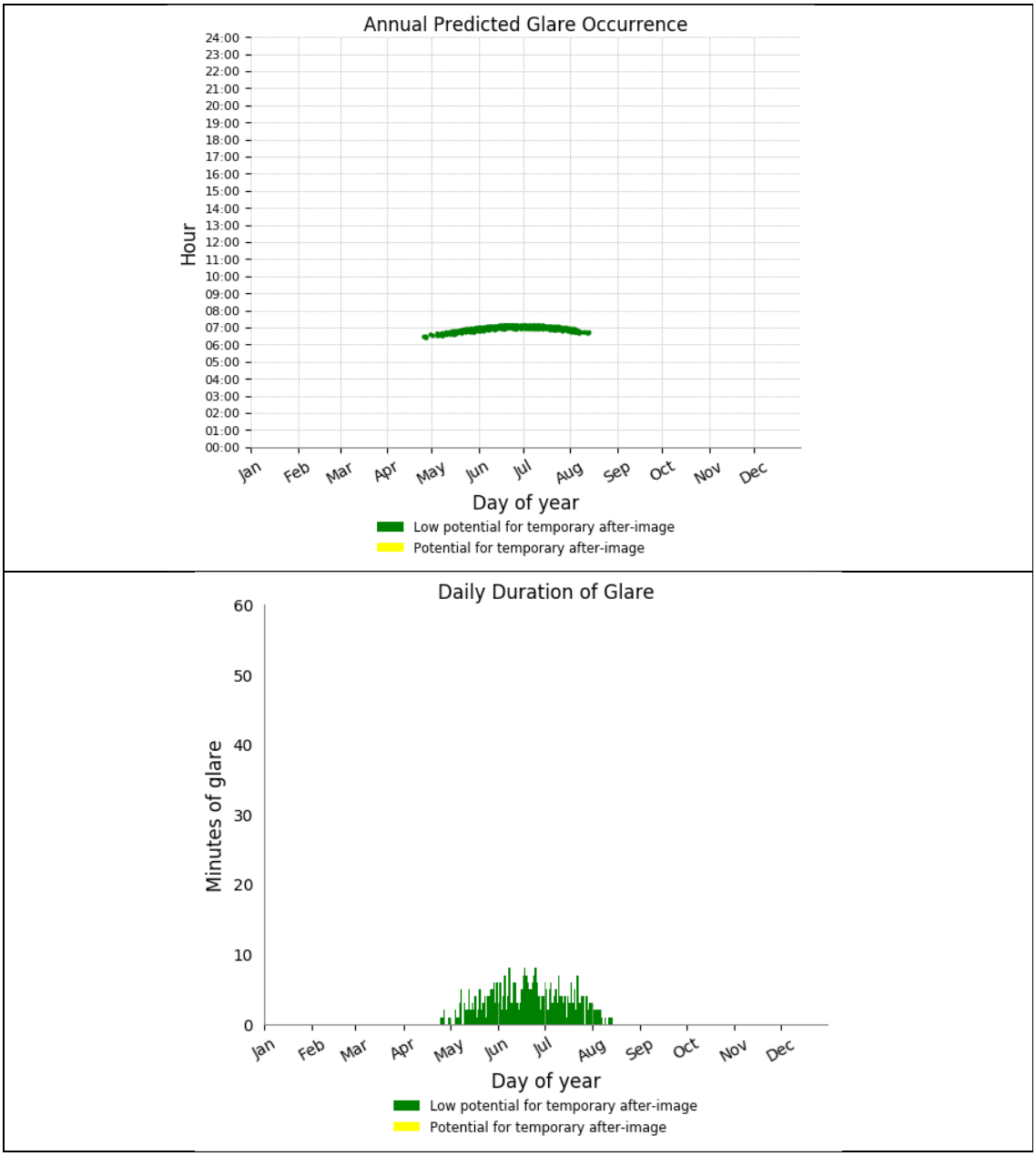


Figure 27: SGHAT Results OP40[18]

[18] OP number shown in Hazard Plot is incorrect due to calculation requirement to split into blocks

8.12 OP41 – Scenic Drive Side Road

This property may experience some very limited GREEN GLARE during the early morning hours of each day for up to 5 min. This is however not considered to be an issue and is easily screened by the existing vegetation on this property. However, in addition to the existing vegetation the Client proposes to incorporate a 50 m wide visual buffer including a 10 m wide and 4 m high landscape screen around the boundary of the Project Area adjacent to OP41. This visual buffer and landscape screen in combination with the existing vegetation surrounding many parts of the project area and adjacent residences will substantially ameliorate any GREEN GLARE.



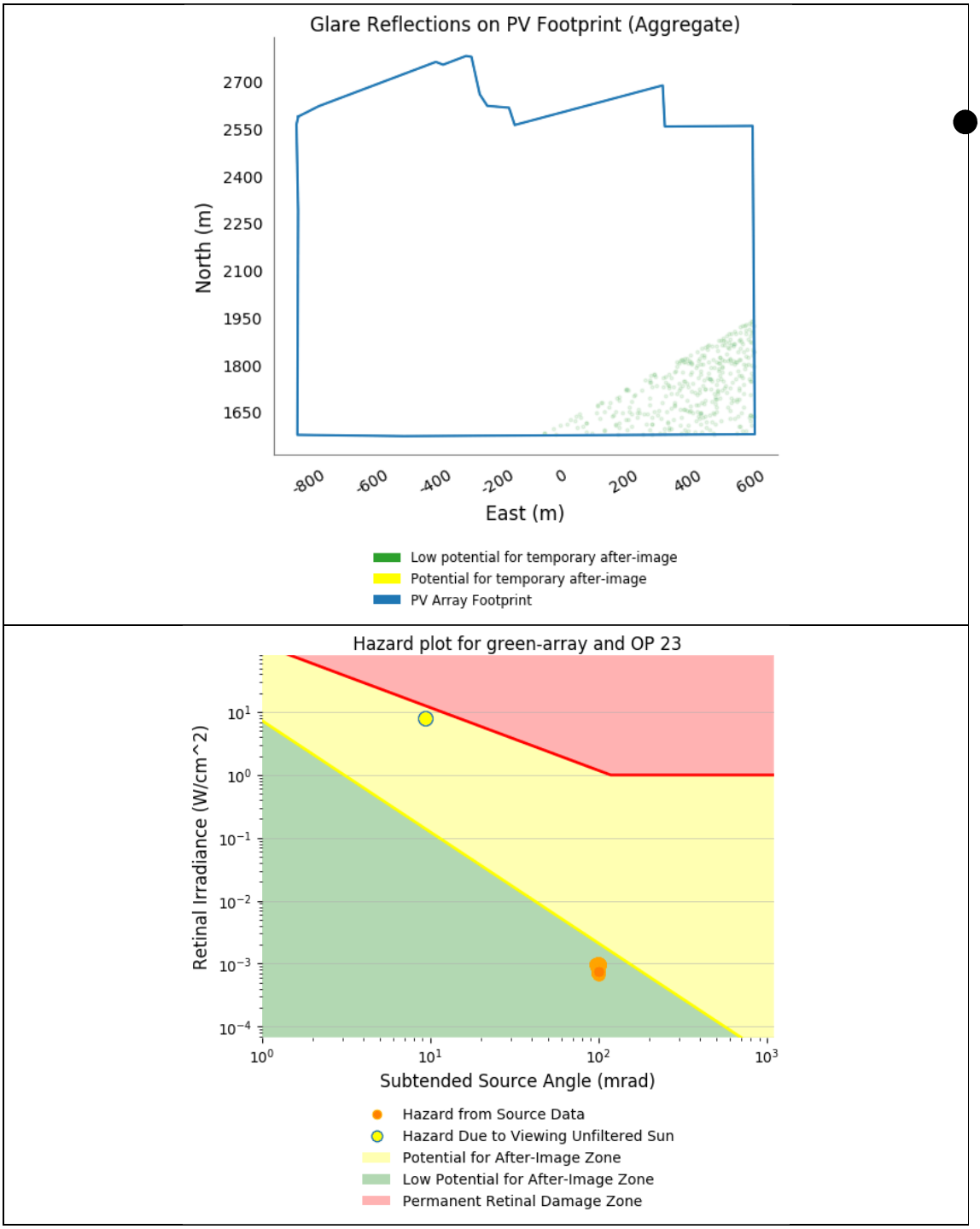
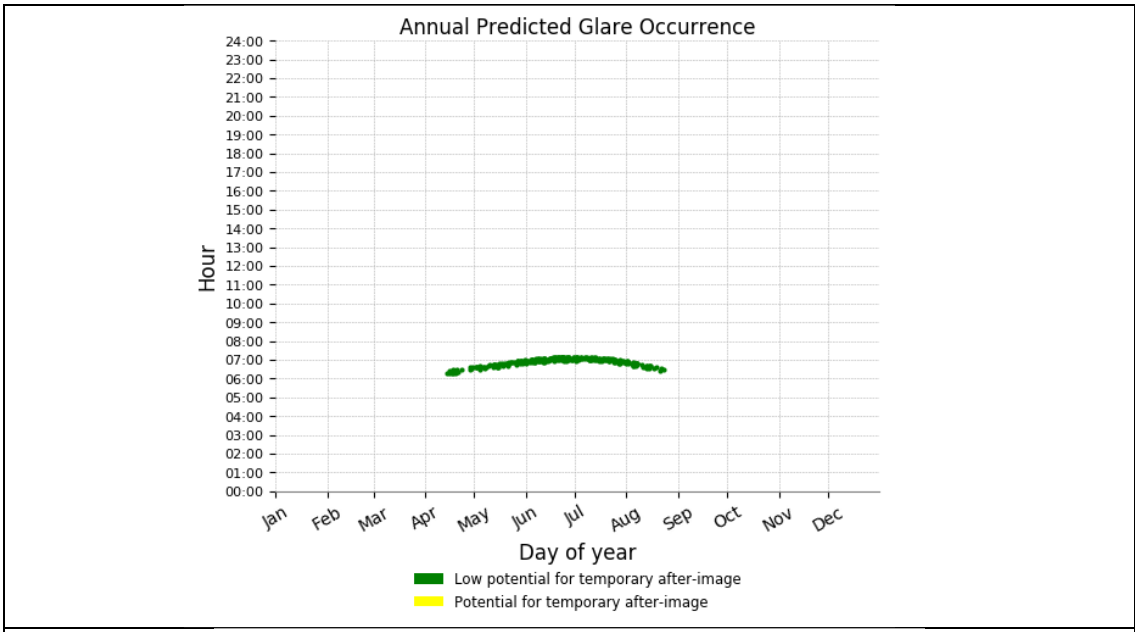


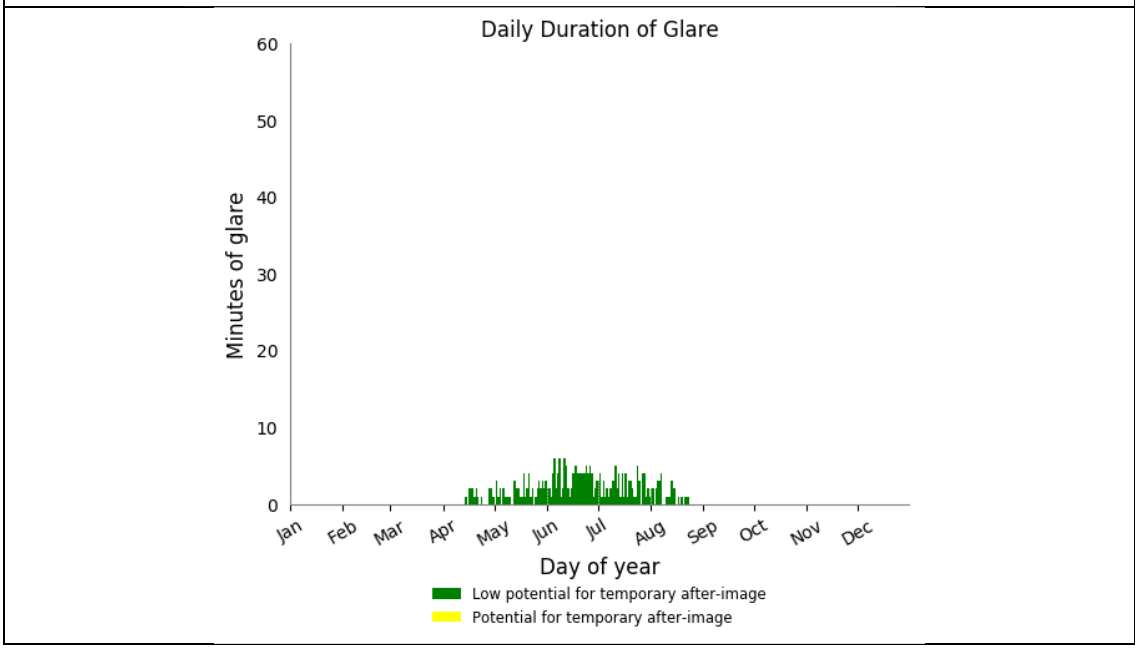
Figure 28: SGHAT Results OP41[19]

[19] OP number shown in Hazard Plot is incorrect due to calculation requirement to split into blocks

8.13 OP42 – Scenic Drive Side Road

This property may experience some very limited GREEN GLARE during the early morning hours of each day for up to 5 min. This is however not considered to be an issue and is easily screened by the existing vegetation on this property. However, in addition to the existing vegetation the Client proposes to incorporate a 50 m wide visual buffer including a 10 m wide and 4 m high landscape screen around the boundary of the Project Area adjacent to OP42. This visual buffer and landscape screen in combination with the existing vegetation surrounding many parts of the project area and adjacent residences will substantially ameliorate any GREEN GLARE.





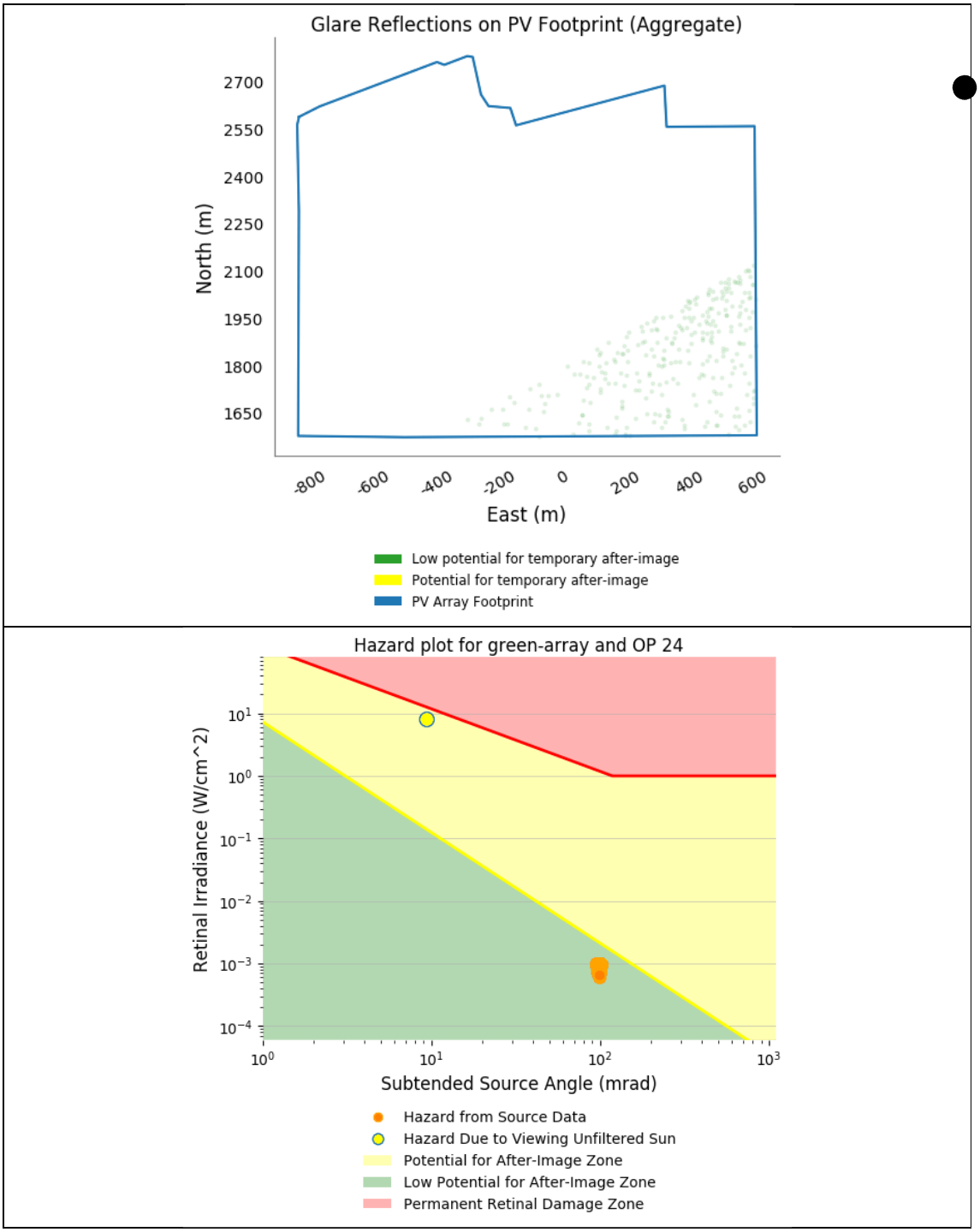
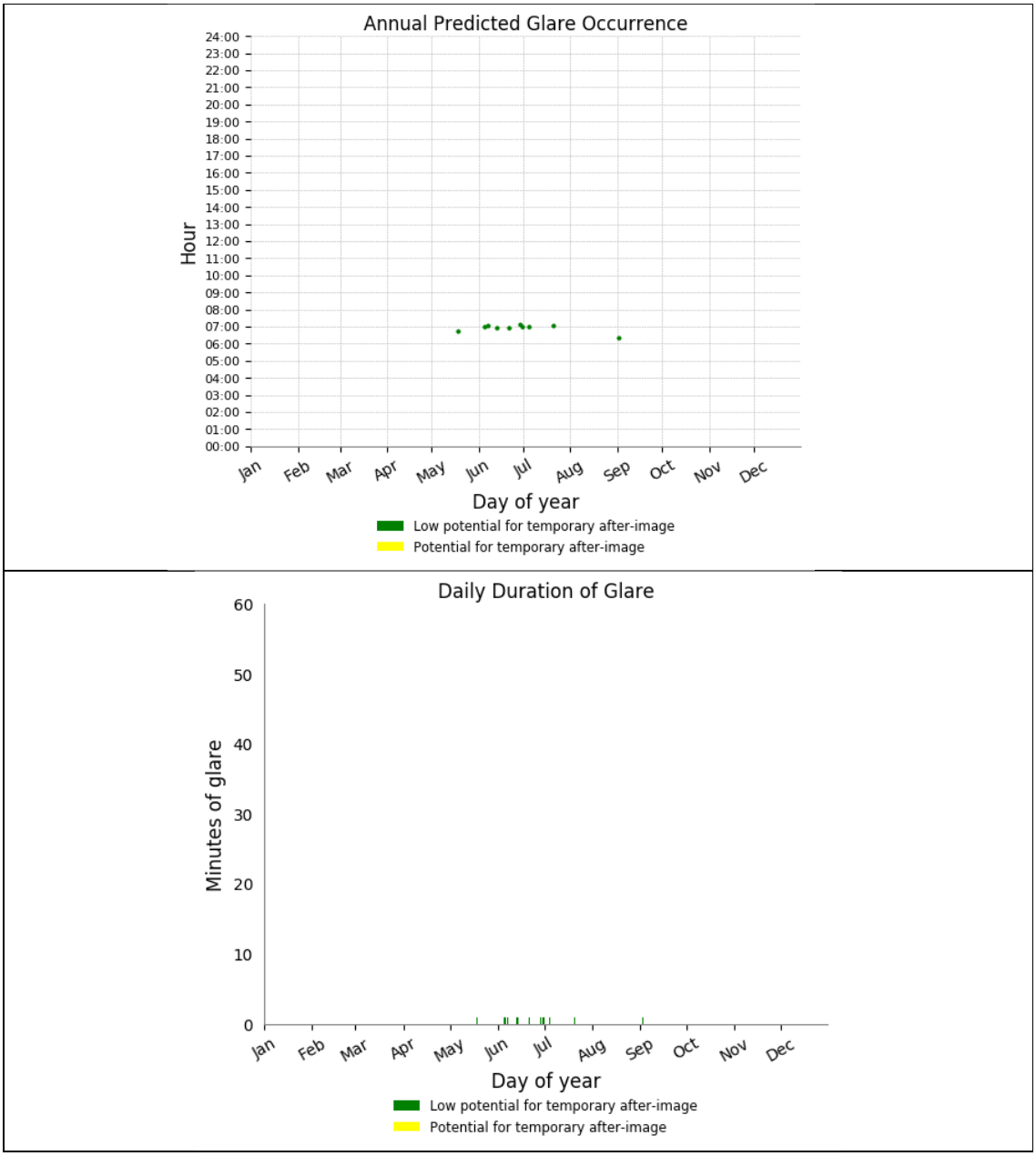


Figure 29: SGHAT Results OP42[20]

[20] OP number shown in Hazard Plot is incorrect due to calculation requirement to split into blocks

8.14 OP43 – Scenic Drive Side Road

This property may experience some very limited GREEN GLARE during the early morning hours of each day for up to 2 min. This is however not considered to be an issue and is easily screened by the existing vegetation on this property.



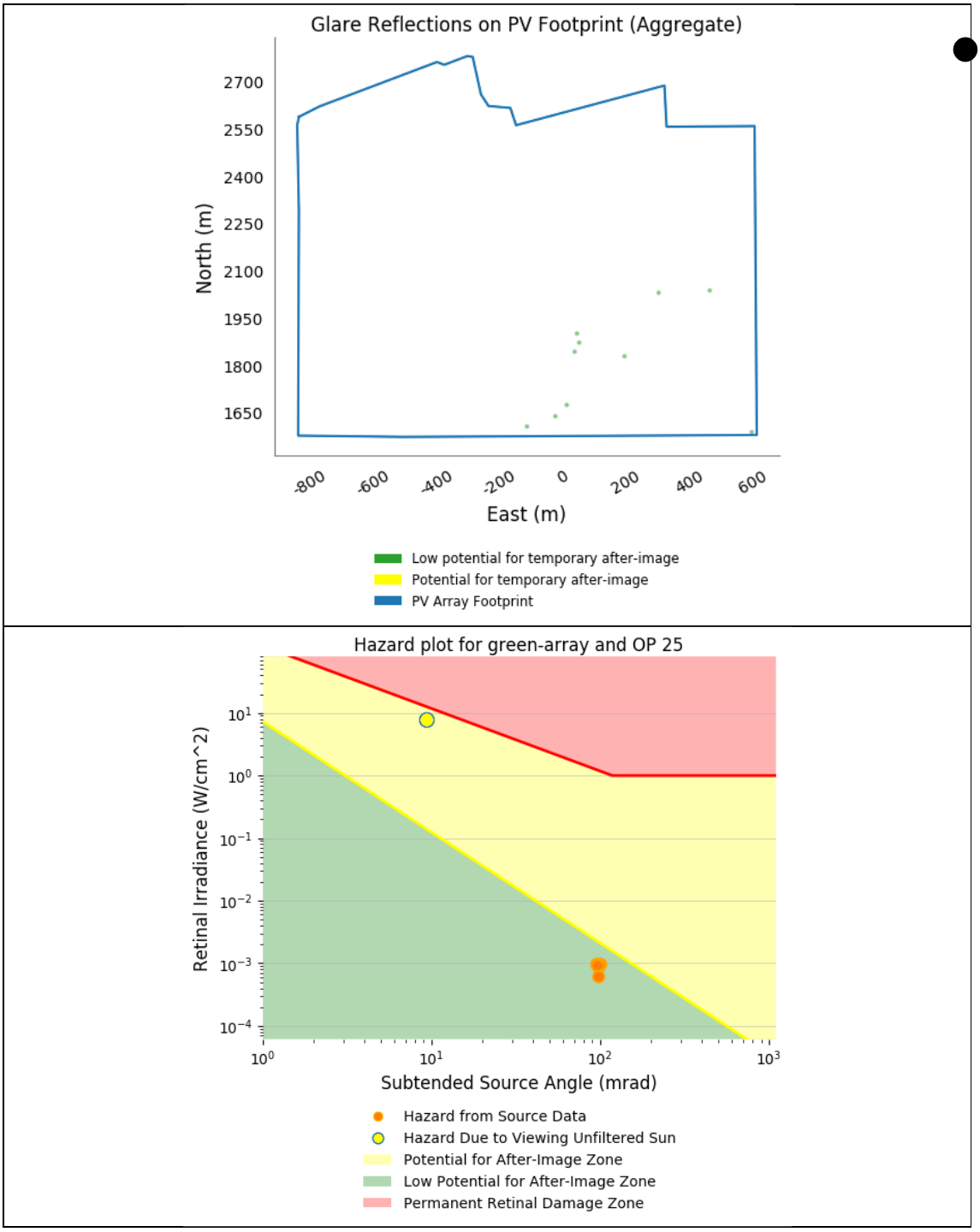
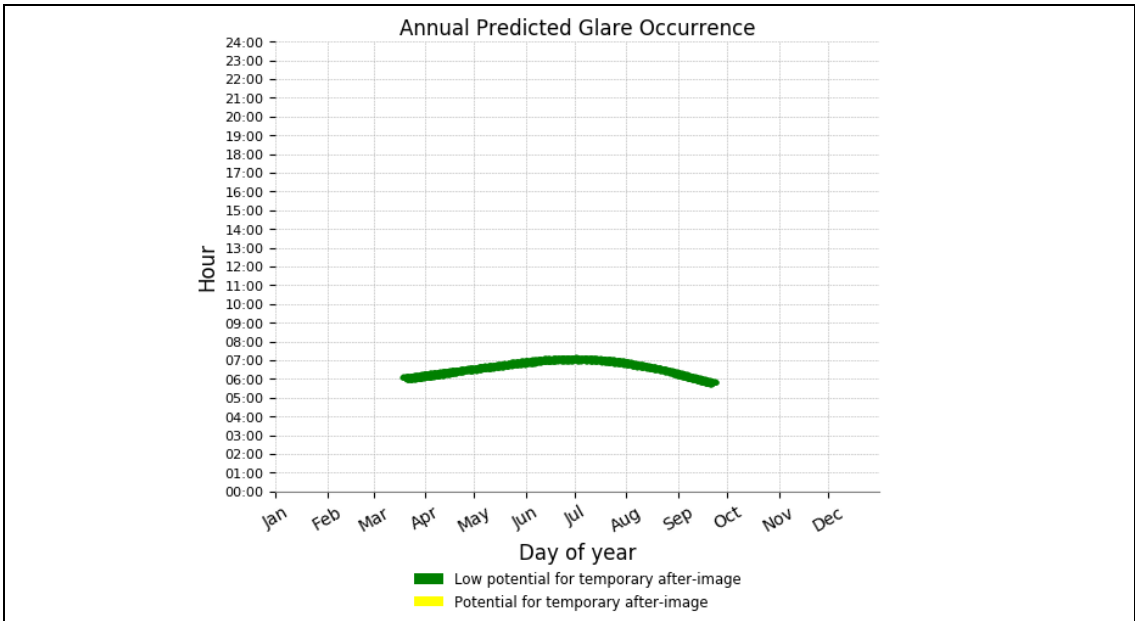


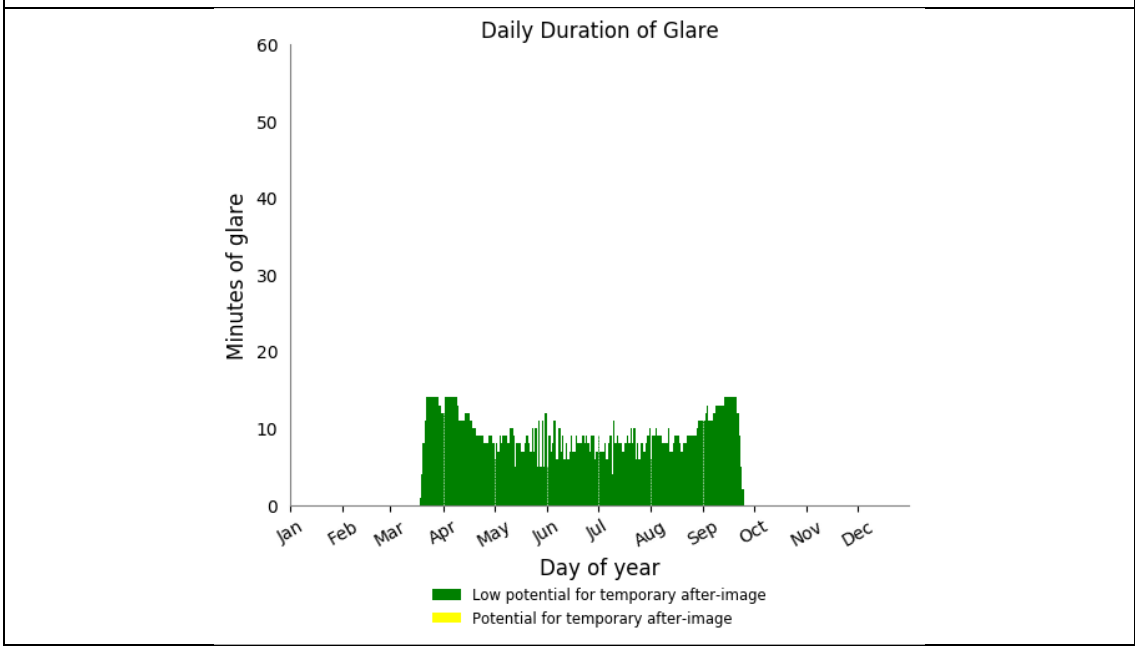
Figure 30: SGHAT Results OP43[21]

[21] OP number shown in Hazard Plot is incorrect due to calculation requirement to split into blocks

8.15 OP44 – Gulf View Road

This property may experience some limited GREEN GLARE during the early morning hours of each day for up to 15 min. This is however not considered to be an issue and is easily screened by the existing vegetation on this property. However, in addition to the existing vegetation the Client proposes to incorporate a 50 m wide visual buffer including a 10 m wide and 4 m high landscape screen around the boundary of the Project Area adjacent to OP44. This visual buffer and landscape screen in combination with the existing vegetation surrounding many parts of the project area and adjacent residences will substantially ameliorate any GREEN GLARE.





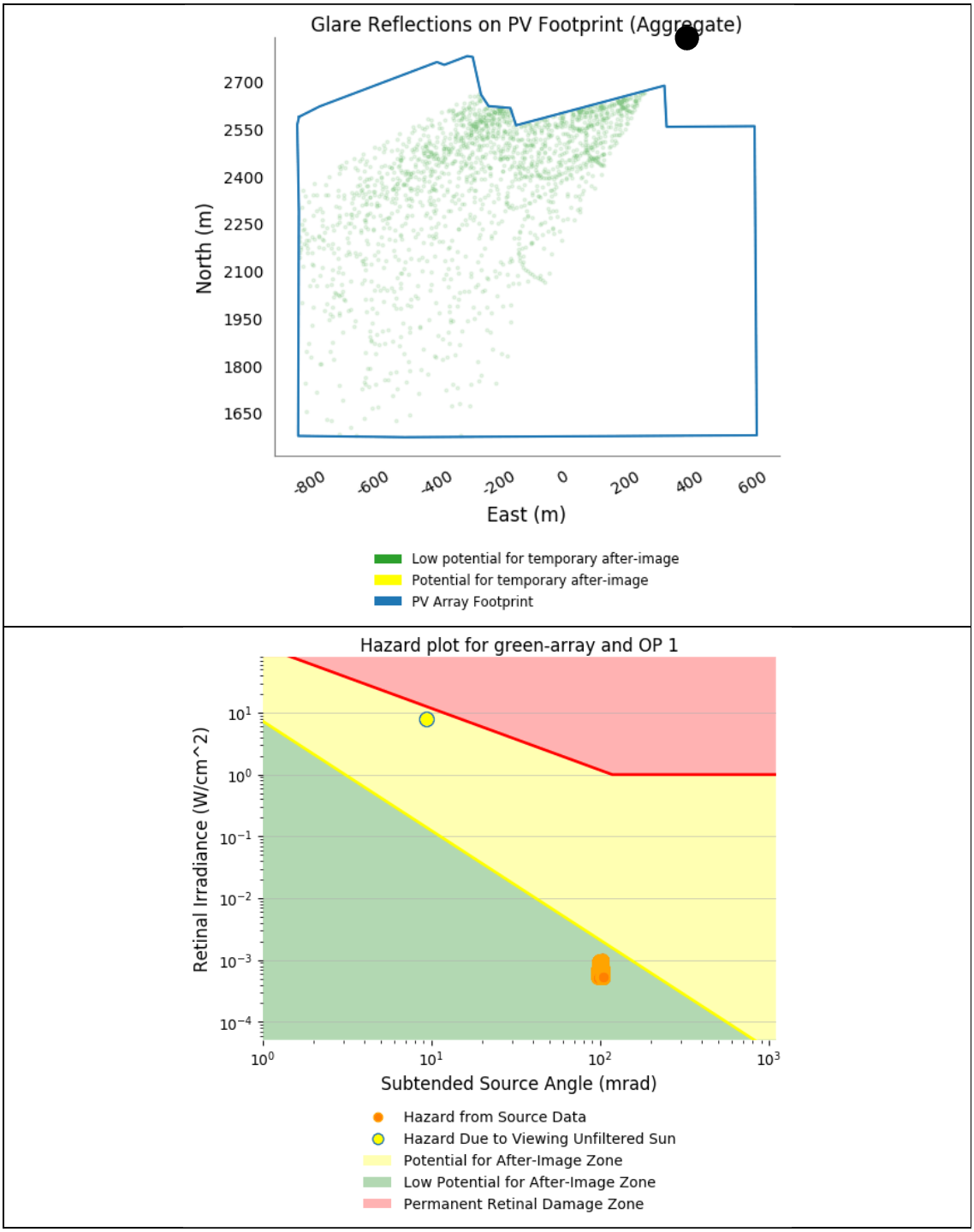
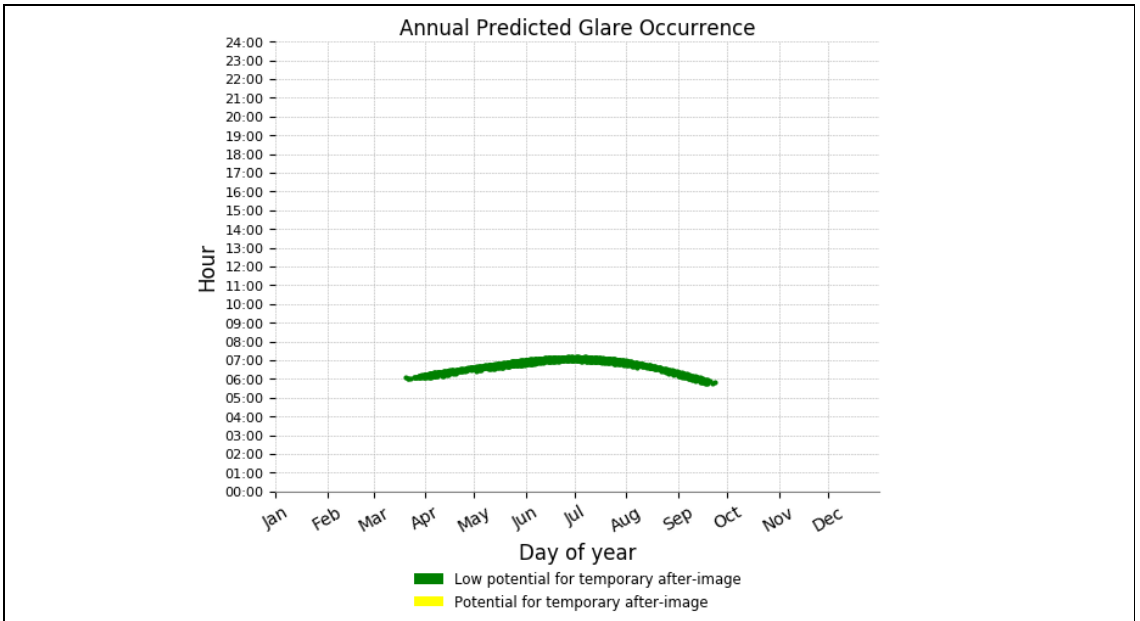


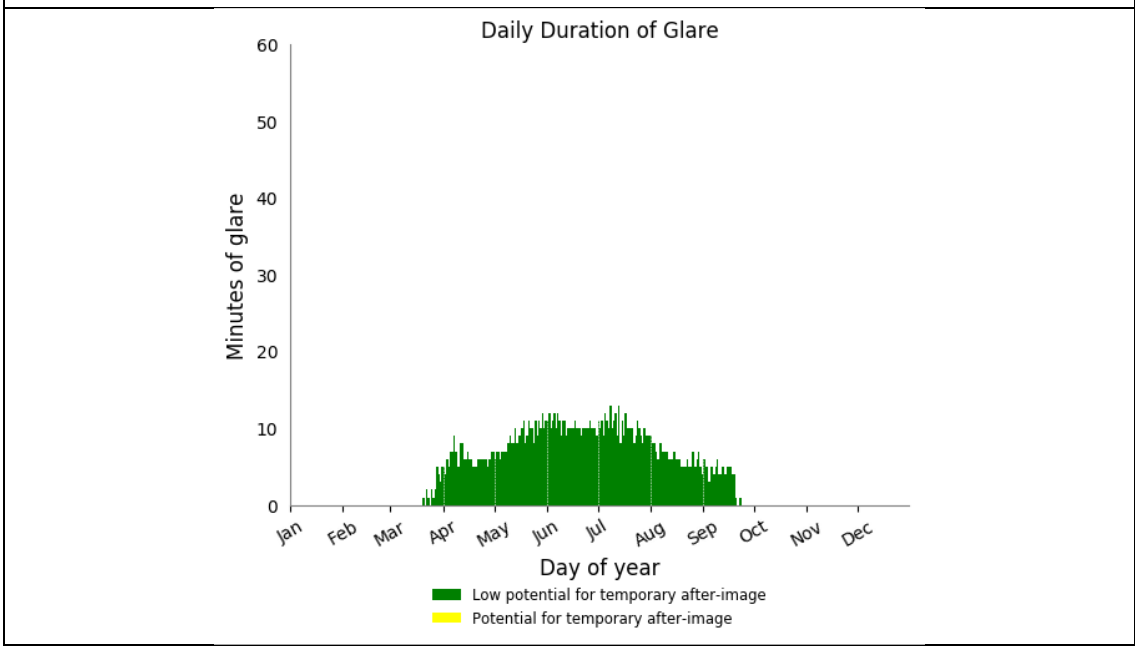
Figure 31: SGHAT Results OP44[22]

[22] OP number shown in Hazard Plot is incorrect due to calculation requirement to split into blocks

8.16 OP49 – Off Gulf View Road

This property may experience some limited GREEN GLARE during the early morning hours of each day for up to 12 min. This is however not considered to be an issue and is easily screened by the existing vegetation on this property. However, in addition to the existing vegetation the Client proposes to incorporate a 50 m wide visual buffer including a 10 m wide and 4 m high landscape screen around the boundary of the Project Area adjacent to OP49. This visual buffer and landscape screen in combination with the existing vegetation surrounding many parts of the project area and adjacent residences will substantially ameliorate any GREEN GLARE.





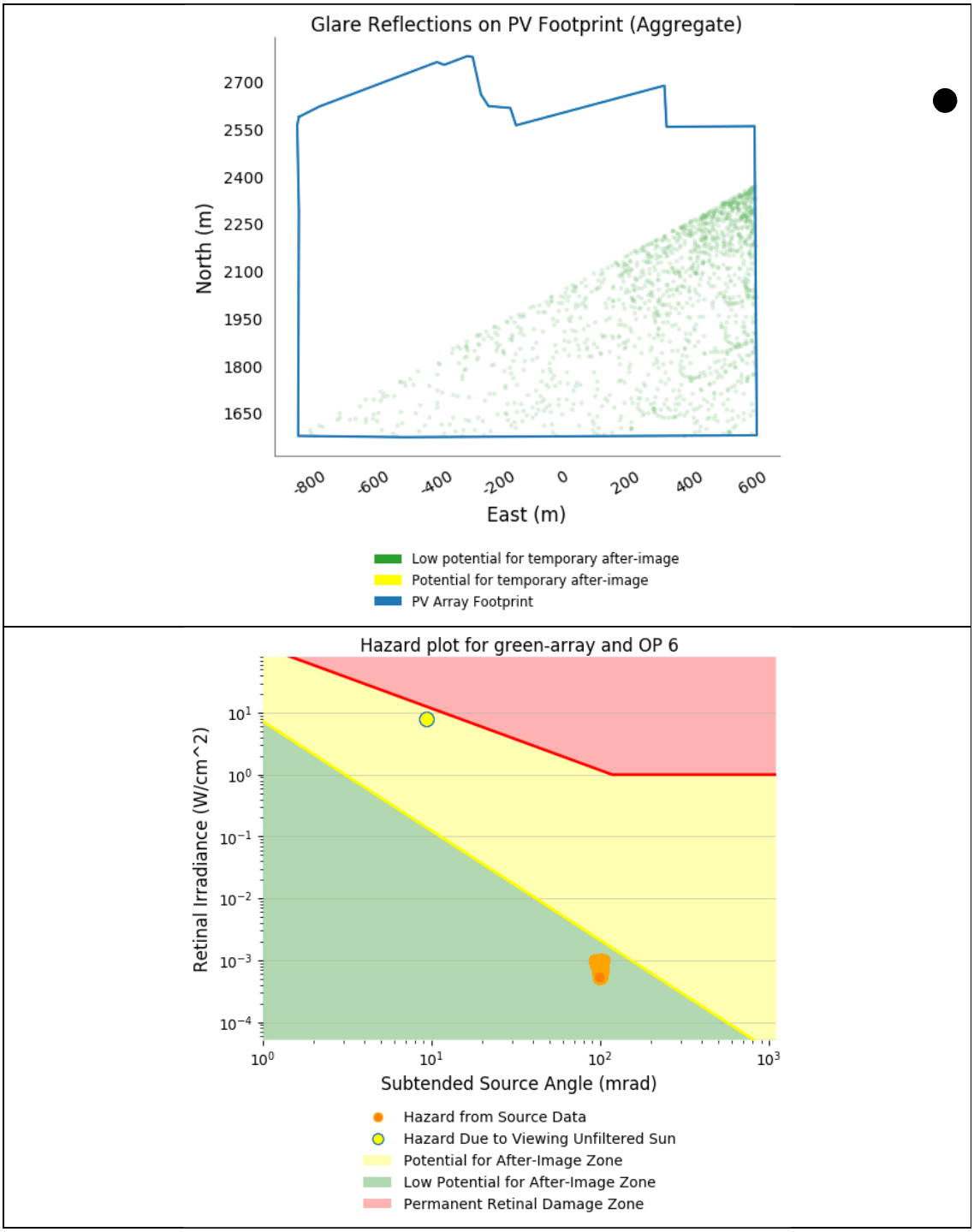
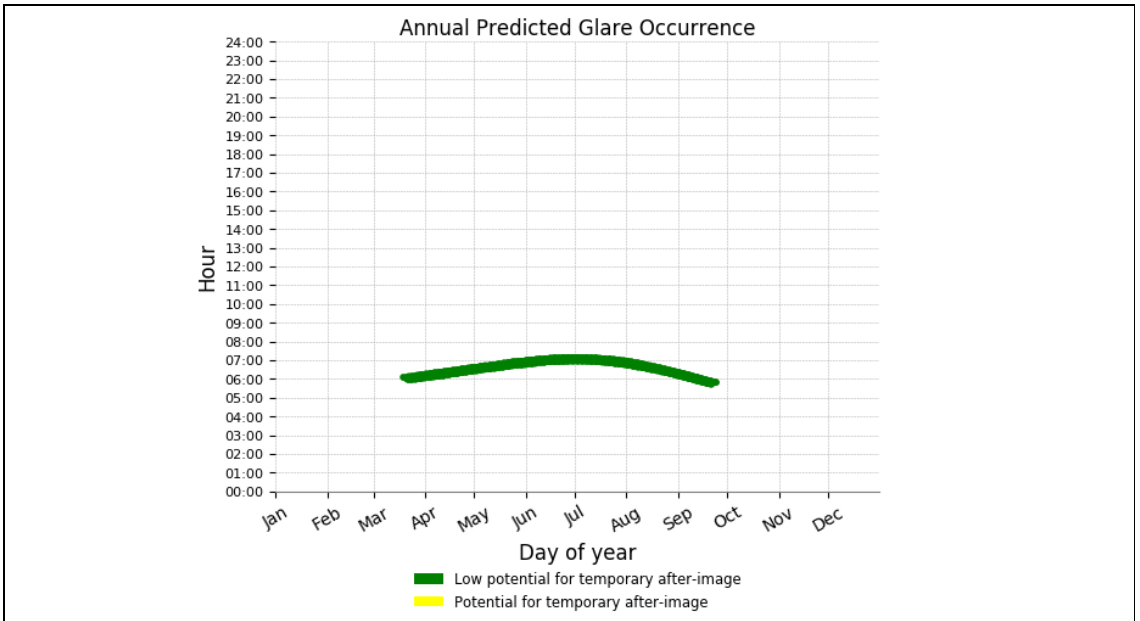


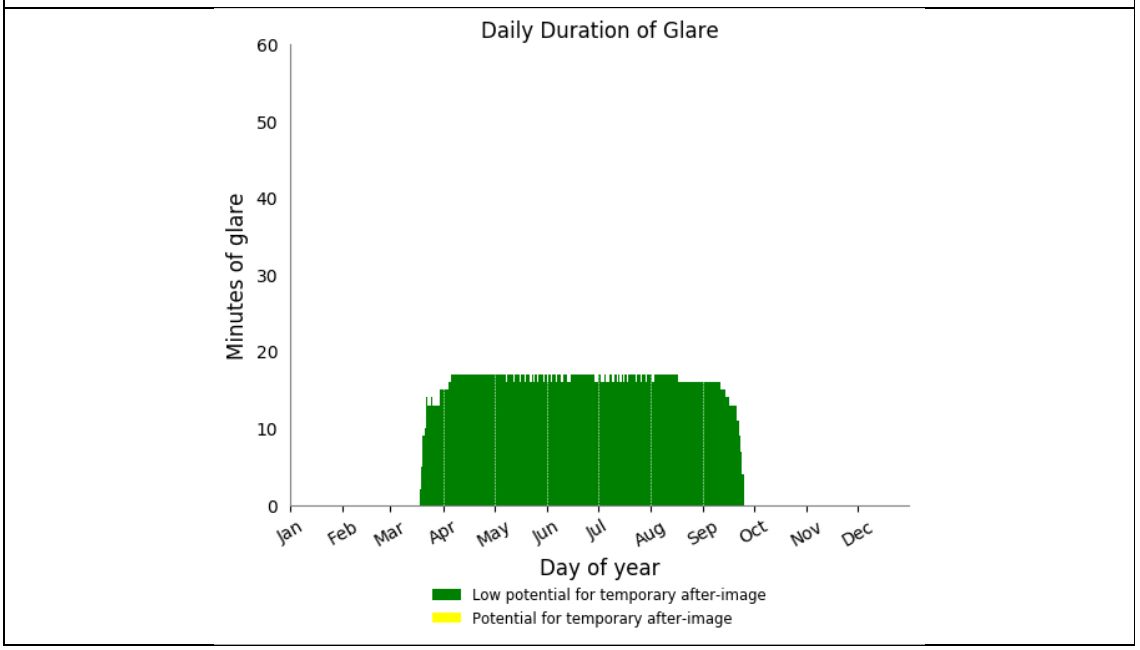
Figure 32: SGHAT Results OP49[23]

[23] OP number shown in Hazard Plot is incorrect due to calculation requirement to split into blocks

8.17 OP50 – Off Gulf View Road

This property may experience some limited GREEN GLARE during the early morning hours of each day for up to 18 min. This is however not considered to be an issue and is easily screened by the existing vegetation on this property. However, in addition to the existing vegetation the Client proposes to incorporate a 50 m wide visual buffer including a 10 m wide and 4 m high landscape screen around the boundary of the Project Area adjacent to OP50. This visual buffer and landscape screen in combination with the existing vegetation surrounding many parts of the project area and adjacent residences will substantially ameliorate any GREEN GLARE.





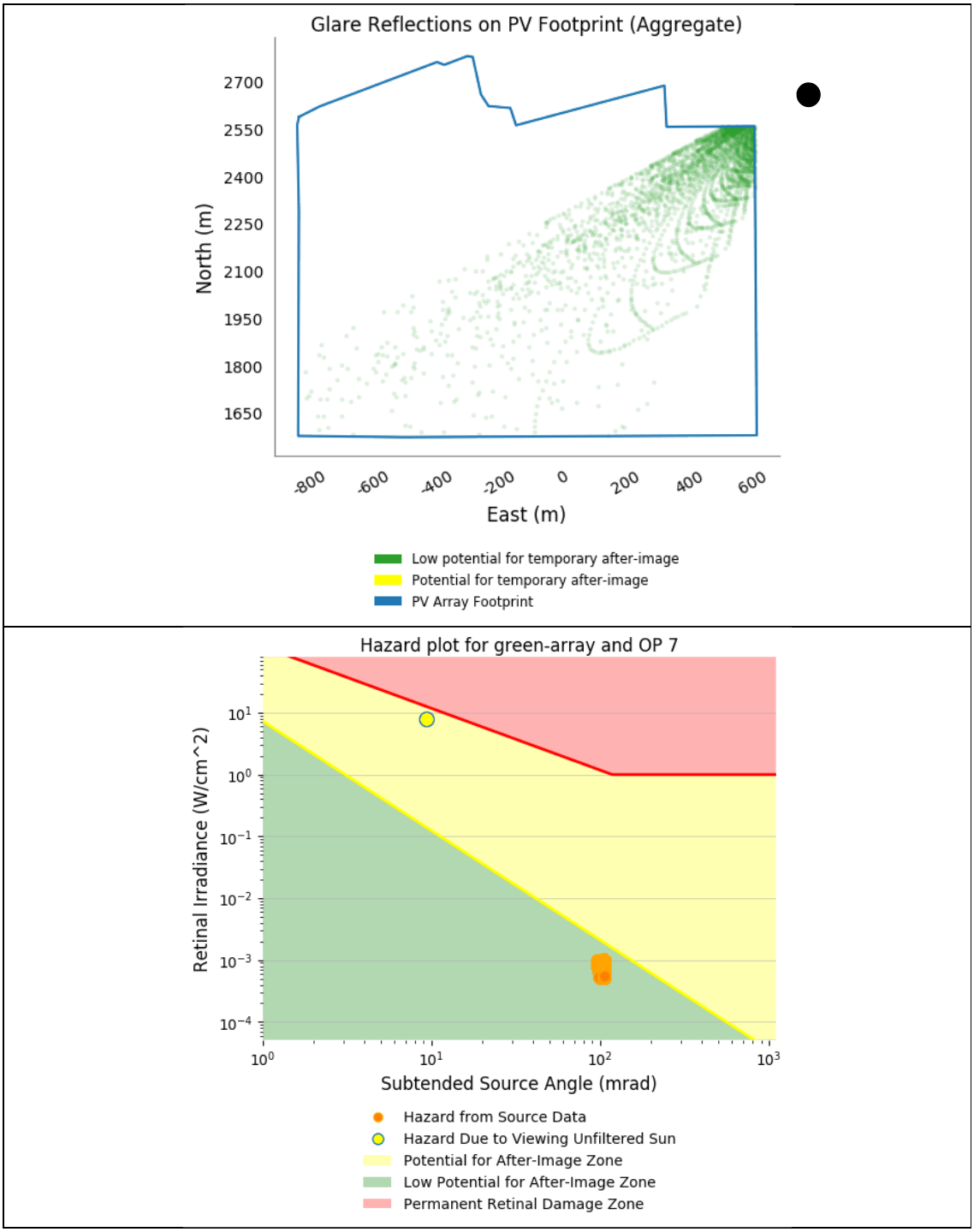
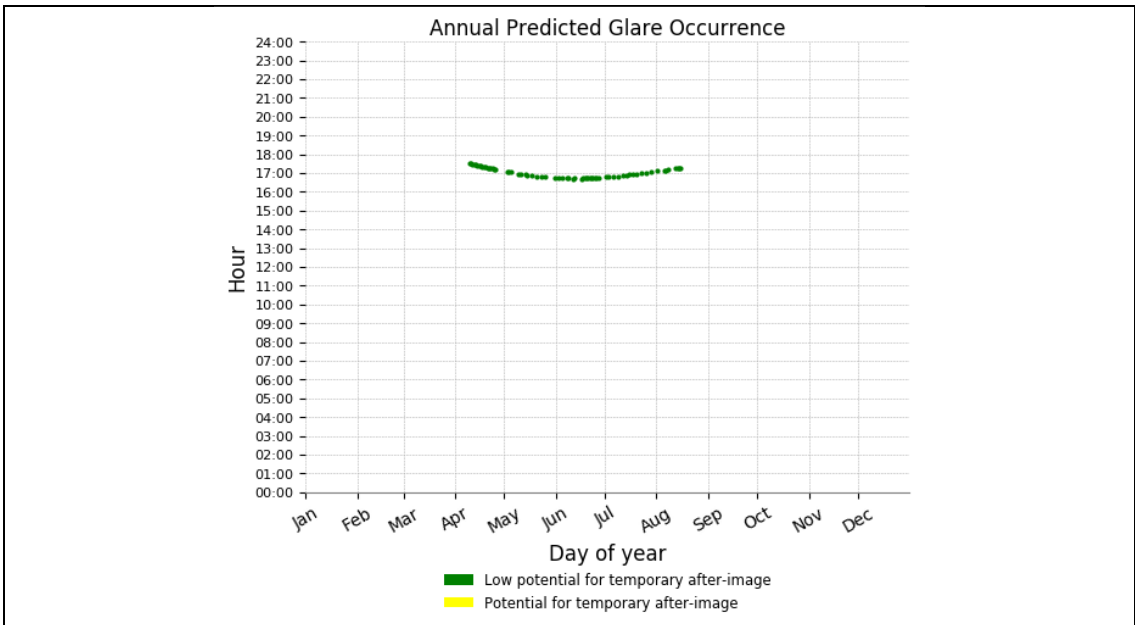


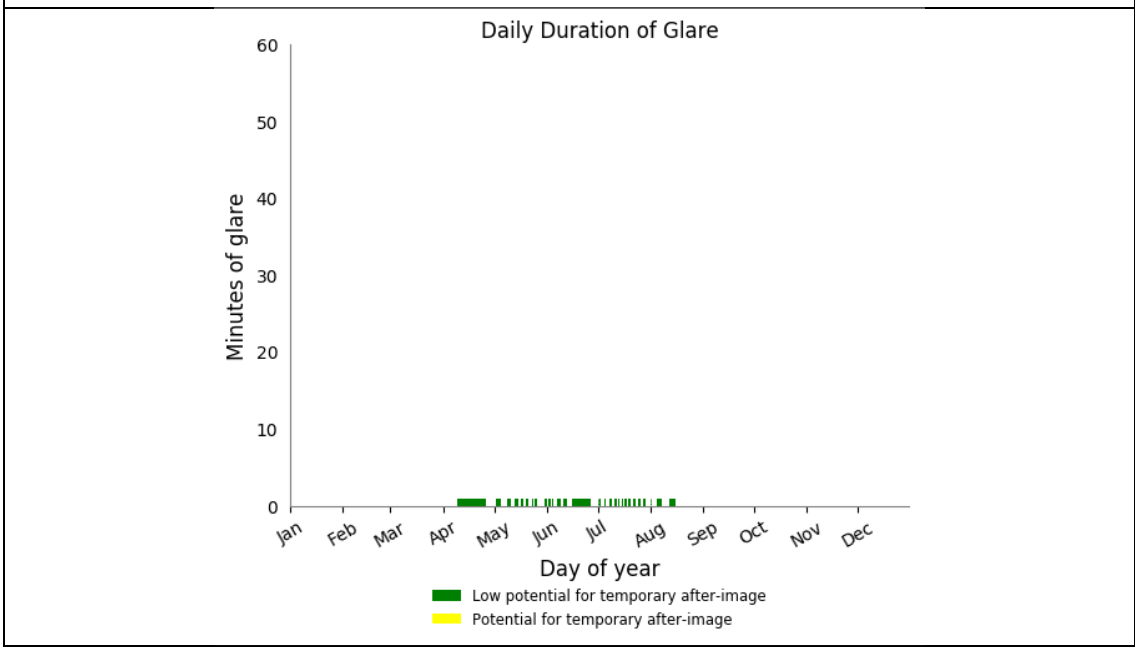
Figure 33: SGHAT Results OP50[24]

[24] OP number shown in Hazard Plot is incorrect due to calculation requirement to split into blocks

8.18 Warnertown Road

On Warnertown Road only very short duration of some GREEN GLARE during the late afternoon hours can be expected. As sun is very low during that period and therefore already represents some glare issues for drivers heading west and through their rear-view mirror driving east the additional glare from the PVS solar panels is considered negligible. Intermittent screening by trees or scrubs alongside the road further reduces any potential glare issues. However, in addition to the existing vegetation within the road corridor the Client proposes to incorporate a 10 m wide and 4 m high landscape screen around the boundary of the Project Area adjacent to Warnertown Road. This visual buffer and landscape screen in combination with the existing vegetation will substantially ameliorate any GREEN GLARE.





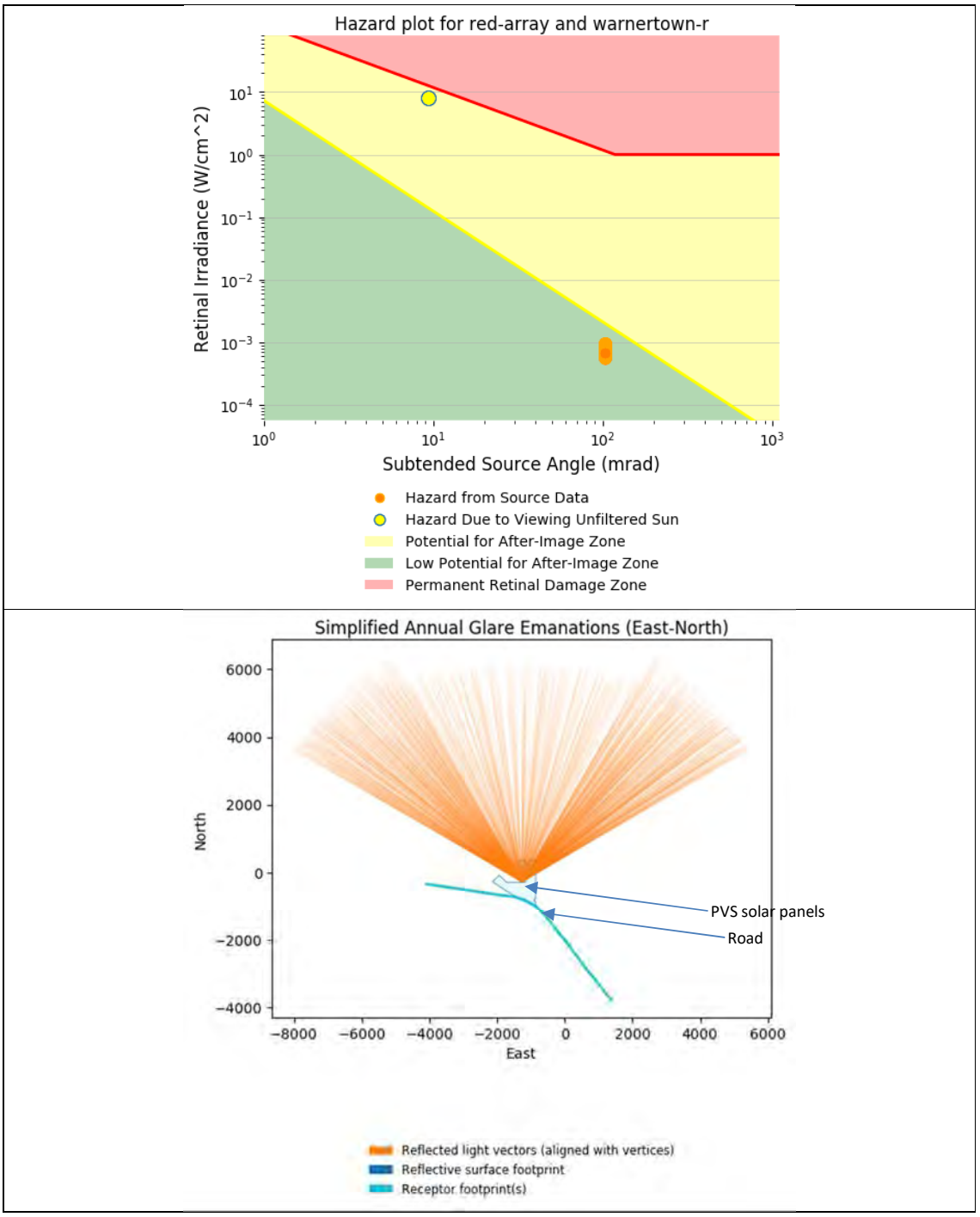
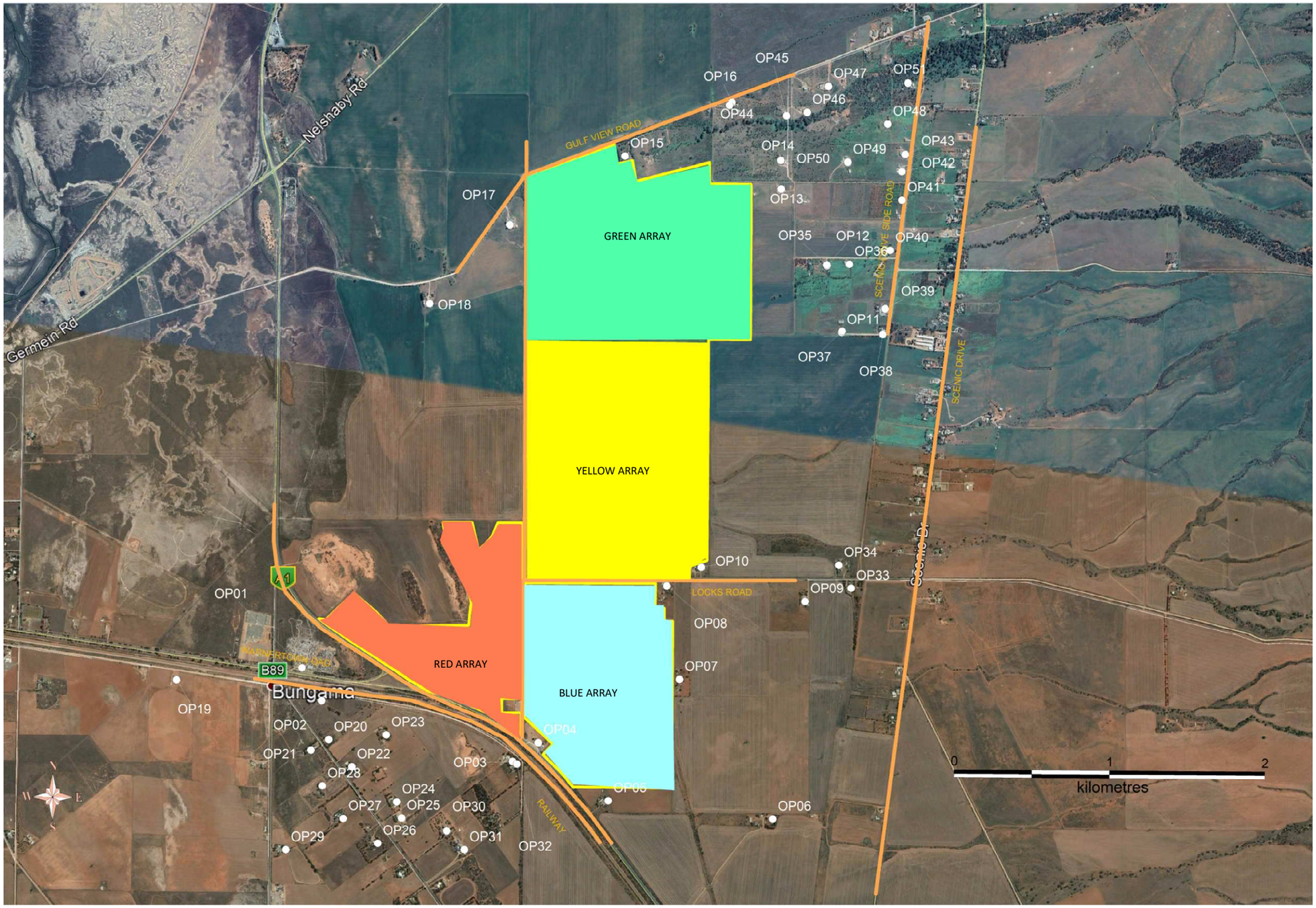


Figure 34: SGHAT Results Warnertown Road



Point

Subarrays Legend

Region

Region

Region

Region

Roads Legend

Line

BV

CONSULTING

BV CONSULTING

NORA-PLATIEL-STR. 4, 34253 LOHFELDEN
GERMANY

PV Plant Overview

BUNGAMA SOLAR

SIZE	Author	DWG NO	REV
A3	B. Voll	BPV-LAYOUT-BV20181111	0

SCALE	n/a	25-11-2018	SHEET	1 OF 1

APPENDIX 13

Noise Assessment

BUNGAMA SOLAR

NOISE ASSESSMENT

Prepared for Bungama Solar

Prepared by Muller Acoustic Consulting

EPS ENERGY

Reference No. 11297

November 18

BUNGAMA SOLAR

www.bungamasolar.com.au

Noise Assessment

Bungama Solar Project
Napperby, South Australia
November 2018

Prepared for: Bungama Solar 1 Pty Ltd
November 2018
MAC180707RP1

Muller Acoustic Consulting

Document Information

Noise Assessment

Bungama Solar Project

Napperby, South Australia

Prepared for: Bungama Solar 1 Pty Ltd
PO Box 195
Charlestown NSW 2290

Prepared by: Muller Acoustic Consulting Pty Ltd
PO Box 262, Newcastle NSW 2300
ABN: 36 602 225 132
P: +61 2 4920 1833
www.mulleracoustic.com

Document ID	Status	Date	Prepared By	Signed	Reviewed By	Signed
MAC180707RP1	Final	26 November 2018	Rod Linnett		Oliver Muller	

DISCLAIMER

All documents produced by Muller Acoustic Consulting Pty Ltd (MAC) are prepared for a particular client's requirements and are based on a specific scope, circumstances and limitations derived between MAC and the client.

COPYRIGHT: Use or copying of this document in whole or in part (including photographs) without the written permission of Muller Acoustic Consulting Pty Ltd's client constitutes an infringement of copyright. Notwithstanding anything to the contrary Muller Acoustic Consulting Pty Ltd has prepared this document for the sole us of the client including their respective heirs, successors and assigns and vests copyright of all material produced by Muller Acoustic Consulting Pty Ltd's (but excluding pre-existing material and material in which copyright is held by a third party) in the client including their respective heirs, successors and assigns.

LIMITATION: Muller Acoustic Consulting Pty Ltd's accepts no liability or responsibility whatsoever for or in respect of any use of or reliance upon this report by any third party.

CONTENTS

1 Introduction

Muller Acoustic Consulting Pty Ltd (MAC) has been commissioned by EPS Energy Pty Ltd on behalf of Bungama Solar 1 Pty Ltd to prepare a Noise Assessment (NA) for the proposed Bungama Solar Project (the 'Project'). The Project is an integrated but separately operated grid connected Photo Voltaic Energy Generation System (PVS) of approximately 280MW (AC) generation capacity and a 140MW capacity Battery Energy Storage System (BESS) with 560MWh of storage that will feed into the National Electricity Market via ElectraNet's Bungama Substation. This report presents the methodology and findings of the assessment for the construction and operation of the project.

1.1 Purpose and Objectives

A NA is required as part of the Planning Report for the project. The purpose of the NA is to quantify potential environmental noise levels associated with the construction and operation of the project. Where impacts are identified, the assessment includes recommendations for potential noise mitigation and management measures.

1.2 Scope of the Assessment

The NA includes the following key tasks:

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

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

This page has been intentionally left blank

2 Project Description

2.1 Background

The Project land comprises the Project area on which the PVS, BESS Project's substation, Operations and Maintenance buildings and associated infrastructure will be built and operated together with the land required to connect the Project's elements to ElectraNet's Bungama Substation.

The Project area is approximately 530ha located in the suburbs of Bungama, Napperby and Warnertown in South Australia, and is situated approximately 6km east of Port Pirie, and 218km north of the State's capital, Adelaide. The Project is within the Local Government Area (LGA) of Port Pirie Regional Council.

Land within the immediate surrounding area of the Project area is used for agriculture, rural residential living and public services including electricity infrastructure.

2.2 Description of Proposed Construction Works

The Project includes the installation of groups of Photo Voltaic (PV) panels arranged in rows mounted on single axis trackers with a maximum height most likely not exceeding 4m above the natural ground level. The PV panels will be installed on a mounting structure comprising steel posts driven approximately 2.5m below ground using a small pile driver. Additional support structures would be attached to the piles, which would then support the PV panels.

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

2.3 Description of Proposed Operation

The PVS element of the Project will have a maximum output capacity of up to approximately 280MW (AC). The BESS element of the Project includes up to 140MW capacity battery with up to 560MWh of storage. The Project may also include one or more synchronous condensers to assist in providing inertia for managing power system strength. The PVS element, the BESS element and associated infrastructure, collectively from herein are referred to as "the Project".

The Project will include, but not be limited to, the following components:

- Solar Photo Voltaic modules and ground mounted tracking racks;
- DC/AC containerised or skid mounted inverter stations;
- Battery storage area;
- Synchronous condensers (subject to requirement);
- Transformers;
- Switching yard and electrical substation;
- Associated underground cables connecting groups of solar panels to inverter stations and inverter stations via overhead and/or underground transmission lines to a transformer in the substation;
- Ancillary infrastructure and buildings associated with the development including a site office, maintenance sheds, laydown area/compound access tracks and perimeter fencing; and
- Connection to Bungama Substation via overhead and/or underground transmission lines.

The project will be contained solely within the site, including areas required for stockpiling and materials laydown during construction as shown in **Figure 1**.

The project would operate 24 hours a day, 7 days a week, which would involve the presence of staff on-site and would typically see minimal plant and equipment operating on site. During operation, the PVS would generate electricity which would be transferred into the power grid via the substation. Key noise emissions from the operation of the project are associated with the inverter and transformer components of the substation. It is noted that emissions from these sources are anticipated to be acoustically insignificant compared to ambient background noise levels at assessed receptors.

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

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

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

2.4 Potentially Sensitive Receptors

From review of aerial imagery and associated project information, MAC has identified the following potentially sensitive receptors that may be affected by noise from operations, construction activities and related road traffic and are presented in **Figure 1**.

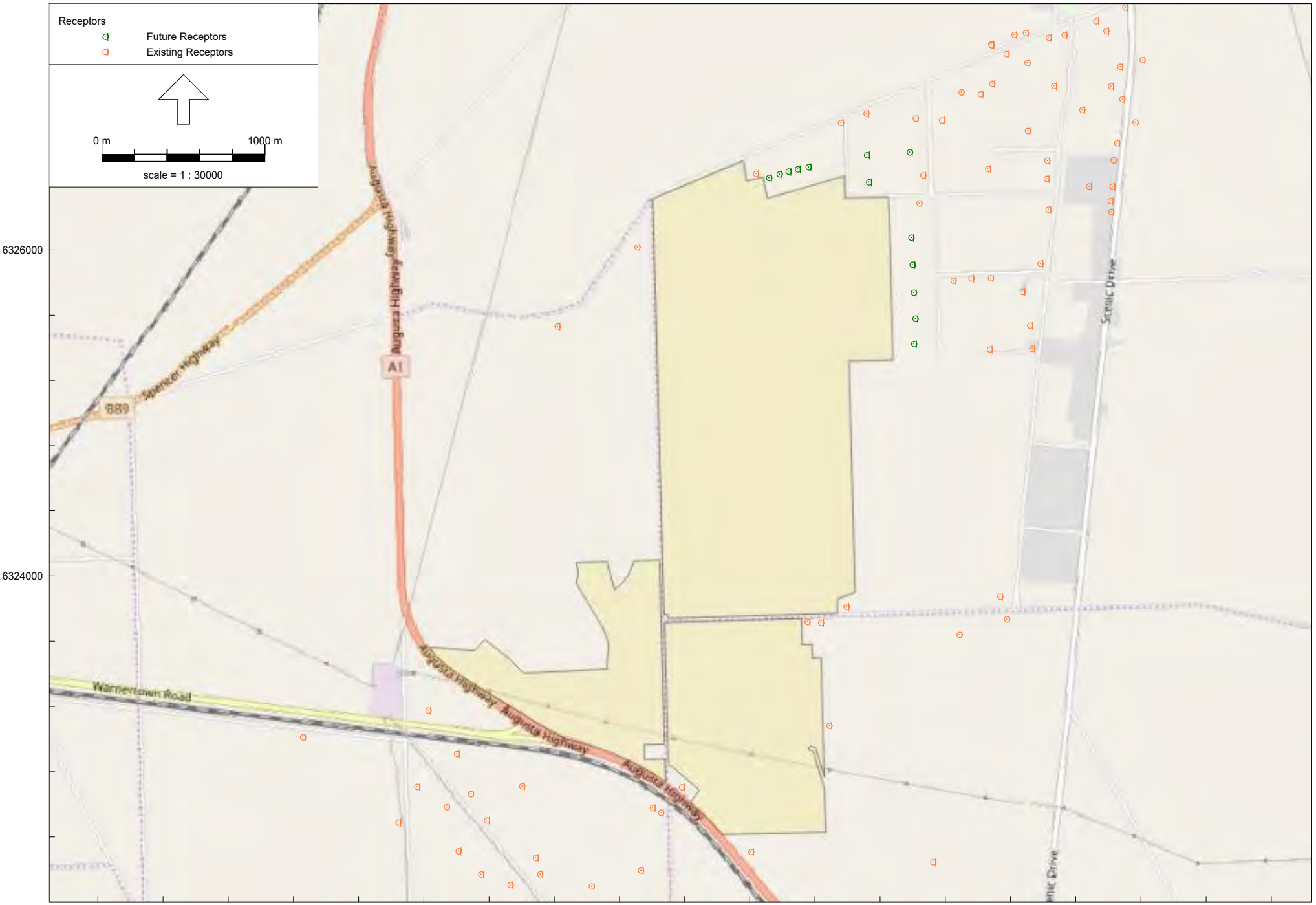


Figure 1 - Project Layout

Bungama Solar - Operation Noise Assessment

Muller Acoustic Consulting - Australia

Industrial noise - ISO 9613.1/2, [EIS Assessment - Figures] , iNoise V2018.2 Enterprise. Licensed to Muller Acoustic Consulting - Australia

3 Noise Policy and Guidelines

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

- South Australia Environment Protection Authority's (EPA), Environment Protection (Noise) Policy, (EPP) 2007 (Noise Policy);
- South Australia Environment Protection Authority's Information Sheet on Construction Noise, 2017;
- South Australia Environment Protection Authority's Information Sheet on General Environmental Noise, 2013;
- Department of Planning, Transport and Infrastructure (DPTI) Road Traffic Noise Guidelines V5 2016 (RTNG).
- NSW Environment Protection Authority (EPA), Noise Policy for Industry (NPI), 2017; and
- NSW Environment Protection Authority (EPA) – NSW Environmental Noise Management – Industrial Noise Policy (INP), January 2000 and relevant application notes (superseded).

3.1 South Australia Environment Protection (Noise) Policy 2007

An Environment Protection Policy (EPP) is a legislative tool provided under the Environment Protection Act 1993 (the EP Act). An EPP can be made for any purpose directed towards securing the objects of the Act.

The South Australia Environment Protection (Noise) Policy 2007 (Noise Policy) provides a legal framework for the assessment of a wide range of noise issues and incorporates a range of regulatory tools depending on the issue. In general, guidance is provided on the starting point (the indicative noise level) for action, and the factors to consider in determining what action to take. For more defined situations, such as the operation of an air conditioning unit at a dwelling, mandatory provisions are used. For more complex situations, descriptive and informative guidelines are called up by the Noise Policy.

The objectives of the Noise Policy are:

- to establish noise goals that, if achieved, secure compliance with the EP Act.
- where noise exceeds those noise goals, the Policy establishes what requirements the Authority will impose to address the noise issue.
- to establish a consistent approach to development applications under the Development Act. Noise issues are inherently more difficult to resolve once established, and therefore the Policy addresses noise at the development stage.

In addition, the Policy acknowledges there are special activities or sources that require specific management. These activities can be addressed through the application of special provisions or guidelines under the Policy.

3.1.1 Industrial Noise

The aim of the Noise Policy is to limit the level of noise exposure that for people living near industrial and other non-domestic premises.

The maximum permissible noise levels listed in **Table 1** are used as a guide in deciding whether the general environmental duty has been met and are adopted as the noise assessment criteria for this NA.

Table 1 Industrial Noise Assessment Criteria for Various Land Uses, dBA[1]

Land Use Category	Day (7am to 10pm)	Night (10pm to 7am)
Rural Living	47	40
Residential	52	45
Rural Industry	57	50
Light Industry	57	50
Commercial	62	55
General Industrial	65	55
Special Industry	70	60

Note 1: Measured according to the Noise Policy at any place, other than the premises from which the noise emanates, where a person lives or works.

3.2 Road Traffic Noise Guideline

Department of Planning, Transport and Infrastructure (DPTI) Road Traffic Noise Guidelines V5 2016 (RTNG) provide a framework for assessing and treating road traffic noise with regard to the construction of new roads or the upgrading of existing roads. The guideline is applicable for assessment of road traffic noise where traffic noise could possibly affect nearby noise- sensitive premises as a result of the construction of new roads, roadworks (e.g. re-alignment, road widening) or change in the function of roads.

In the absence of relevant policy, the RTNG criteria has been adopted for this NA. Where noise levels from the project construction related traffic are above the adopted RTNG criteria, noise levels may be deemed excessive and require noise mitigation measures to be implemented.

This page has been intentionally left blank

4 Assessment Criteria

4.1 Construction Noise Criteria

The South Australia EPA Noise Policy and its associated guidance documents states that construction noise that causes an adverse impact on amenity is only permitted between 7am and 7pm, Monday to Saturday. Construction noise with an adverse impact on amenity is defined as an average noise level of 45dBA or a single noise event with a maximum noise level of 60dBA at a noise receptor (such as a residential dwelling). In practical terms this means that construction activities with the potential to cause adverse impacts are only permitted between the hours of 7am and 7pm Monday to Saturday where residential premises are potentially affected.

Construction activities that cause adverse impacts (exceed 45dB LA_{eq} or 60dB LA_{max}) are not permitted to occur outside of these hours or on a Sunday or Public Holiday without written permission from the EPA or another agency such as a council that administers the Environment Protection Act 1993.

4.2 Operational Noise Criteria

The noise goals for the project have been determined based on the maximum permissable levels minus 5dB in accordance with Clause 20(3) of the Noise Policy and are presented in **Table 2**.

Table 2 Project Noise Criteria

Receptor Type	Period[1]	Indicative Noise Level	Noise Criteria dB $LA_{eq(15min)}$
Rural Living	Day	47	42
	Night	40	35
Residential	Day	52	47
	Night	45	40
Rural Industry & Light Industry	Day	57	52
	Night	50	45
Commercial	Day	62	57
	Night	55	50
General Industrial	Day	65	60
	Night	55	50
Special Industry	Day	70	65
	Night	60	55

Note 1: ay 7am to 7pm; Night 7pm to 7am.

4.3 Road Traffic Noise Criteria

The adopted RTNG criteria for assessment of impacts from road traffic noise at potential residential receptors are presented in **Table 3**.

Table 3 Road Traffic Noise Assessment Criteria for Residential Land Uses

Road category	Road Name	Type of Project/Development	Assessment Criteria - dBA	
			Day (7am to 10pm)	Night (10pm to 7am)
Local Roads	Locks Road	Existing residences affected by additional traffic on existing local roads generated by land use developments	55dBA LAeq(15hr) external	50dBA LAeq(9hr) external
Freeway/arterial/sub -arterial road	National Highway (A1)	Existing residences affected by additional traffic on existing freeways/arterial/sub-arterial roads generated by land use developments	60dBA LAeq(15hr) external	55dBA LAeq(9hr) external

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

The likely haulage route for equipment from Adelaide is the National Highway (A1) and via Locks Road to either of the three construction compounds/laydown areas.

The nearest potentially affected receptor to the National Highway (A1) is offset 130m. the access route via Locks Road does not pass any potentially sensitive noise receptors and hence, an assessment along the access route has not been completed.

5 Assessment Methodology

A computer model was developed to quantify project noise emissions to neighbouring receptors for typical construction activities and operations. DGMR's iNoise Version 2018.2 noise modelling software was used to assess potential noise impacts associated with the project. A three-dimensional digital terrain map giving all relevant topographic information was used in the modelling process. Additionally, the model uses relevant noise source data, ground type, shielding such as barriers and/or adjacent buildings and atmospheric information to predict noise levels at the nearest potentially affected receptors. Plant and equipment were modelled at various locations and heights, representative of realistic construction and operational conditions for assessed scenarios.

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

5.1 Construction Assessment Methodology

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

- earthworks involving trenching for cabling;
- piling of panel supports; and
- assembly of the panels.

It is envisaged that all three construction scenarios have the potential to occur simultaneously at up to 10 locations across the site. All significant noise generating construction activities will be limited to standard construction hours. Where low intensity construction activities are required to be undertaken outside standard construction hours (is cabling, minor assembly, use of hand tools etc) they will be managed such that they will not cause adverse impacts and comply with the construction noise criteria.

5.2 Operational Assessment Methodology

Noise predictions were modelled for a typical worst case operational scenario over a 15-minute assessment period based on the assumptions, quantities and sound power levels in **Table 4.** Plant noise emission data used in modelling for this assessment were obtained from manufacturers specifications. Where relevant, modifying factors in accordance with Section 3.3 and Fact Sheet D of the NSW Noise Policy for Industry (NPI) which has replaced the NSW Industrial Noise Policy which is referenced by the Noise Policy regarding modifying factors have been applied to source levels.

Final selection of equipment for the battery storage technology power conditioning (synchronous condensers) has not been finalised. In terms of noise emissions, the type of battery used may or may not require the use of HVAC units for temperature control. Similarly, the requirement for synchronous condensers and associated cooling towers are an additional noise source. As a conservative worst case, the assessment has included the use of HVAC units, synchronous condensers and cooling towers.

Table 4 Operational Equipment Sound Power Levels, Lw dBA re 10^{-12} W

Noise Source/Item	Activity	Approx Quantity	Lw/Item	Total Lw
PV Panel Tracking Motor[1]	All tracking motors in operation 1 minute per 15-minute period	8760	60	83
4.9MVA Power Converter Unit [2,3] (Inverter, Transformer)	Constant	50	96	108
3.3MVA Power Converter Unit [2,3] (Inverter, Transformer)	Constant	12	94	100
HVAC unit[4]	Constant	140	87	97
Battery Storage[3]	Constant	140	85	91
Synchronous Condenser[4]	Constant	2	93	86
Cooling Tower	Constant	2	99	102
Substation[2,4]	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 +5dB added for tonality.

Note 3: -15dB applied to account for enclosure

Note 4 -10dB applied for partially enclosed infrastructure

Noise emissions from industry can be significantly influenced by prevailing weather conditions. Wind has the potential to increase noise at a receptor when it is at low velocities and travels from the direction of the noise source.

Meteorological conditions that enhance received noise levels include source to receptor winds and the presence of temperature inversions. To account for the potential for enhancements, noise modelling has been conducted for source to receptor winds (CONCAWE Category 6) for the night time period.

5.3 Road Traffic Noise

The United States (US) Environmental Protection Agency's road traffic calculation method was used to predict the LA_{eq} noise levels from construction vehicles travelling past receptors along public roads. This method is an internationally accepted theoretical traffic noise prediction model and is ideal for calculating road traffic noise where relatively small traffic flows are encountered.

This page has been intentionally left blank

6 Results

6.1 Construction Noise Results

A quantitative estimate of construction noise assessment has been undertaken which indicates that, in general, noise emissions during the construction phase are expected to be less than 45dBA at all receptors and comply with the Environment Protection (Noise) Policy 2007 criteria and not cause adverse impacts. Furthermore, the following measures will be implemented to minimise noise during the construction phase:

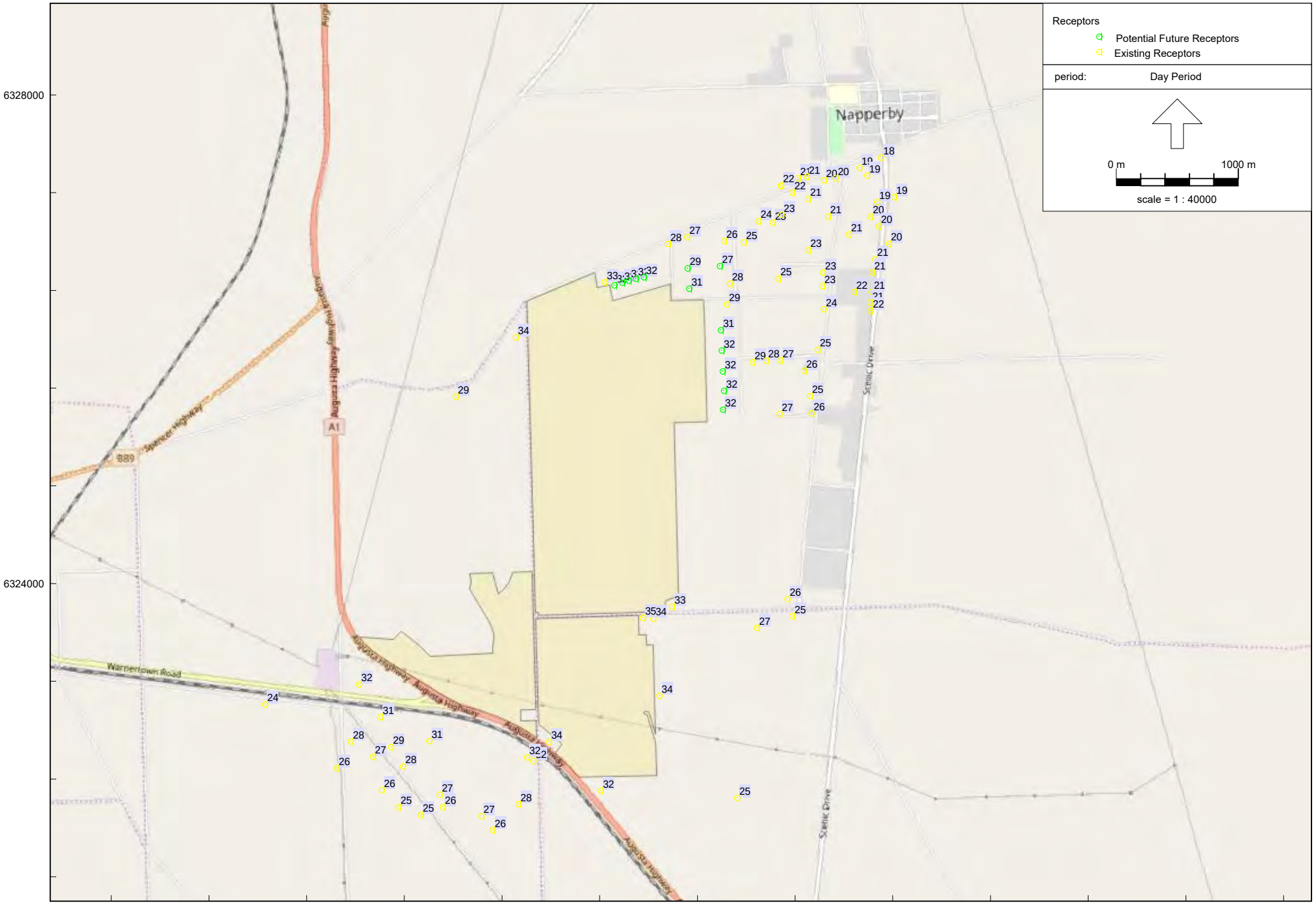
- Work on-site will occur within the standard work hours of 7am and 7pm Monday to Saturday;
- Deliveries and other operations may occur on Sundays, before 7am and after 7pm to avoid an unreasonable interruption of vehicle or pedestrian traffic movement;
- Particularly noisy activities will be commenced after 9am where the noise exceeds industry guidelines.

Subject to approval from the relevant authority, circumstances, such as extreme summer heat, may warrant construction activity to be permitted outside of the hours of 7am and 7pm Monday to Saturday or on a Sunday or Public Holiday.

6.2 Operational Noise Results

Noise levels were predicted at each assessed receptor assuming receptor heights of 1.5m above ground level. Predicted worst case operational noise levels are less than 35dBA during the daytime at all receptor locations; and are less than 38dBA during the night time at all receptor locations for noise enhancing conditions. Predicted noise levels for each assessed receptor are presented in **Figure 2** and **Figure 3**.

Figure 2
Bungama Solar - Operation Noise Assessment



Industrial noise - ISO 9613.1/2, [EIS Assessment - Operation] , iNoise V2018.2 Enterprise. Licensed to Muller Acoustic Consulting - Australia

Muller Acoustic Consulting - Australia

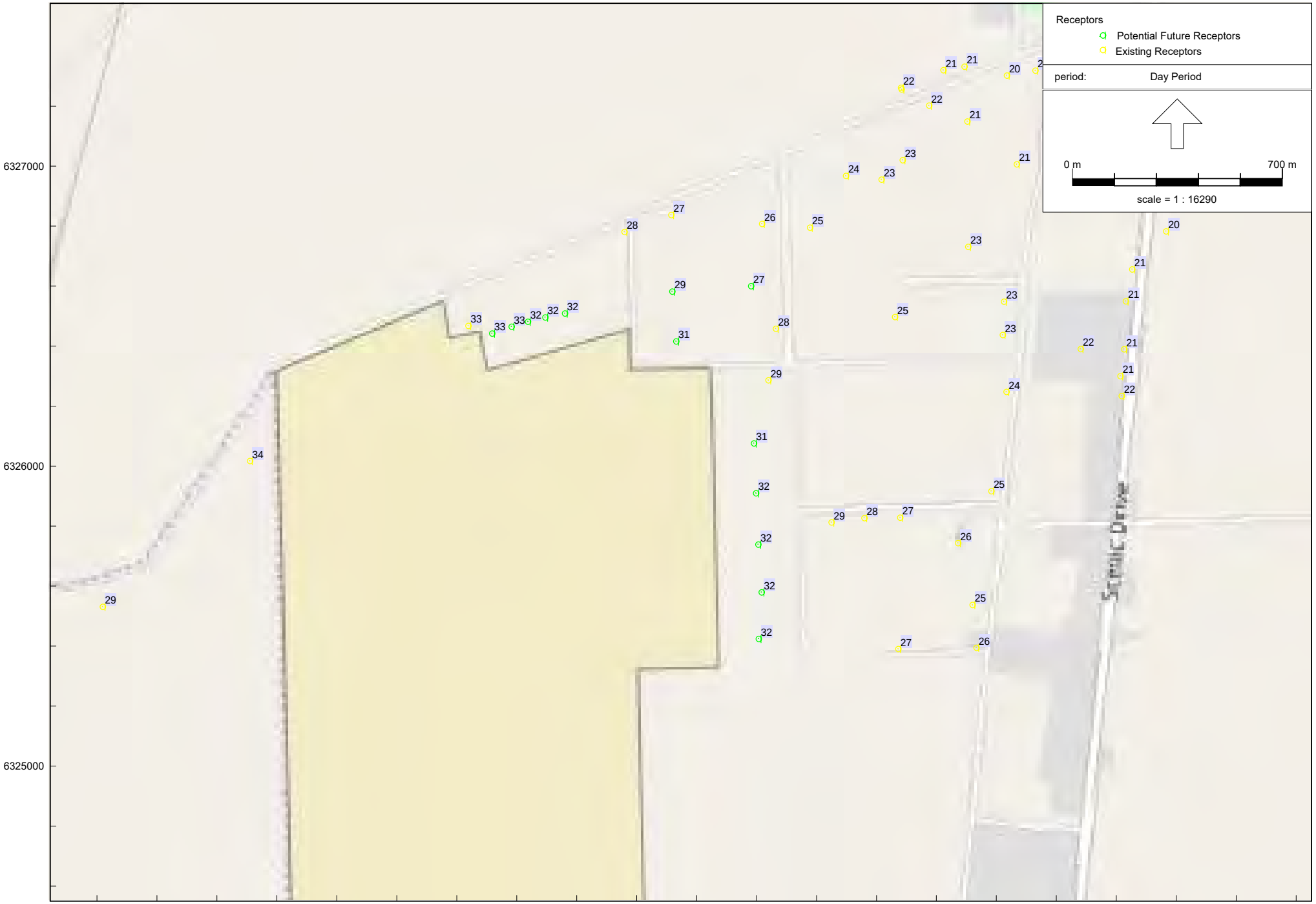
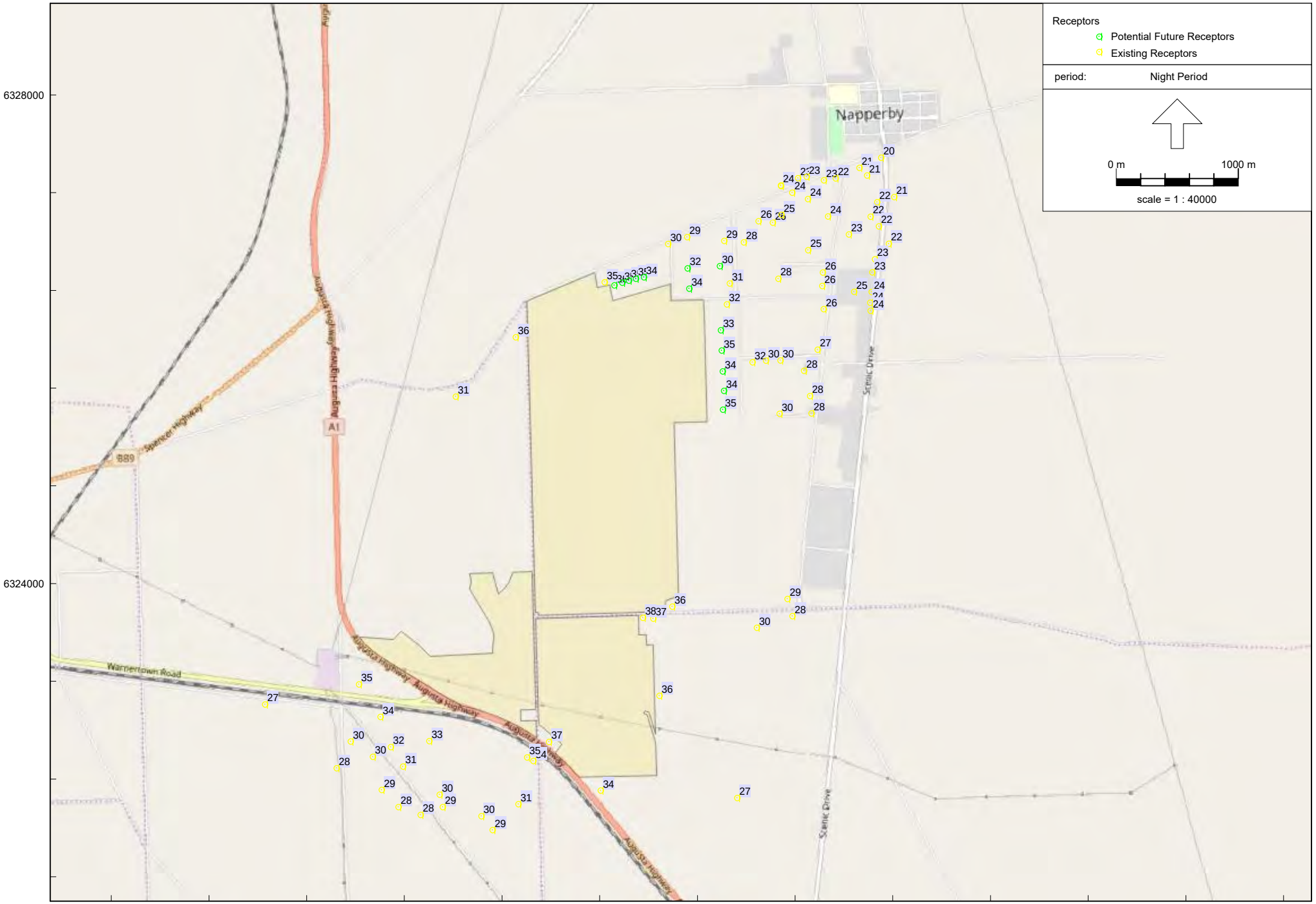


Figure 2A
Bungama Solar - Operation Noise Assessment

Muller Acoustic Consulting - Australia

Industrial noise - ISO 9613.1/2, [EIS Assessment - Operation] , iNoise V2018.2 Enterprise. Licensed to Muller Acoustic Consulting - Australia

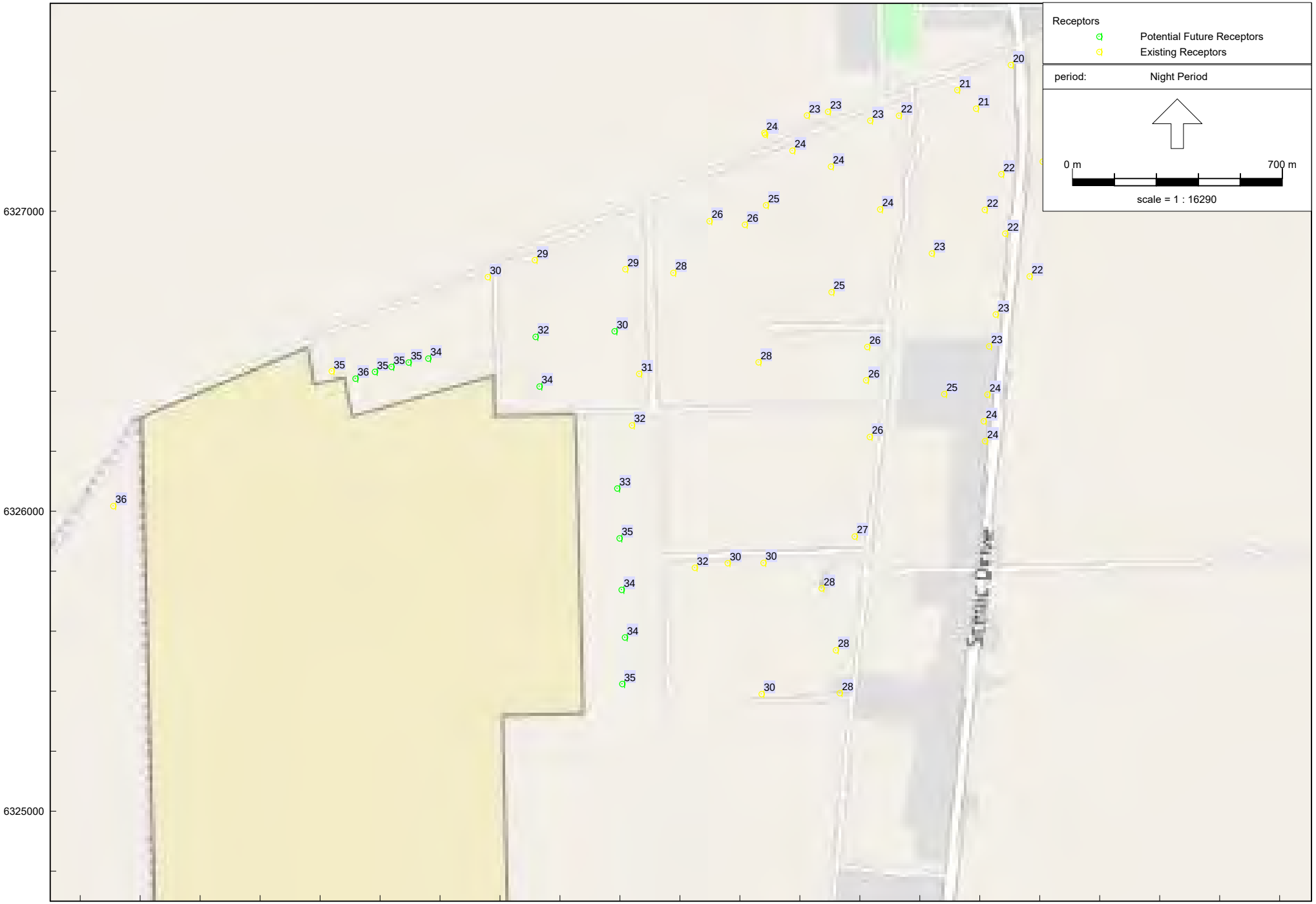
Figure 3
Bungama Solar - Operation Noise Assessment



Industrial noise - ISO 9613.1/2, [EIS Assessment - Operation] , iNoise V2018.2 Enterprise. Licensed to Muller Acoustic Consulting - Australia

Muller Acoustic Consulting - Australia

Figure 3A
Bungama Solar - Operation Noise Assessment



Industrial noise - ISO 9613.1/2, [EIS Assessment - Operation] , iNoise V2018.2 Enterprise. Licensed to Muller Acoustic Consulting - Australia

Muller Acoustic Consulting - Australia

6.3 Road Traffic Noise Assessment

The National Highway (A1) and Locks Road would be the major transport route for all project vehicles. During construction, traffic generated by the project include employee/subcontractor and delivery vehicles. During construction, the traffic volume over a typical day for standard construction hours is expected to be approximately 50 heavy vehicles (semi-trailers and/or b-doubles) and 50 light vehicles per day (including mini buses for employee transport). Road traffic noise calculations based on the parameters adopted for average and peak flows are presented in **Table 5**.

Table 5 Predicted Construction Road Traffic Flows

Vehicle Type	Vehicles per day[1]	Average per hour	Maximum per Hour[2]	Maximum Movements per hour3	Speed km/h
B-double or Semi-trailer	50	7	10	20	80
Mini bus	5	<1	5	10	80
Light Vehicle	45	4.1	20	40	100

Note 1: Standard construction hours 7am to 7pm.

Note 2: Assumes that all mini buses and 50% of light vehicles travel to and from site during AM peak and PM peak.

Note 3: Vehicle movements are doubles the vehicle quantity – one movement to site, one movement return from site.

Predicted $LA_{eq(1hr)}$ noise levels from project related construction traffic at the closest receptor on both roads on the route has been completed using the United States (US) Environment Protection Agency's road traffic calculation method and are presented in **Table 6**.

Table 6 Predicted Construction Road Traffic Noise Levels

Road Name	Nearest Offset Distance to Receptor	Predicted Noise Level	Criteria	Comply
National Highway	130m	40dB $LA_{eq(15hr)}$	60dB $LA_{eq(15hr)}$	Yes

Note 1: Assumes that all worker transportation enters and exits the site in one hour as a worst case assessment

Results demonstrate that project construction traffic noise levels would satisfy the relevant RTNG criteria.

7 Recommendations

7.1 Construction Noise Recommendations

It is noted that a quantitative construction noise assessment is not required, however the Project is committed to managing noise emissions within the community and will adopt the following procedures wherever feasible. Recommendations for consideration during construction activities to reduce emissions to the surrounding community for this project may include:

- scheduling of construction activities to minimise the number of work fronts and simultaneous activities occurring along the boundaries of the project area (within 200m) to minimise noise levels;
- a construction noise management protocol to minimise noise emissions, manage out of hours (minor) works to be inaudible, and to respond to potential concerns from the community;
- where possible use localised mobile screens or construction hoarding around plant to act as barriers between construction works and receptors, particularly where equipment is near the site boundary and/or a residential receptor including areas in constant or regular use (eg unloading and laydown areas);
- operating plant in a conservative manner (no over-revving), be shutdown when not in use, and be parked/started at farthest point from relevant assessment locations;
- selection of the quietest suitable machinery available for each activity;
- avoidance of noisy plant/machinery working simultaneously where practicable;
- minimise impact noise wherever possible;
- utilise a broadband reverse alarm in lieu of the traditional hi frequency type reverse alarm;
- provide toolbox meetings, training and education to drivers and contractors visiting the site during construction so they are aware of the location of noise sensitive receptors and to be cognisant of any noise generating activities;
- signage is to be placed at the front entrance advising truck drivers of their requirement to minimise noise both on and off-site; and
- utilise project related community consultation forums to notify residences within close proximity of the site with project progress, proposed/upcoming potentially noise generating works, its duration and nature and complaint procedure.

7.2 Operational Noise Recommendations

Operational noise predictions identify that relevant noise criteria would be satisfied at all receptors. Notwithstanding, it is recommended that the proponent actively minimise potential noise emissions from the project. To assist in noise management for the project the following is recommended:

- complete a one-off noise validation/ compliance check to quantify emissions from site and to confirm emissions meet relevant criteria; and
- prepare an operational noise management protocol to minimise noise emissions and to respond to potential concerns from the community regarding project noise emissions.

8 Conclusion

Muller Acoustic Consulting Pty Ltd (MAC) has been engaged by EPS Energy Pty Ltd to complete a Noise Assessment (NA) for the construction and operation of a Solar Farm at Bungama, near Napperby, South Australia. The assessment has quantified potential noise emissions associated with the construction (including road traffic) and operation of the project.

A quantitative construction noise assessment has been completed and identifies that adverse impacts should not occur. However, where construction activities are close to receptors (within 200m) mitigation measures have been recommended to minimise noise emissions (see Section 7.1).

The results of the NA demonstrate that operational noise levels satisfy relevant noise criteria at all assessed receptors. However, recommendations to ensure noise levels are minimised and verified have been provided in this report (see Section 7.2).

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

Based on the NA results, there are no noise related issues which would prevent the approval of the project. The results of the assessment shows compliance with the relevant construction, operational and road noise criteria.

This page has been intentionally left blank

Appendix A – Glossary of Terms

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

Table A1 Glossary of Terms

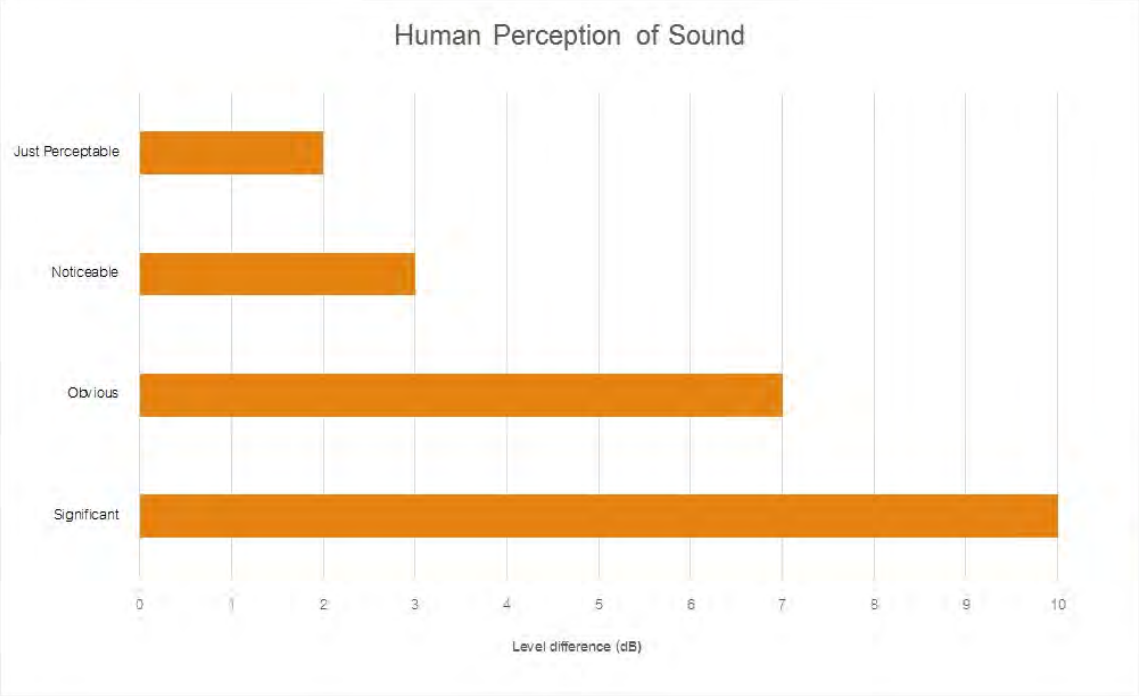
Term	Description
1/3 Octave	Single octave bands divided into three parts
Octave	A division of the frequency range into bands, the upper frequency limit of each band being twice the lower frequency limit.
ABL	Assessment Background Level (ABL) is defined in the NPI as a single figure background level for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

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

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

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

Figure A1 – Human Perception of Sound



Muller Acoustic Consulting Pty Ltd
PO Box 262, Newcastle NSW 2300
ABN: 36 602 225 132
P: +61 2 4920 1833
www.mulleracoustic.com

MAC
Muller Acoustic Consulting

APPENDIX 14

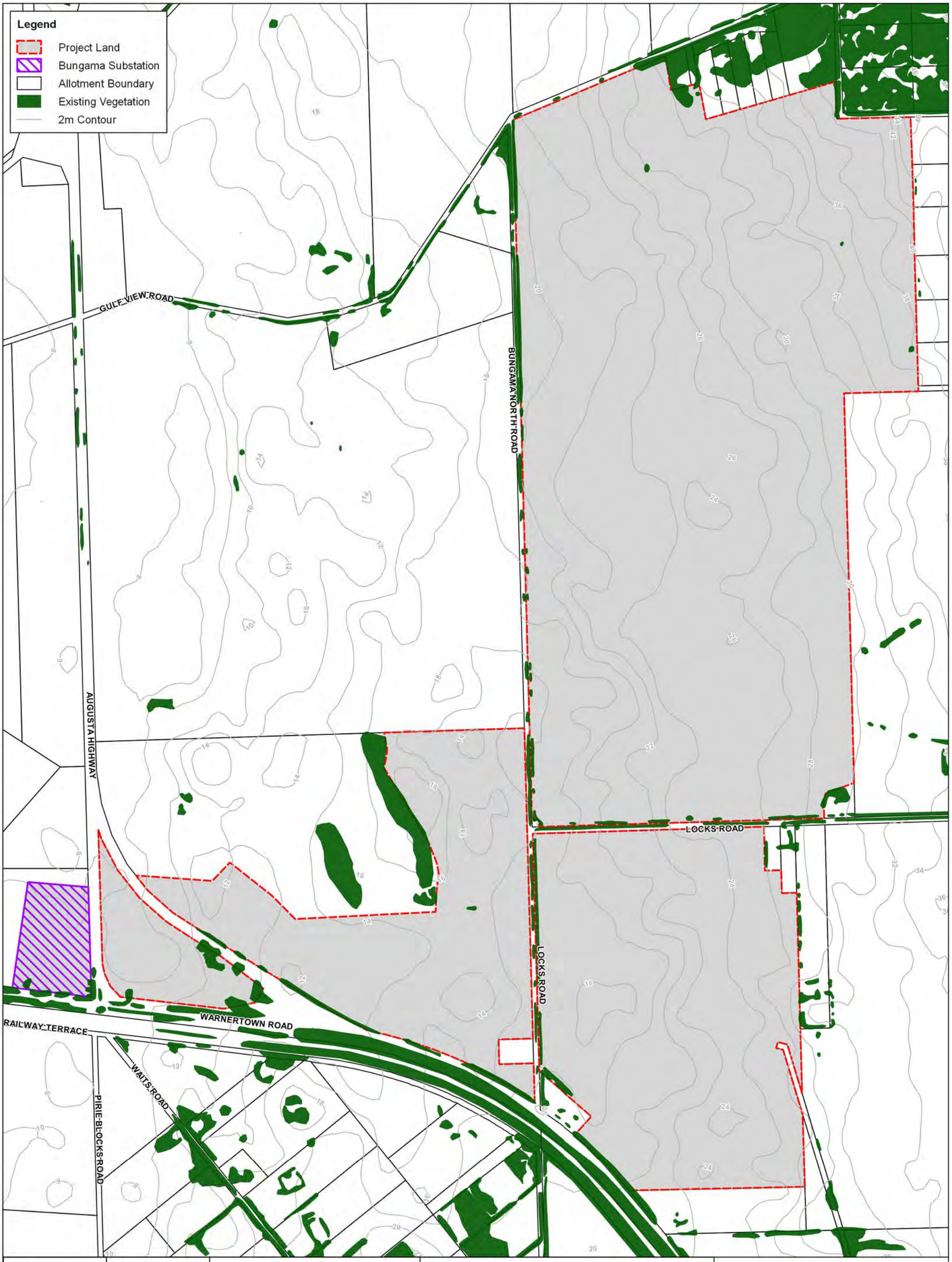
Landscaping Plan

BUNGAMA SOLAR

LANDSCAPE PLAN
BUNGAMA SOLAR
BUNGAMA, SA, AUSTRALIA

Author:	SW		**Page 1 of 6** Landscape Plan	BUNGAMA SOLAR
Reviewer:	SMC/ JB			
A3 Scale:	N/A		**Bungama Solar | Bungama SA Australia**	
Job Ref/Version:	11297/ V03		22/11/2018	

11297_PR_Landscape_CoverSheet_pg1.qgs



Author:	SW
Reviewer:	SMC/ JB
A3 Scale:	1:12,500
Job Ref/Version:	11297/ V02

0 200 400 600 m

Map Projection: GDA 1994 MGA Zone 54

Page 2 of 6

Contours and Existing Vegetation Onsite or on Adjoining Roads

Bungama Solar | Bungama SA Australia

26/11/2018

BUNGAMA SOLAR

11297_PR_Landscape_ExistingVeg_pg2.qgs

Legend

- Project Land
- Bungama Substation
- Proposed Battery Energy Storage System and Substation
- Indicative Solar Array Area
- Allotment Boundary
- Proposed Landscape Screening
- Proposed Internal Road

Note:
Landscaping is to be undertaken in accordance with any staging of the project. If the project is staged, then relevant landscaping will be implemented with each stage.

GULF VIEW ROAD
BUNGAMA NORTH ROAD
AUGUSTA HIGHWAY
LOCKS ROAD
WARNERTOWN ROAD
RAILWAY TERRACE
PIRIE BLOCKS ROAD
WAITS ROAD

Proposed Landscaping

Author:	SW
Reviewer:	SMC/ JB
A3 Scale:	1:12,500
Job Ref/Version:	11297/ V03

0 200 400 600 m

Map Projection: GDA 1994 MGA Zone 54

Page 3 of 6

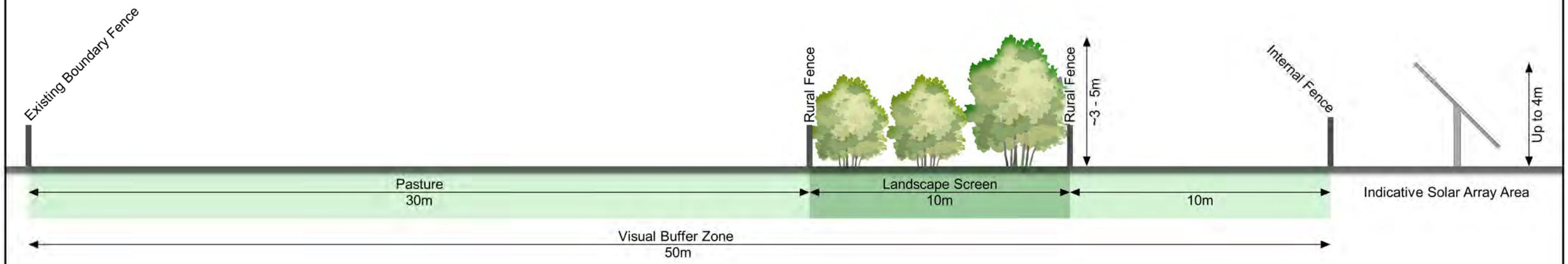
Landscape Masterplan

Bungama Solar | Bungama SA Australia

22/11/2018

BUNGAMA SOLAR

11297_PR_Landscape_Masterplan_pg3.qgs



Author:	SW
Reviewer:	SMC/ JB
A3 Scale:	1:150
Job Ref/Version:	11297/ V03

0 2.5 5 7.5 10 m

Elevations

Bungama Solar | Bungama SA Australia

22/11/2018

BUNGAMA SOLAR

11297_PR_Landscape_Elevations_pg4.qgs

Indicative Solar Array Area

Internal Fence

Pasture

10m

Rural Fence

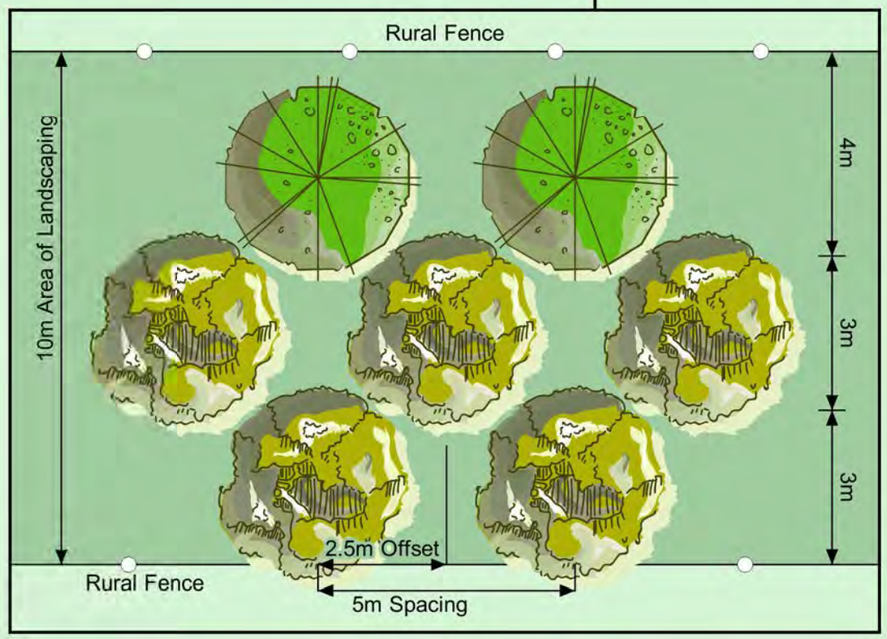
10m

Rural Fence

50m

30m

Pasture



Symbol	Botanical Name	Common Name	Pot Size	Indicative Densities	Mature Height	Mature Width
	Callistemon harkness	Gawler Hybrid Bottlebrush	150mm	4m spacing	5m	4m
	Grevillea olivacea	Olive Grevillea	150mm	4m spacing	4m	4m

Existing Boundary Fence

Author:	SW
Reviewer:	SMC/ JB
A3 Scale:	1:250
Job Ref/Version:	11297/ V03

0 5 10 15 m

Page 5 of 6

Detail Sheet

Bungama Solar | Bungama SA Australia

22/11/2018

BUNGAMA SOLAR

11297_PR_Landscape_DetailSheet_pg5.qgs

GENERAL

All landscaping is to be supervised by a landscape contractor or suitably qualified person. Any sub-contractors are to be co-ordinated by the lead contractor.

DEEP RIPPING

To be undertaken where tree stock is to be planted with (i) a bulldozer, or (ii) rippers on a tractor in dry conditions only.
Rip in a grid pattern where possible.
Avoid bringing clay soils to the surface.

FENCING & RABBIT PROOF NETTING

Place tree guards around seedlings upon planting.
Rabbit proof netting may be placed around the landscape area to protect it from invasion following works.
Stock proof fencing placed around landscaping until trees are at mature height.

WEED CONTROL

A Weed Management Plan will be developed in accordance with the Environmental Management Strategy.

PLANT MATERIAL

Plants shall be of the species and size detailed within the landscaping drawings. Plants shall be vigorous, well established, hardened off and free from pests and diseases. Plants shall not be soft, forced or root bound. Potted plants should be bushy or well furnished.

PLANTING

Ensure planting hole is bigger than pot size. When planting do not damage root system. Hold plant within the planting hole, replace soil around plant and firm down.

WATERING

To eliminated transplanting shock, water with one litre of water per seedling upon planting.
Over drier periods (December, January, February, March) water plant once a month at most until established.

MULCHING

Mulch to be of organic material, laid up to 75mm thick, 1m around each plant.
Keep mulch away from plant stems.

GROUNDCOVER

Use pasture species that will be seeded under solar panels as groundcover.

MAINTENANCE

For the first 52 weeks check plants for stress or failure and soil moisture.
Water as required.
Replace dead plants.

Olive Grevillea | *Grevillea olivacea*
Source: GardensOnLine

Gawler Hybrid Bottlebrush | *Callistemon harkness*
Source: davesgarden.com

Author:	SW		**Page 6 of 6**	BUNGAMA SOLAR
Reviewer:	SMC/ JB		**Specfic Details**	
A3 Scale:	N/A		**Bungama Solar | Bungama SA Australia**	
Job Ref/Version:	11297/ V03		22/11/2018	

BUNGAMA
SOLAR

www.bungamasolar.com.au

STATE COMMISSION ASSESSMENT PANEL
A COMMITTEE OF THE STATE PLANNING COMMISSION

Reference: *354/V004/18*
Contact Officer: *Simon Neldner*
Telephone: *08 7109 7058*
Email: *simon.neldner@sa.gov.au*

State Commission
Assessment Panel

Level 5
50 Flinders Street
Adelaide SA 5000

GPO Box 1815
Adelaide SA 5001

2 January 2019

Dear Sir/Madam,

Application Number: 354/V004/18
Proposed Development: Bungama Solar Farm and ancillary infrastructure
Subject Land: Augusta Highway, Bungama, Locks Road, Napperby

SECTION 49 - REFERRAL

The State Commission Assessment Panel (SCAP) has recently received a copy of the proposed development described above, pursuant to Section 49 of the *Development Act 1993*. A copy of the application is attached (Section 49(4a)).

Councils attention is particularly drawn to the time allowed for reports under Section 49 (5) and (6).

49 (5) A council may report to the SCAP on any matters contained in a notice under subsection (4a).

(6) Where a notice is given to a council under subsection (4a), and a report from the council is not received by the SCAP within two months of the date of the notice, it will be conclusively presumed that the council does not intend to report on the matter.

When replying please attach a copy of this letter with your details below.

Yours faithfully,

For **STATE COMMISSION ASSESSMENT PANEL**

I advise that this Council has **the attached/~~no report~~** to make on the proposed development described below.

Grant McKenzie
Reporting Officer

26/2/2019
Date

Enquiries:
Adina Teaha
T 8633 9737|E ateaha@pirie.sa.gov.au

Ref: A12590, A12993, A9449, A9480, A9482, A9696, A9697, A9698, A11848 and A10808 / 354/V004/18
GM:AT

Port Pirie Regional Council

26 February 2019

RECEIVED 4 MAR 2019

The Secretary
State Commission Assessment Panel
GPO Box 1815
ADELAIDE SA 5001

To the Secretary,

DEVELOPMENT NO.:	354/V004/18
APPLICANT:	EPS Energy
PROPOSAL:	Bungama Solar Farm and ancillary infrastructure
SUBJECT LAND:	Multiple properties bound within Napperby and Bungama

The Port Pirie Regional Council welcomes the opportunity to provide comments on Development Application 354/V004/18. In conducting a review of the proposed development and pursuant to Section 49(5) of the Development Act 1993, the Council has no objections with the project subject to the following considerations:

1. The Indicative PVS Operations Layout provided within Appendix 3 shows site entries to laydown areas are from Gulf View Road and Bungama North Road. As these roads have not been designed for heavy vehicle traffic it is suggested internal tracks via Locks Road/Augusta Highway be used during construction, and entry and use of these roads be minimized to any post-construction maintenance works. Any costs associated with traffic management or upgrading any roads (including widening or wear and tear of local roads) be borne by the proponent.

   It is noted that in the EPS Energy Report a Traffic Management Plan and Dilapidation Report will be established with the terms agreed upon with the Council prior to the commencement of construction.

2. The collection treatment of wastewater onsite requires the proponent to seek Wastewater Approval from the Council.

3. In reference to the allowance within the plans for a construction camp, which is proposed if there is insufficient accommodation for staff employed as part of the project, the Council has completed recent investigations showing the city comprises sufficient capacity for local lodging – over a thousand available bed numbers – and therefore the proponent is encouraged to strongly consider supporting local businesses by using existing amenities, wherever possible.

If you have any questions or wish to seek clarification, please contact the officer listed in this letter.

Yours sincerely

Grant McKenzie
Director Development & Regulation
PORT PIRIE REGIONAL COUNCIL

South Australian
COUNTRY FIRE SERVICE

DEVELOPMENT ASSESSMENT SERVICE UNIT
GPO Box 2468, Adelaide SA 5001
Level 5, 60 Waymouth Street, Adelaide SA 5000
P: (08) 8115 3352
E: das@cfs.sa.gov.au

Prepared by:
Joel Taggart

Reference: 354/V004/18

14 March 2019

Department of Planning, Transport and Infrastructure
GPO Box 1815
ADELAIDE SA 5001

ATTN: Laura Kerber

SA WATER – SOLAR FARM, BUNGAMA & NAPPERBY

The South Australian Country Fire Service (SACFS) welcomes and supports development in regional and rural areas of South Australia. While the SACFS has no direct concerns with the proposal, the proposed development does pose a number of bush fire safety and bush fire service response issues for the SACFS. The comments detailed below are designed to stop fire spreading from the site as best as possible (as per the landholders responsibility under the *Fire and Emergency Services Act, 2005)*, as well as minimise the impact on site infrastructure from bush fire entering the site.

Fire response capability

- The site will be serviced in the first instance by the Warnertown and the Napperby CFS brigades.
- Due to the regional nature of the site, secondary and subsequent fire service crews may have some distance to travel, therefore, additional on-site firefighting infrastructure may need to be considered to reduce the severity of any incident.

SA COUNTRY FIRE SERVICE REQUIREMENTS/COMMENTS

The SA CFS requests that the following conditions are applied to any consent issued as part of this project –

All access/egress roads on the project site:

- *Shall be constructed with a formed, compacted, self-draining, all-weather surface,*
- *Shall be a minimum width of 6 metres, if constructed less than 6m wide, shall incorporate passing bays with a minimum formed width of 6 metres (including the road or driveway width), and a minimum formed length of 17 metres. The passing bays should be constructed at 200 metre intervals along the driveway. Where it is necessary to provide adequate visibility, such as the nearest point to another passing bay, passing bays may be required at intervals of less than 200m.*
- *Shall be constructed with a minimum external radius of 12.5m for all road curves,*

- *Shall not exceed a gradient of 16 degrees (29%),*
- *Shall incorporate solid all-weather crossings over any water-course capable of supporting fire-fighting vehicles with a gross vehicle mass (GVM) of 21 tonnes,*
- *Vegetation overhanging the access road shall be pruned to achieve a minimum vehicular clearance of not less than 4 metres width and a vertical height clearance of 4 metres,*
- *Shall allow fire-fighting vehicles to safely enter and exit the site in a forward direction by incorporating a loop road around the site.*
- *Shall have gates into the site are of at least 6m in width, and at least 2 access points shall be developed into the site*

Water Supply to the site:

- *A minimum on-site storage of 22,000 litres of water in a metal or concrete tank shall always remain on site for firefighting purposes, with fittings, pumps and pipework to be constructed in accordance with SA Minister's Specification SA78*

Fire-fighting equipment – (During Construction Phase):

- *Shall be readily available and in good operable condition at all times mounted on a suitably designed vehicle or trailer dedicated to serve as the 'site fire trailer' for each construction site*
- *Shall consist of –*
  - *2000 litres fire-fighting water*
  - *1 x 5HP (3.7Kw) fire-fighting pump*
  - *2 x 30metre x 19mm ID fire hose reels with spray/jet nozzles*
  - *4 x fire-fighting knapsacks*
  - *4 x rake-hoes*
  - *2 x 9 litre stored water pressurised extinguishers*
  - *2 x 9kg dry powder extinguishers*

Vegetation Management

- *As the Visual Buffer Zone is proposed in close proximity to nearby dwellings, vegetation within these buffer zones should be of a low flammability variety, as per the list here –*

  https://www.stateflora.sa.gov.au/the-australian-garden/why-choose-native-plants/bushfire-resistance
- *In the event that vegetation under the solar arrays is not able to be managed, a 20m vegetation management zone (VMA), as detailed below, shall apply to the solar arrays.*
- *A vegetation management zone (VMZ) shall be established and maintained within 20 metres of the sub-station and battery energy storage facility as follows:*
  - *The understorey plants within the VMZ shall be maintained such that when considered overall a maximum coverage of 30% is attained, and so that the leaf area of shrubs is not continuous.*
  - *Grasses within the zone shall be reduced to a maximum height of 10cm during the fire danger season (e.g. by grazing, slashing or chemical treatment)*

- *The VMZ shall be maintained to prevent the accumulation of dead vegetation during the fire danger season.*

Bushfire safety
The bushfire protection level for the area is mapped as a General Bushfire Protection Area.

All buildings will need to comply with National Construction Code and consider bushfire provisions found in AS3959 (Construction of Buildings in Bushfire Prone Areas), the Minister's Code (Undertaking Development in Bushfire Protection Areas) and Minister's Specification SA 78 due to its location.

Conclusion
The South Australian Country Fire Service (SACFS) welcomes and supports this development. Whilst the proposal does highlight some operational bush fire safety considerations, the South Australian Country Fire Service seeks that the abovementioned conditions are applied to the approval. The applicant and/or DPTI staff are more than welcome to contact the undersigned to discuss these matters further. It should also be noted that these comments do not relate to building fire safety matters, which will be addressed at the Building Rules Assessment stage.

The SA CFS support SCAP/DPTI forwarding this information directly on to the applicant and landholder.

Yours sincerely

JOEL TAGGART
RPIA, B. Urban & Regional Planning (Hons.)
MANAGER – DEVELOPMENT ASSESSMENT SERVICE
South Australian Country Fire Service

In reply please quote 2018/01915, Process ID: 555652
Enquiries to Reece Loughron
Telephone (08) 7109 7876
E-mail dpti.luc@sa.gov.au

Government of South Australia
Department of Planning, Transport and Infrastructure

POLICY, STRATEGY AND PROGRAM DEVELOPMENT

Transport Assessment and Policy Reform

GPO Box 1533
Adelaide SA 5001

ABN 92 366 288 135

6 March 2019

State Commission Assessment Panel
C/- Ms Laura Kerber
Department of Planning, Transport and Infrastructure
GPO Box 1815
ADELAIDE SA 5001

Dear Ms Kerber,

SECTION 49 DEVELOPMENT ACT - CROWN DEVELOPMENT CONSULTATION ADVICE

Development No.	354/V004/18
Applicant	Department of Energy and Mining
Location	Augusta Highway, Locks Road and Gulf View Road, Bungama
Proposal	Staged construction of a photovoltaic energy generation system and battery energy storage system with associated infrastructure

The above development proposal was referred to the Commissioner of Highways (CoH) by the State Commission Assessment Panel for advice to assist in its report to the Minister for Planning in accordance with the requirements of Section 49(7a) of the *Development Act 1993*.

The following response is provided in accordance with Section 49(7a) of the *Development Act 1993*.

CONSIDERATION

The subject site abuts Augusta Highway, an arterial road under the care, control and management of CoH and Locks Road, Bungama North Road and Gulf View Road, local roads under the care, control and management of the Port Pirie Regional Council. The adjacent section of Augusta Highway is identified as a Major Traffic Route, Primary Freight Route and Tourist Route under the Department of Planning, Transport and Infrastructure's (DPTI's) *'A Functional Hierarchy for South Australia's Land Transport Network'* and is gazetted for PBS Level 3B (vehicles up to 42 metres in length). At this location, Augusta Highway carries approximately 4,800 vehicles per day (19% commercial vehicles) and has a posted speed limit of 100 km/h. Locks Road, Bungama North Road and Gulf View Road have a default rural speed limit of 100km/h. Locks Road and Scenic Drive are gazetted for B-Double vehicles up to 26 metres in length. However, these roads are not gazetted for PBS Level 2A vehicles.

Access and Road Safety

DPTI has reviewed the Planning Report (Reference No. 11297, Revision V01, dated 29 November 2018) and associated Transport Impact Assessment by GTA (Reference S159810, Issue A, dated 27 November 2018). According to the Report, the project will involve an estimated 24 months construction period, with access proposed to be gained primarily via the Augusta Highway/Locks Road junction and Locks Road. No direct access is proposed from Augusta Highway.

GTA has assessed the traffic impacts of the proposed development at the Augusta Highway/Locks Road junction and concluded that the traffic generated during the construction period is likely to meet the warrant for a Basic right-turn (BAR) treatment and Basic left-turn (BAL) treatment. GTA note that there is an existing auxiliary left turn lane (AUL) at this junction and that the additional left turn movements associated with the construction traffic would be accommodated by the existing AUL treatment. With regards to catering for right turn movements from Augusta Highway, GTA concludes that the risk associated with the right turn movements are low due to the low volumes and that a formalised right turn treatment is not considered necessary.

It should be noted that the Augusta Highway/Locks Road junction is located on a horizontal curve and is adjacent a truck parking/rest area to the west and a service station on the south-east side of Locks Road. Given these site constraints, it is not possible to provide any suitable right turn treatment at this junction. Accordingly, this junction is not considered to be suitable for the types and numbers of heavy vehicles expected during construction. Consideration should therefore be given to utilising the Augusta Highway/Scenic Drive junction given this junction has a left turn deceleration lane and a BAR treatment that could be upgraded to a CHR treatment.

Understand that the applicant has already commenced discussions with the Council regarding the alternate access route via Scenic Drive and is keen to explore other access options which would avoid the need to turn right from Augusta Highway into Locks Road. To enable the applicant to explore all potential access routes without holding up the development application process, a condition of approval that requires the preparation of a Traffic Management Plan (which includes that the final access route is developed in consultation with and the agreement of DPTI and Council) is recommended. Any road upgrades required to facilitate safe access should be consistent with all relevant Austroads Guides, Australian Standards and DPTI/Council requirements, with all costs borne by the applicant. Furthermore, it should be noted that any access for oversize/over-mass vehicles will require a permit and separate approval through the National Heavy Vehicle Regulator.

Glint and Glare

The South Australian State Planning Policy Module: Building Near Airfields (Principles of Development Control 3(a) and 4) states that development in the vicinity of airfields should not create a risk to public safety by lighting glare and that outdoor lighting within 6km of an airport should be designed such that it does not pose a hazard to aircraft operation.

It is noted that a 'Glint and Glare Assessment' was undertaken by BV Consulting (Reference No. 11297, Version 3.1 dated 25 November 2018. The assessment considered the impacts on air planes, cars, trains and houses, including impacts on the Port Pirie Airport, Augusta Highway, Locks Road, Warnertown Road and the railway line to the south of the development. No glint and glare issues were identified for the Port Pirie Airport Control Tower nor for any flight paths during approach to or departure from Port Pirie Airport for any of the three runways. Minor issues of glare were identified for some houses in the surrounds of the

project area and a small section of Warnertown Road. In addition to the existing vegetation around the project area, the applicant proposes a visual buffer and landscape screen to ameliorate any issues. However, in the event that glint and glare issues arise and cause road safety concerns on the arterial road network, the Commissioner of Highways reserves the right to investigate amelioration measures in conjunction with the applicant.

Transmission Line

The Planning Report identifies two options of connecting the new Bungama solar farm substation to ElectraNet's Bungama Substation. Option 1 is an underground connection which extends under Augusta Highway and option 2 involves the construction of an overhead 275kV transmission line.

Whilst it is preferred that an underground connection be undertaken, should the aboveground option be favoured the transmission line must ensure that sufficient vertical clearances are achieved. A height clearance of a minimum of 7.5 metres is recommended. Furthermore, the transmission/tower poles should be located on private property where possible. If this is not feasible and the transmission/tower poles are located within the road reserve, the transmission/tower poles should be located outside the clear zone requirements and as far away as practicable from the road edge.

CONCLUSION

In-principle, no objection is raised to the proposed development. However, the final haul route for the construction phase should be developed as part of a Traffic Management Plan in consultation with and the agreement of DPTI and Council.

The planning authority is advised to attach the following conditions to any approval:

1. Prior to construction within the site, a 'Construction Management Plan (CMP)', prepared in consultation with the Commissioner of Highways and the Port Pirie Regional Council, shall be submitted for approval by the Minister for Planning. The CMP shall address matters including, but not limited to the following:

    - A Traffic Management Plan (TMP) that includes access routes and any proposed upgrades. The TMP shall also show all traffic devices to be utilised (including variable message signs) and any proposed traffic restrictions. The applicant shall notify DPTI's Traffic Management Centre on Ph. 1800 018 313 prior to undertaking any works that would impact the arterial road network and contractor(s) shall complete a 'Notification of Works' form via the following link:

      https://www.dpti.sa.gov.au/contractor_documents/works_on_roads_by_other_organisations

    - Managing impacts to infrastructure within the road reserve.

2. All access to the subject site shall be in accordance with the Traffic Management Plan.

3. Any infrastructure within the road reserve that is demolished, altered, removed or damaged during the construction of the project shall be reinstated to the satisfaction of the relevant asset owner, with all costs being borne by the applicant.

4. Any road and/or junction upgrades required to facilitate safe access to the site shall be consistent with all relevant Austroads Guides, Australian Standards and DPTI/Council requirements. All associated costs shall be borne by the applicant.

5. Any glare issues affecting the arterial road network shall be mitigated to the satisfaction of the Commissioner of Highways.

6. All power lines over arterial roads shall provide a minimum vertical clearance of 7.5 metres.

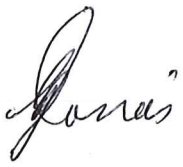
7. The transmission/tower poles shall be located on private property where possible.

8. Any undergrounding of the transmission line across Augusta Highway shall be undertaken to the requirements and satisfaction of the Commissioner of Highways.

The following note provide important information for the benefit of the applicant and is required to be included in any approval:

- In the event that Restricted Access Vehicles (including oversize and overmass components) are proposed to be uitilised, the applicant must ensure that all necessary approvals/permits are obtained from the National Heavy Vehicle Regulator (refer link: https://www.nhvr.gov.au

Yours sincerely,



for **MANAGER, TRANSPORT ASSESSMENT AND POLICY REFORM**
for **COMMISSIONER OF HIGHWAYS**

A copy of the decision notification form should be forwarded to dpti.developmentapplications@sa.gov.au

DEVELOPMENT ACT, 1993
S49/S49A – CROWN DEVELOPMENT
REPRESENTATION ON APPLICATION

Applicant:	Energy Projects Solar (EPS)
Development Number:	354/V004/18
Nature of Development:	Construction of the Bungama Solar Farm
Zone / Policy Area:	Primary Production Zone
Subject Land:	Warnertown Road and Augusta Highway, Bungama, and Locks Road and Bungama North Road, Napperby
Contact Officer:	Laura Kerber
Phone Number:	7109 7073
Close Date:	Friday 1 March 2019

My Name: Ben, Debbie Aitchison My phone number: 0447672184.

Primary method(s) of contact: Email: aitchy1982@gmail.com

Postal Address: PO Box 248 Port Pirie Postcode: 5540.

You may be contacted via your nominated PRIMARY METHOD(s) OF CONTACT if you indicate below that you wish to be heard by the State Commission Assessment Panel in support of your submission.

My interests are: *(please tick one)*

- ☑ owner of local property
- ☐ occupier of local property
- ☐ a representative of a company/other organisation affected by the proposal
- ☐ a private citizen

The address of the property affected is:

209 Gulf View Road Napperby Postcode 5540

My interests are: *(please tick one)*

- ☐ I support the development
- ☐ I support the development with some concerns
- ☑ I oppose the development

The specific aspects of the application to which I make comment on are: Interface Between land uses. Principles of Development Control., Noise, Dust and Airborne pollutants, Vibration, electrical interference, light spill, glare, hours of operation, traffic impacts. Bottle brush trees, Devalue of house + property Landscaping Fences and walls. (Family pledge on house)

I: (please tick one)

- ☑ wish to be heard in support of my submission
- ☐ do not wish to be heard in support of my submission *(Please tick one)*

By: (please tick one)

- ☑ appearing personally
- ☐ being represented by the following person *(Please tick one)*

Signature:

Date: 19/2/19

Return Address: The Secretary, State Commission Assessment Panel, GPO Box 1815, Adelaide, SA 5001 /or
Email: scapadmin@sa.gov.au

DEVELOPMENT ACT, 1993
S49/S49A – CROWN DEVELOPMENT
REPRESENTATION ON APPLICATION

Applicant:	Energy Projects Solar (EPS)
Development Number:	354/V004/18
Nature of Development:	Construction of the Bungama Solar Farm
Zone / Policy Area:	Primary Production Zone
Subject Land:	Warnertown Road and Augusta Highway, Bungama, and Locks Road and Bungama North Road, Napperby
Contact Officer:	Laura Kerber
Phone Number:	7109 7073
Close Date:	Friday 1 March 2019

My Name: Carl Gorey My phone number: 0419852457

Primary method(s) of contact: Email: carlgorey@gmail.com

Postal Address: PO Box 844 Port Pirie SA Postcode: 5540

You may be contacted via your nominated PRIMARY METHOD(s) OF CONTACT if you indicate below that you wish to be heard by the State Commission Assessment Panel in support of your submission.

My interests are: *(please tick one)*

- [x] owner of local property
- [ ] occupier of local property
- [ ] a representative of a company/other organisation affected by the proposal
- [x] a private citizen

The address of the property affected is: _____ Postcode _____

My interests are: *(please tick one)*

- [ ] I support the development
- [ ] I support the development with some concerns
- [x] I oppose the development

The specific aspects of the application to which I make comment on are: See attached document.

I: *(please tick one)*

- [x] wish to be heard in support of my submission
- [ ] do not wish to be heard in support of my submission *(Please tick one)*

By: *(please tick one)*

- [ ] appearing personally
- [ ] being represented by the following person *(Please tick one)*

Signature: _____

Date: 5-2-2019

Return Address: The Secretary, State Commission Assessment Panel, GPO Box 1815, Adelaide, SA 5001 /or
Email: scapadmin@sa.gov.au

DEVELOPMENT ACT, 1993
S49/S49A – CROWN DEVELOPMENT
REPRESENTATION ON APPLICATION

Applicant:	**Energy Projects Solar (EPS)**
Development Number:	**354/V004/18**
Nature of Development:	**Construction of the Bungama Solar Farm**
Zone / Policy Area:	**Primary Production Zone**
Subject Land:	**Warnertown Road and Augusta Highway, Bungama, and Locks Road and Bungama North Road, Napperby**

The Specific Aspects of the application to which I make comment on are:

My Wife and I moved back to Port Pirie 15 years ago for a work opportunity and spent 5 years looking for a nice quiet block where we can get away from then rat race and the industrial feel of the town where we grew up. We found a lovely Property only 15 minutes from Pirie but where there was no industry except for the harvest once a year. We decided that we could accept that and purchased two blocks as we wanted to ensure that we didn't have neighbours to close as we enjoy our privacy. We have spent the last ten years getting this area to become our own private secluded little piece of paradise. When we first heard about this project, we were quite alarmed as the perimeter of the purposed property is only 400m from our front gate.

When our property became council zoned residential, we were a little unsure until we spoke to council and our minds were put at rest. We thought that this would at least mean there would be no industry around us and that was a good thing.

Our major concerns are:

General noise and dust from vehicles and construction during the construction period.

Ongoing Glare from the panels as they will be pointing directly at our property in the mornings and they move up as the morning goes on.

Our view across the rolling paddocks and onto Port Pirie will be destroyed by this eyesore right in the middle of it.

Through research, I have found that there is a buzz or hum that generally comes from solar farms and this is something that is not what we want on our quite mornings enjoying the countryside.

Our Land is council zoned "Residential", surely this sort of thing can't be put next door to a residential property.

On the other side of Highway One (Augusta Highway) there is a parcel of land that is good for nothing as it is all salt bush, surely this area would impact less people and make use of an otherwise useless parcel of land.

Yours Truly,

Carl Gorey

Unhappy Napperby Resident

Wyatt, Sharon (DPTI)

From: bigdog@adam.com.au
Sent: Thursday, 28 February 2019 6:33 PM
To: DPTI:State Commission Assessment Panel
Subject: 354/V004/18 - Energy Projects Solar (EPS)

To whom it may concern,

Please see our submission against the development of the EPS solar fam in Bungarma SA.

1) Devaluation and lack of potential buyers.

As discussed previously my wife and I decided to purchase the property at Napperby, South Australia due to its zoning the parcel of land was zoned rural living.

This zoning allowed and facilitated as stated by the local council of Port Pirie a provision to build one house and one shed all buildings were to be off single story in nature. The zoning also stating all building materials used were to blend in with the natural rural agricultural farming environment. Why do we have zonings in place if we just change them? My wife and I have done the right thing here we checked the zonings prior to purchasing the land. The agricultural land next door will now be changed and zoned industrial estate what ever we call the new land classification the development is a massive industrial project that will provide 85000 homes with electricity industrial industrial industrial.

My wife and I had planned on building a house in the near future with the equity in the land being our house deposit.

EPS Energy stated that they had been planning this development for the past 18 months. We only purchased the property 14 months ago if we had known that their were plans in place for an industrial scale power plant on our boundary we would have never purchased the land.

This is an industrial sized project a massive 500 hectares in turn this will transform a rural agricultural farming setting into an industrial environment changing the whole landscape.

This will decrease property values and limit potential buyers in the property market. EPS Energy state that there is no evidence to suggest the development will devalue real estate in the area. I state isn't that convenient that solar farms have not been around long enough in order to supply appropriate data on the matter.

What I do no is I am not the only person to share this view point some online sources EPS Energy may like to reference are. Warwick News Warwick QLD, Press Reader Chinchilla QLD, Shepprden News VIC, Transcontinental Stirling North SA, The Border Mail VIC and there are more.

All the people interviewed showed a fear that was real and tangible that properties in the area would be devalued. We are not just in the area we are right next door to this industrial power plant.

The commonwealth bank are a business looking out for their interests and investments and will value our property accordingly. My family will lose the rural agricultural farming environment due to this industrial project. The agricultural farming setting is the very thing that attracts people to purchase property in the area. My wife and I did not purchase here to live next door to an industrial solar farm

Should my wife and I go back to work for a couple of years to save the deposit that we both thought we had already saved due to the equity in our land and take one for the better good of the state? (Remember the banks also take resale into account.)

EPS energy state that they will consider compensation it is a no brainer that it will effect resale and valuations who would buy next door to an industrial project of this scale. This project could be moved out to Port Davis great land for the development no one lives out that way no one to bother. Compensation for the direct neighbours I feel is appropriate as there is only a hand full of us and it would be much cheaper financially then running electricity lines from Port Davis to the power network sub station. Simon I do not understand what the hold up in compensation is about make us some form of offer. This is a very stressful time for the property owners we where just going about our normal lives and then whamoo.

We are not money grabbing here we would be happy if you relocated my wife and I to another property in the area with simular attributes away from the industrial power station.

2) Noise and traffic visual effect.

Solar panels do not make noise inverters do but my main concern is the sun tracking system. A friend off my wife is currently employed in QLD installing a simular solar power generator. In consultation with him he reports that we will definitely hear the tracking system due to our very close proximity to the development.

(This development bordered an industrial estate great site location)

My wife and I would like to thank you in this area Simon for taking the time to visit the property alter the design in order to minimise the impact on us and offering a tree line on the boundary to assist with noise and the visual impact. We also appreciate your reassurance that the communal farm access road will not be utilised for the development due to the close proximity off our children playing.

3) Solar panel glare and temperature rise.

We are hoping that the tree line offered will deflect the glare created but feel the tree line will have too border all off the properties due to the size of the development.

Mature trees would be the best option as we do not wish to see or hear the industrial development. Thankyou for assistance in this area also Simon.

Napperby becomes a very very hot place in summer 47 degrees is not unusual 40 degrees is sustainable for extended periods off time.

I am hearing about the heat island effect created buy PV solar farms we can not be sitting around in 50 degrees. There is a lot of research coming out of the USA on this topic but their industrial solar farms are in the desert away from people.

In summary

The industrial solar development is a whooping 500 hectares will supply 85000 homes with electricity and is much larger then the other developments I have mentioned for reference by EPS energy.

The shear size of the industrial development will change the rural agricultural and farming environment of the whole area. No matter what spin we put on the zoning or name we call it this is an industrial venture this is a fact.

Developments of this industrial nature devalue properties and stunt resale especially when they are on your door step 10 to 20 meters from your boundary EPS Energy state there is no evidence to support this come on it is a no brainer.

Industrial solar power stations have other concerns noise when in very close proximity to neighbours, the heat island effect, concerns for interference with internet and TV reception, glare from solar panels, magnetic fields. We as the general population area told there is no evidence or not enough data due to solar power stations being a brand new industry. So they say lets do it and worry about the consequences latter when we have data. The blue sky asbestos mines ring a bell hear James hardies are getting a little ring also its safe they said. The nuclear talons plant out the back of Port Pirie was left untouched for years until they poured slag over it about 15 years ago.

I am not against solar power it is fantastic but it should be put on poor quality land away from homes and towns we are a massive continent no need to put it right on top of people until we no how safe these industrial power plants are lets collect 10 year worth of data first.

EPS solar state they work with the community an offer of compensation is only fair in this instance for the direct neighbours that have to live with this for the next 30 years asap please we need help out here.

I hope we can come to some arrangement with EPS Energy to have this Solar farm moved from our back fence or at the very least some sort of compensation is only far and just considering I have recently had bank valuations done on the property the banks will not allow me to borrow on any equity in the land. As they state the property would sit on the market for an extended period of time and I cannot see this changing with the construction of a massive industrial power plant being built on my back step over the next two years.

Lets face it who would want to purchase anything with a mining site out the back and surrounds.

Due to not being able to use the equity in our land my wife and I are busy trying to save another 15k which we thought we would have already had in the value of our property in order to buy / build our new home which will now be in another location

Thank you for letting our concerns be heard.

should you require any more information please do not hesitate to contact us.

Marcus Doggett - 0415 342 493

Karen Doggett

DEVELOPMENT ACT, 1993
S49/S49A – CROWN DEVELOPMENT
REPRESENTATION ON APPLICATION

Applicant:	Energy Projects Solar (EPS)
Development Number:	354/V004/18
Nature of Development:	Construction of the Bungama Solar Farm
Zone / Policy Area:	Primary Production Zone
Subject Land:	Warnertown Road and Augusta Highway, Bungama, and Locks Road and Bungama North Road, Napperby
Contact Officer:	Laura Kerber
Phone Number:	7109 7073
Close Date:	Friday 1 March 2019

My Name: Michelle Gorey My phone number: 0407 397 943

Primary method(s) of contact: Email: michellegorey@gmail.com

Postal Address: PO Box 844
PORT PIRIE Postcode: 5540

You may be contacted via your nominated PRIMARY METHOD(s) OF CONTACT if you indicate below that you wish to be heard by the State Commission Assessment Panel in support of your submission.

My interests are: *(please tick one)*

- ☑ owner of local property
- ☐ occupier of local property
- ☐ a representative of a company/other organisation affected by the proposal
- ☐ a private citizen

The address of the property affected is:

249 OLIVE GROVE RD NAPPERBY Postcode 5540

My interests are: *(please tick one)*

- ☐ I support the development
- ☐ I support the development with some concerns
- ☑ I oppose the development

The specific aspects of the application to which I make comment on are: ~~de~~ see attached

I: *(please tick one)*

- ☑ wish to be heard in support of my submission
- ☐ do not wish to be heard in support of my submission *(Please tick one)*

By: *(please tick one)*

- ☐ appearing personally
- ☑ being represented by the following person CARL GOREY *(Please tick one)*

Signature: MGorey

Date: 6/2/19

Return Address: The Secretary, State Commission Assessment Panel, GPO Box 1815, Adelaide, SA 5001 /or
Email: scapadmin@sa.gov.au

DEVELOPMENT ACT, 1993
S49/S49A – CROWN DEVELOPMENT
REPRESENTATION ON APPLICATION

Applicant:	**Energy Projects Solar (EPS)**
Development Number:	**354/V004/18**
Nature of Development:	**Construction of the Bungama Solar Farm**
Zone / Policy Area:	**Primary Production Zone**
Subject Land:	**Warnertown Road and Augusta Highway, Bungama, and Locks Road and Bungama North Road, Napperby**

The Specific Aspects of the application to which I make comment on are:

My Husband and I moved back to Port Pirie 15 years ago for a work opportunity and spent 5 years looking for a nice quiet block where we can get away from then rat race and the industrial feel of the town where we grew up. We found a lovely Property only 15 minutes from Pirie but where there was no industry except for the harvest once a year. We decided that we could accept that and purchased two blocks as we wanted to ensure that we didn't have neighbours to close as we enjoy our privacy. We have spent the last ten years getting this area to become our own private secluded little piece of paradise. When we first heard about this project, we were quite alarmed as the perimeter of the purposed property is only 400m from our front gate.

When our property became council zoned residential, we were a little unsure until we spoke to council and our minds were put at rest. We thought that this would at least mean there would be no industry around us and that was a good thing.

Our major concerns are:

General noise and dust from vehicles and construction during the construction period.

Ongoing Glare from the panels as they will be pointing directly at our property in the mornings and they move up as the morning goes on.

Our view across the rolling paddocks and onto Port Pirie will be destroyed by this eyesore right in the middle of it.

Through research, I have found that there is a buzz or hum that generally comes from solar farms and this is something that is not what we want on our quite mornings enjoying the countryside.

Our Land is council zoned "Residential", surely this sort of thing can't be put next door to a residential property.

On the other side of Highway One (Augusta Highway) there is a parcel of land that is good for nothing as it is all salt bush, surely this area would impact less people and make use of an otherwise useless parcel of land.

Yours Truly,

MDGorey

Michelle Gorey

Unhappy Napperby Resident

DEVELOPMENT ACT, 1993
S49/S49A – CROWN DEVELOPMENT
REPRESENTATION ON APPLICATION

Applicant:	Energy Projects Solar (EPS)
Development Number:	354/V004/18
Nature of Development:	Construction of the Bungama Solar Farm
Zone / Policy Area:	Primary Production Zone
Subject Land:	Warnertown Road and Augusta Highway, Bungama, and Locks Road and Bungama North Road, Napperby
Contact Officer:	Laura Kerber
Phone Number:	7109 7073
Close Date:	Friday 1 March 2019

My Name: BARRY ROBIN BARKER My phone number: 0417668502

Primary method(s) of contact: Email:

Postal Address: PO BOX 591 PORT PIRIE Postcode: 5540

You may be contacted via your nominated PRIMARY METHOD(s) OF CONTACT if you indicate below that you wish to be heard by the State Commission Assessment Panel in support of your submission.

My interests are: *(please tick one)*

- [x] owner of local property
- [x] occupier of local property
- [ ] a representative of a company/other organisation affected by the proposal
- [ ] a private citizen

The address of the property affected is:

7 WEST TERRACE NAPPERBY Postcode 5540

My interests are: *(please tick one)*

- [ ] I support the development
- [ ] I support the development with some concerns
- [x] I oppose the development

The specific aspects of the application to which I make comment on are: DESTROYING LOCAL COMMUNITY – RIGHT OUT AT THE ENTRANCE TO PORT PIRIE - DEVALUATION OF PROPERTY – UNSALEABLE PROPERTY BECAUSE OF VISUAL POLLUTION & GLARE FROM 5 SQUARE KILOM. OF SOLAR PANELS

I: *(please tick one)*

- [x] wish to be heard in support of my submission
- [ ] do not wish to be heard in support of my submission *(Please tick one)*

By: *(please tick one)*

- [x] appearing personally
- [ ] being represented by the following person *(Please tick one)*

Signature: BRBarker

Date: 20/2/2019

Return Address: The Secretary, State Commission Assessment Panel, GPO Box 1815, Adelaide, SA 5001 /or Email: scapadmin@sa.gov.au

DEVELOPMENT ACT, 1993
S49/S49A – CROWN DEVELOPMENT
REPRESENTATION ON APPLICATION

RECEIVED 26 FEB 2019

Applicant:	Energy Projects Solar (EPS)
Development Number:	354/V004/18
Nature of Development:	Construction of the Bungama Solar Farm
Zone / Policy Area:	Primary Production Zone
Subject Land:	Warnertown Road and Augusta Highway, Bungama, and Locks Road and Bungama North Road, Napperby
Contact Officer:	Laura Kerber
Phone Number:	7109 7073
Close Date:	Friday 1 March 2019

My Name: James Barker My phone number: 0429315606

Primary method(s) of contact: Email: JEKBarker@gmail.com

Postal Address: PO. 591 Postcode: 5540

You may be contacted via your nominated PRIMARY METHOD(s) OF CONTACT if you indicate below that you wish to be heard by the State Commission Assessment Panel in support of your submission.

My interests are: *(please tick one)*

- [x] owner of local property
- [x] occupier of local property
- [ ] a representative of a company/other organisation affected by the proposal
- [ ] a private citizen

The address of the property affected is:

Lot 3 Scenic Drive Napperby, 48 Bain Ave Napperby Postcode 5540

My interests are: *(please tick one)*

- [ ] I support the development
- [ ] I support the development with some concerns
- [x] I oppose the development

The specific aspects of the application to which I make comment on are: Blocking my view, devalution of property at Both Locations, inviomental impact on primary Producing Land

I: *(please tick one)*

- [x] wish to be heard in support of my submission
- [ ] do not wish to be heard in support of my submission *(Please tick one)*

By: *(please tick one)*

- [x] appearing personally
- [ ] being represented by the following person *(Please tick one)*

Signature:

Date: 20/2/19

Return Address: The Secretary, State Commission Assessment Panel, GPO Box 1815, Adelaide, SA 5001 /or
Email: scapadmin@sa.gov.au

DEVELOPMENT ACT, 1993
S49/S49A – CROWN DEVELOPMENT
REPRESENTATION ON APPLICATION

Applicant:	Energy Projects Solar (EPS)
Development Number:	354/V004/18
Nature of Development:	Construction of the Bungama Solar Farm
Zone / Policy Area:	Primary Production Zone
Subject Land:	Warnertown Road and Augusta Highway, Bungama, and Locks Road and Bungama North Road, Napperby
Contact Officer:	Laura Kerber
Phone Number:	7109 7073
Close Date:	Friday 1 March 2019

My Name: MARGARET ANNE BARKER My phone number: 0448321610

Primary method(s) of contact: Email:

Postal Address: P.O. Box 591
PORT PIRIE Postcode: 5540

You may be contacted via your nominated PRIMARY METHOD(s) OF CONTACT if you indicate below that you wish to be heard by the State Commission Assessment Panel in support of your submission.

My interests are: *(please tick one)*

- ☐ owner of local property
- ☑ occupier of local property
- ☐ a representative of a company/other organisation affected by the proposal
- ☐ a private citizen

The address of the property affected is:

7 WEST TERRACE, NAPPERBY Postcode 5540

My interests are: *(please tick one)*

- ☐ I support the development
- ☐ I support the development with some concerns
- ☒ I oppose the development

The specific aspects of the application to which I make comment on are: This Development will cause the devaluation of the properties in this area, making them unsaleable because of the ruination of their views which they paid a great deal of money for. An area as large as this in an area zoned Residential is not for Solar Panels!!

I: *(please tick one)*

- ☐ wish to be heard in support of my submission
- ☑ do not wish to be heard in support of my submission *(Please tick one)*

By: *(please tick one)*

- ☐ appearing personally
- ☑ being represented by the following person BARRY ROBIN BARKER *(Please tick one)*

Signature:

Date: 20/2/2019

Return Address: The Secretary, State Commission Assessment Panel, GPO Box 1815, Adelaide, SA 5001 /or
Email: scapadmin@sa.gov.au

RESPONSE TO SUBMISSIONS

Prepared for Bungama Solar

EPS ENERGY

Reference No. 11297 March 19

BUNGAMA SOLAR

www.bungamasolar.com.au

QUALITY ASSURANCE AND DECLARATION

Quality Assurance and Version Control Table		
Project:	Bungama Solar	
Client:	Bungama Solar 1 Pty Ltd and Bungama Solar 2 Pty Ltd	
Rev:	**Date:**	**Reference:**
V01	22.02.2019	Bungama Solar Response to Submissions
Checked by:	T. Kelly	
Approved by:	S. McCall and J. Burns	
Declaration:	*The opinions and declarations in this document are ascribed to EPS Energy and are made in good faith and trust that such statements are neither false nor misleading.* *In preparing this document, EPS Energy has considered and relied upon information obtained from the public domain, supplemented by discussions between key EPS Energy staff, representatives from governing agencies and independents, including the client and specialist consultants.*	
Applicant:	EPS Energy PO Box 195 Charlestown NSW 2290 (02) 9258 1362	
Prepared By:	A. Tipper	
Reviewed By:	S. McCall	
Project Land:	CT 6037/29 – A20 DP80628 CT 6127/5 – A558 FP188690 CT 5954/187 – A52 DP25903 CT 5949/272 – A4 DP24997 CT 5390/999 – A559 FP188691 CT 5360/334 – A551 FP188683 CT 5972/304 – A1 DP24255 CT 5776/531 – A501 DP52803 CT 5776/532 – A502 DP52803 CT 5978/766 – A55 DP71831	

CONTENTS

LIST OF TABLES

TABLE OF FIGURES

TABLE OF PLATES

This page has intentionally been left blank.

1. INTRODUCTION

Bungama Solar is proposed to be an integrated but separately operated grid connected Photovoltaic Energy Generation System (PVS) of approximately 280MW (AC) generation capacity and a 140MW capacity Battery Energy Storage System (BESS) with 560MWh of storage that will feed into the National Electricity Market via ElectraNet's Bungama Substation. The PVS element, the BESS element and associated infrastructure, together are "the Project".

This Response to Submissions (RTS) document has been prepared by Energy Projects Solar (EPS) Pty Ltd ACN: 609 935 588 for Bungama Solar 1 Pty Ltd ACN: 621 450 762 the special purpose vehicle for the (PVS) and Bungama Solar 2 Pty Ltd ACN: 621 450 995 the special purpose vehicle for the (BESS).

A Development Application was lodged for the Project on 30/11/2018 and subsequently assigned the Development Application number 354/V004/18.

In accordance with Section 49 of the *Development Act 1993*, Port Pirie Regional Council, other prescribed regulatory bodies and the public were notified of the proposal and invited to make written submissions. The referral and exhibition period for the Project was 31/01/2019 – 01/03/2019, during which the following submissions were received:

- One submission from Port Pirie Regional Council in support of the Project with comments;
- Three submissions prescribed regulatory bodies in support of the Project with comments; and
- Six submissions from the public expressing opposition to the Project.

This RTS has been prepared to respond to the submissions received in the referral and exhibition period by Council, other prescribed regulatory bodies and the public.

2. PORT PIRIE REGIONAL COUNCIL

Comment: *The Port Pirie Regional Council welcomes the opportunity to provide comments on Development Application 354/V004/18. In conducting a review of the proposed development and pursuant to Section 49(5) of the Development Act 1993, the Council has no objections with the project subject to the following considerations:*

1. *The Indicative PVS Operations Layout provided within Appendix 3 shows site entries to laydown areas are from Gulf View Road and Bungama North Road. As these roads have not been designed for heavy vehicle traffic it is suggested internal tracks via Locks Road/Augusta Highway be used during construction, and entry and used of these roads be minimised to any post-construction maintenance works. Any costs associated with traffic management or upgrading any roads (including widening or wear and tare of local roads) be borne by the proponent.*

   It is noted that in the EPS Energy Report a Traffic Management Plan and Dilapidation Report will be established with the terms agreed upon with the Council prior to the commencement of construction.

2. *The collection treatment of wastewater onsite requires the proponent to seek Wastewater Approval from the Council.*

3. *In reference to the allowance within the plans for a construction camp, which is proposed if there is insufficient accommodation for staff employed as part of the project, the Council has completed recent investigations showing the city comprises sufficient capacity for local lodging – over a thousand available bed numbers – and therefore the proponent is encouraged to strongly consider supporting local businesses by using existing amenities, wherever possible.*

Response:

1. A Traffic Management Plan will be prepared for the Project, in consultation with DPTI and Council, which will include identification of final site entry points and traffic route(s). The Project proposes to use internal access roads from Locks Road for construction to access the laydown areas from Gulf View Road and Bungama North Road. The access gates on Bungama North Road are for cross over points between the project areas either side of the road and it is not proposed to use Bungama North Road as an accessway in the north-south direction.

   A Dilapidation Report, or equivalent report, of the road conditions along the nominated local access roads will be prepared, prior to commencement of construction, in consultation with Council.

2. The Project will seek a Wastewater Approval from the Council for treatment of wastewater on-site, if it is required as part of the final design.

3. The Project reiterates its preference for local accommodation, as stated within the Bungama Solar Planning Report.

   Approval is sought for a temporary construction camp for the Project to avoid delays to construction if there is insufficient suitable existing accommodation to meet the requirements of the Project.

3. PRESCRIBED REGULATORY BODIES

3.1. DEPARTMENT OF ENERGY AND MINING – MINING REGULATION

Comment: *Department of Energy and Mining – Mining Regulation supports the proposed development and recommends that holders of the existing mining and exploration tenements, as listed below, are consulted in respect to the proposed development and their concerns are addressed:*

- *Extractive Minerals Lease (EML) 5945;*
- *EML 6012; and*
- *EML 6309 (Formerly Exploration Licence Application 2018/00139).*

Response:

EML 5945

Extractive Mineral Lease (EML) 5945 is located within the allotment boundary of CT5949/272, Deposited Plan 24997, but is outside the Project land, as identified in Figure 3-1.

The holder of EML 5945 is a Project landowner. The Project is leasing the Project land from the holder of EML 5945. As such, the holder of EML 5945 has been thoroughly consulted regarding the Project and supports the Project.

EML 6012

EML 6012 is located outside the Project land, as identified in Figure 3-1.

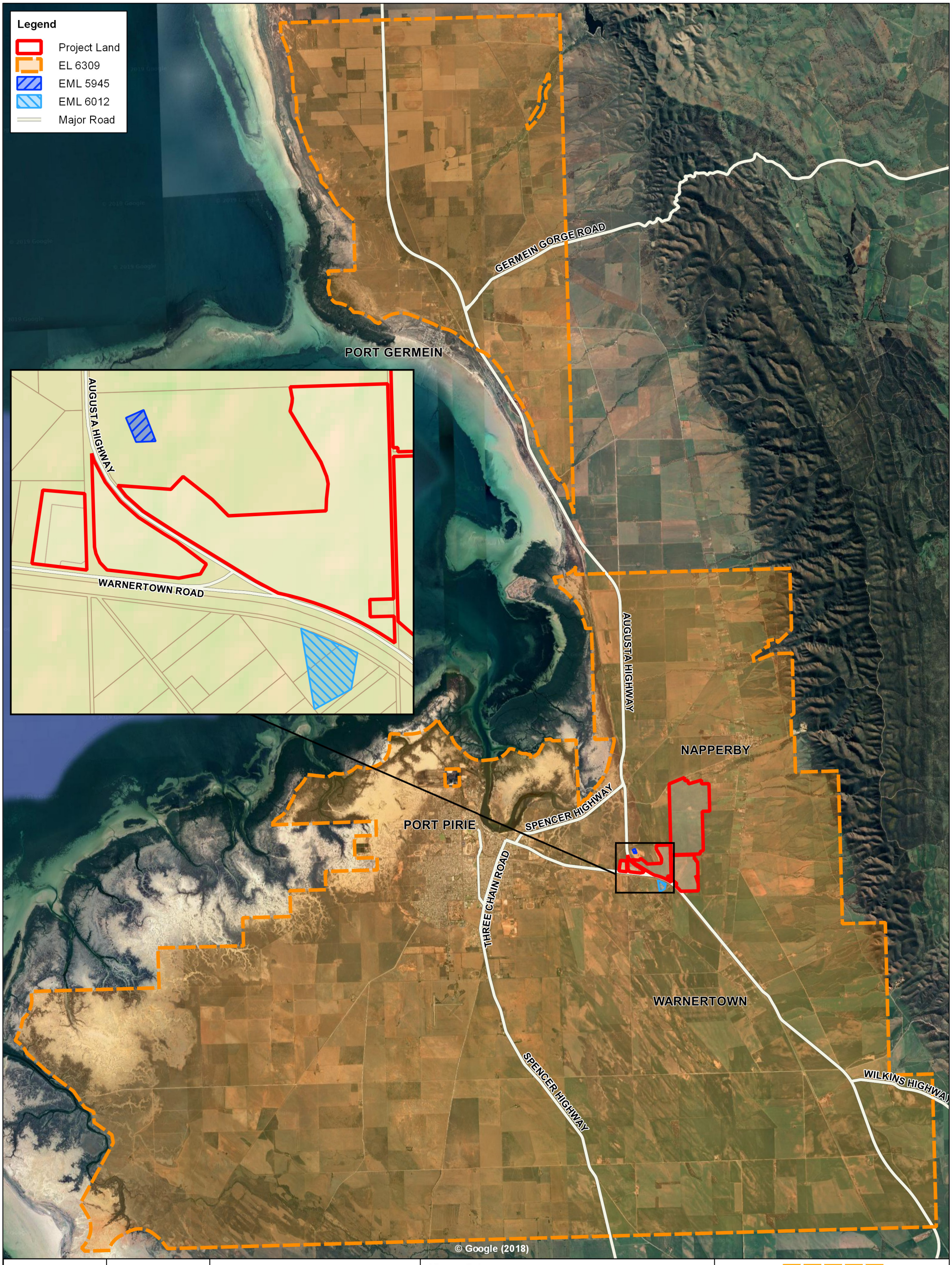
The Project has completed extensive public consultation since May 2018. To briefly summarise, consultation for the Project has included two rounds on on-ground information sessions, newspaper advertisement, unaddressed mail-outs, media releases, Project website and dedicated Project telephone-line.

In addition to this consultation, as recommended by the Department of Energy and Mining – Mining Regulation, Bungama Solar has sent a letter to the holder of EML 6012.

EML 6309

EML 6309 covers an area of 61200 hectares. It spans from Crystal Brook and Lower Broughton in the south, to Baroota in the north. It covers the majority of Port Pirie Regional Council Local Government Area including the Project land, as identified in Figure 3-1.

As previously noted, extensive consultation has already been undertaken. In addition to the consultation completed thus far, as recommended by the Department of Energy and Mining – Mining Regulation, Bungama Solar has sent a letter to the holder of EML 6309.



Author:	SW
Reviewer:	SMC/JB
A3 Scale:	1:125,000
Job Ref:	11297/V01

0 2 4 6 km

Map Projection: GDA 1994 MGA Zone 54

Figure 3-1

Mineral Exploration and Production Tenements

Bungama Solar | Bungama SA Australia

25/3/2019

BUNGAMA SOLAR

11297_Mineral_Tenements.qgs

3.2. NATURAL RESOURCES NORTHERN AND YORKE

Comment: *The primary concern for development on modified land holdings is for weed / pest plant management and control. In approving a development there will be to* (sic) *adequate provision for earth moving equipment and vehicle traffic management and hygiene, the removal/destruction of vegetation potentially containing pest plant material or seeds and the storage or removal of soil also potentially containing pest plant material or seeds.*

Response:

Weed and pathogen hygiene measures and protocols will be employed as part of the construction process to ensure that no new weeds or other pathogens are introduced to the site.

Weed/pest plant management will be provided for in the Construction Environmental Management Plan (CEMP).

3.3. DEPARTMENT OF PLANNING, TRANSPORT AND INFRASTRUCTURE – COMMISSIONER OF HIGHWAYS

Comment:

Access and Road Safety

DPTI has reviewed the Planning Report (Reference No 11297, Revision V01, dated 29 November 2018) and associated Transport Impact Assessment by GTA (Reference S159810, Issue A, dated 27 November 2018). According to the Report the project will involve an estimated 24 months construction period, with access proposed to be gained primarily via the Augusta Highway/Locks Road junction and Locks Road. No direct access is proposed from Augusta Highway.

GTA has assessed the traffic impacts of the proposed development at the August Highway/Locks Road junction and concluded that the traffic generated during the construction period is likely to meet the warrant for a Basic right-turn (BAR) treatment and Basic left-turn (BAL) treatment. GTA note that there is an existing auxiliary left turn land (AUL) at this junction and that the additional left turn movements associated with the construction traffic would be accommodated by the existing AUL treatment. With regards to catering for right turn movements from Augusta Highway, GTA concluded that the risk associated with the right turn movements are low due to the low volumes and that a formalised right turn treatment is not considered necessary.

It should be noted that the Augusta Highway/Locks Road junction is located on a horizontal curve and is adjacent to a truck parking/rest area to the west and a service station on the south-east side of Locks Road. Given these site constraints, it is not possible to provide any suitable right turn treatment at this junction. Accordingly, this junction is not considered to be suitable for the types and numbers of heavy vehicles expected during construction. Consideration should therefore be given to utilising the Augusta Highway/Scenic Drive junction given this junction has a left turn deceleration land and a BAR treatment that could be upgraded to a CHR treatment.

Understand that the applicant has already commenced discussions with Council regarding the alternate access route via Scenic Drive and is keen to explore other access options which would avoid the need to turn right from Augusta Highway into Locks Road. To enable the applicant to explore all potential access routes without holding up the development application process, a condition of approval that requires the preparation of a Traffic Management Plan (which includes that the final access route is developed in consultation with and the agreement of DPTI and Council) is recommended. Any road upgrades required to facilitate safe access should be consistent with all relevant Austroads Guides, Australian Standards and DPTI/Council requirements, with all costs borne by the applicant. Furthermore, it should be noted that any access for oversize/over-mass vehicles will require a permit and separate approval through the National Heavy Vehicle Regulator.

Glint and Glare

The South Australian State Planning Policy Module: Building Near Airfields (Principles of Development Control 3(a) and 4) states that development in the vicinity of airfields should not create a risk to public safety by lighting glare and that outdoor lighting within 6km of an airport should be designed such that it does not pose a hazard to aircraft operation.

It is noted that a 'Glint and Glare Assessment' was undertaken by BV Consulting (Reference No 11297, Version 3.1 dated 25 November 2018). The assessment considered the impacts on air planes, cars, trains, and houses, including impacts on the Port Pirie Airport, Augusta Highway, Locks Road, Warnertown Road and the railway line to the south of the development. No glint and glare issues were identified for the Port Pirie Airport Control Tower nor for any flight paths during approach to or departure from Port Pirie Airport for any of the three runways. Minor issues of glare were identified for some houses in the surrounds of the project area and a small section of Warnertown Road. In addition to the existing vegetation around the project area, the applicant proposes a visual buffer and landscape screen to ameliorate any issues. However, in the event that glint and glare issues arise and cause road safety concerns on the arterial road network, the Commissioner of Highways reserves the right to investigate ameliorate measures in conjunction with the applicant.

Transmission Line

The Planning Report identifies two options of connecting the new Bungama Solar farm substation to ElectraNet's Bungama Substation. Option 1 is an underground connection which extents under Augusta Highway and option 2 involves the construction of an overhead 275kV transmission line.

Whilst it is preferred that an underground connection be undertaken, should the aboveground option be favoured the transmission line must ensure that sufficient vertical clearances are achieved. A height clearance of a minimum of 7.5 metres is recommended. Furthermore the transmission/tower poles should be located on private property where possible. If this is not feasible and the transmission/tower poles are located outside the clear zone requirements and as far away as practicable from the road edge.

Conclusion

In-principle, no objection is raised to the proposed development. However, the final haul route for the construction phase should be developed as part of a Traffic Management Plan in consultation with and the agreement of DPTI and Council.

Response:

Access and Road Safety

A Traffic Management Plan will be prepared for the Project, in consultation with DPTI and Council, which will include definition of construction traffic route(s).

It is noted that DPTI do not support a right-turn into Locks Road from Augusta Highway.

There are a number of alternative access options that require further consideration by the Proponent in consultation with the Project traffic engineering consultant, Council and DPTI as part of development of the Traffic Management Plan. These potential alternative options include, but are not limited to, the following:

- Right hand turn onto Scenic Drive from the Augusta Highway, left hand turn onto Locks Road;
- Veering left onto Warnertown Road from Augusta Highway, turning right onto Pirie Blocks Road, turning right onto Augusta Highway and turning left into Locks Road; and
- Veering left onto Warnertown Road from Augusta Highway, turning right onto Germein Road/Spencer Highway, turning right onto Augusta Highway and turning left into Locks Road.

Final traffic route(s) require inputs from the technology selection and final Project design to determine the number of vehicle movements. These inputs will enable further detailed modelling and analysis by the traffic engineering consultant prior to final route(s) selection.

Glint and Glare

The Glint and Glare Assessment concluded that existing vegetation, in combination with proposed landscape screening will substantially ameliorate limited Green Glare (low-level glare) expected to be experienced during late afternoon hours.

It is accepted that, in the event that glint and glare issues arise and cause road safety concerns on the arterial road network, the Commissioner of Highways reserves the right to investigate ameliorate measures in conjunction with the applicant.

Transmission Line

Connecting the Project to the existing Bungama substation will require connection infrastructure including, but not limited to, underground cabling and/or overhead transmission and associate poles.

Should an overhead connection option be selected, sufficient vertical clearances and appropriate placement of towers will be incorporated into detailed design. Final design, specification and layout of all permanent operations components of the development will be submitted to the relevant authority prior to commencement of construction.

3.4. SOUTH AUSTRALIAN COUNTRY FIRE SERVICE

Comment:

The South Australian Country Fire Service (SACFS) welcomes and supports development in regional and rural areas of South Australia. While the SACFS has no direct concerns with the proposal, the proposed development does pose a number of bush fire safety and bush fire service response issues for the SACFS. The comments detailed below are designed to stop fire spreading from the site as best as possible (as per the landholders responsibility under the Fire and Emergency Services Act, 2005), as well as minimise the impact on site infrastructure from bush fire entering the site.

Fire response capability:

- *The site will be serviced in the first instance by the Warnertown and the Napperby CFS brigades.*
- *Due to the regional nature of the site, secondary and subsequent fire service crews may have some distance to travel, therefore, additional on-site firefighting infrastructure may need to be considered to reduce the severity of any incident.*

The SA CFS requests that the following conditions are applied to any consent issued as part of this project –

All access/egress roads on the project site*:*

- *Shall be constructed with a formed, compacted, self-draining, all-weather surface,*
- *Shall be a minimum width of 6 metres, if constructed less than 6m wide, shall incorporate passing bays with a minimum formed width of 6 metres (including the road or driveway width), and a minimum formed length of 17 metres. The passing bays should be constructed at 200 metre intervals along the driveway. Where it is necessary to provide adequate visibility, such as the nearest point to another passing bay, passing bays may be required at intervals of less than 200m.*
- *Shall be constructed with a minimum external radius of 12.5m for all road curves,*
- *Shall not exceed a gradient of 16 degrees (29%),*
- *Shall incorporate solid all-weather crossings over any water-course capable of supporting fire-fighting vehicles with a gross vehicle mass (GVM) of 21 tonnes,*
- *Vegetation overhanging the access road shall be pruned to achieve a minimum vehicular clearance of not less than 4 metres width and a vertical height clearance of 4 metres,*
- *Shall allow fire-fighting vehicles to safely enter and exit the site in a forward direction by incorporating a loop road around the site.*
- *Shall have gates into the site are of at least 6m in width, and at least 2 access points shall be developed into the site.*

Water Supply to the site:

- *A minimum on-site storage of 22,000 litres of water in a metal or concrete tank shall always remain on site for firefighting purposes, with fittings, pumps and pipework to be constructed in accordance with SA Minister's Specification SA78.*

Fire-fighting equipment – (During Construction Phase):

- *Shall be readily available and in good operable condition at all times mounted on a suitably designed vehicle or trailer dedicated to serve as the 'site fire trailer' for each construction site*
- *Shall consist of –*
  - *2000 litres fire-fighting water*
  - *1 x 5HP (3.7Kw) fire-fighting pump*
  - *2 x 30metre x 19mm ID fire hose reels with spray/jet nozzles*
  - *4 x fire-fighting knapsacks*
  - *4 x rake-hoes*
  - *2 x 9 litre stored water pressurised extinguishers*
  - *2 x 9kg dry powder extinguishers*

Vegetation Management

- *As the Visual Buffer Zone is proposed in close proximity to nearby dwellings, vegetation within these buffer zones should be of a low flammability variety, as per the list here –*

  https://www.stateflora.sa.gov.au/the-australian-garden/why-choose-native-plants/bushfire-resistance

- *In the event that vegetation under the solar arrays is not able to be managed, a 20m vegetation management zone (VMA), as detailed below, shall apply to the solar arrays.*
- *A vegetation management zone (VMZ) shall be established and maintained within 20 metres of the sub-station and battery energy storage facility as follows:*
  - *The understorey plants within the VMZ shall be maintained such that when considered overall a maximum coverage of 30% is attained, and so that the leaf area of shrubs is not continuous.*
  - *Grasses within the zone shall be reduced to a maximum height of 10cm during the fire danger season (e.g. by grazing, slashing or chemical treatment)*
  - *The VMZ shall be maintained to prevent the accumulation of dead vegetation during the fire danger season.*

Bushfire Safety

The bushfire protection level for the area is mapped as a General Bushfire Protection Area.

All buildings will need to comply with National Construction Code and consider bushfire provisions found in AS3959 (Construction of Buildings in Bushfire Prone Areas), the Minister's Code (Undertaking Development in Bushfire Protection Areas) and Minister's Specification SA 78 due to its location.

Conclusion

The South Australian Country Fire Service (SACFS) welcomes and supports this development. Whilst the proposal does highlight some operational bush fire safety considerations, the South Australian Country Fire Service seeks that the abovementioned conditions are applied to the approval. The applicant and/or DPTI staff are more than welcome to contact the undersigned

to discuss these matters further. It should also be noted that these comments do not relate to building fire safety matters, which will be addressed at the Building Rules Assessment stage.

The SA CFS support SCAP/DPTI forwarding this information directly on to the applicant and landholder.

Response:

EPS Energy, on behalf of Bungama Solar have consulted directly with the South Australian Country Fire Service in February 2019. CFS highlighted access requirements, such as adequate space for turning fire control vehicles within the Project area.

The measures outlined by CFS are acceptable, and the Project will continue to liaise with CFS as the Project progresses. Specifically, a Bushfire Management and Emergency Response Plan will be prepared for the Project in consultation with CFS.

3.5. EPIC ENERGY

EPIC Energy did not provide comments to DPTI on the Bungama Solar Development Application during the referral period.

As an easement authority with a registered interest in the Project land, EPS Energy, on behalf of Bungama Solar, have consulted with EPIC Energy over the course of Project development.

Project representatives met with EPIC Energy in June 2018 to introduce and discuss the Project. No concerns regarding the Project were raised at this meeting.

An update on the Project and an invitation to an information session in Port Pirie was provided to EPIC Energy via email in February 2019. EPIC Energy did not attend the session.

Bungama Solar will continue to liaise with EPIC Energy through the Project development.

4. PUBLIC SUBMISSIONS

A total of six public submissions were received during the public exhibition period. The six submissions were in opposition of the Project. All submissions were received from individuals within 2km radius of the Project.

Two submissions were received on 13/02/2019 from individuals with the same surname and same residential address. The two submissions were identical in content. For the purposes of analysing the submissions, we will refer to these individuals as 'Group A'.

Three submissions were received on 26/02/2019 from individuals with the same surname, two of which hold the same residential address. For the purposes of analysing the submissions, we will refer to these individuals as 'Group B'.

One submission was received on 28/02/2019 from a Napperby couple. For the purposes of analysing the submissions, we will refer to these individuals as 'Group C'.

4.1. SUMMARY OF CONSULTATION

A detailed summary of consultation completed prior to lodgement of the Development Application is provided in the Bungama Solar Community and Stakeholder Engagement Report (Appendix 6 to the Bungama Solar Planning Report). The following additional information is provided to detail the consultation completed post-lodgement of the Project Development Application.

In summary, a second round of on-ground community engagement completed to coincide with the public exhibition period. EPS Energy conducted the on-ground community engagement at the Northern Festival Centre, Port Pirie, over the course of two days:

- Tuesday, 12 February 2019 - Dedicated 'Neighbour Information Session' between 5.30pm – 7pm; and
- Wednesday, 13 February 2019 - General 'Community Information Session' between 10am – 1pm and 3pm – 6pm.

An estimated 49 guests attended the sessions over the two days. This included two neighbouring landowners that could not attend the May/June 2018 Consultation. The response from the wider community, members of the Port Pirie Regional Council, other Government agencies, and the neighbouring landowners was largely positive and supportive of the Project.

In addition to the on-ground community engagement the Project has continued to liaise with the public via meetings, letters, telephone calls and emails. Majority of public communication has been expressions of interest from individuals and organisations wanting to be involved in the Project in the construction and operational phases. A database of expressions of interest is being compiled to provide to the Engineering Procurement and Construction Contractor, when they are appointed.

The remainder of public communication has been with neighbouring landowners that have specific questions and concerns about the Project. EPS Energy, on behalf of Bungama Solar, has been working to address these question and concerns on an ongoing basis. Most neighbouring landowners are satisfied with our ongoing commitment to work with them to address their concerns, and as a result we anticipate this is the reason why they have not lodged an objection submission. To demonstrate with an example, based on further feedback received at the February 2019 neighbour information session from one of the Project's directly adjacent neighbouring landowners in the northern portion of the site (neighbouring Group C), one of the proposed landscaping species and the exact placement of some of the landscaping screen is being amended.

Notwithstanding, some of the neighbouring landowners the Project has been working with have lodged objection submissions. The following sections summarise consultation EPS Energy, on behalf of Bungama Solar, has completed with the Groups thus far.

4.1.1. Group A

EPS Energy, on behalf of Bungama Solar, had contact with Group A prior to receiving written submissions.

In summary, one of the individuals in Group A attended the May/June 2018 Community and Neighbour Information Sessions at Napperby Tennis Club. Following discussions with the individual at the session, the Director of EPS Energy attended Group A's property to discuss in further detail their specific concerns about the Project.

Following the May/June 2018 Community and Neighbour Information Sessions and site visit, EPS Energy sent a letter to Group A on 27/06/2018. The letter thanked Group A for their feedback and confirmed:

- Their comments would be taken into account as part of the next round of Project design;
- A Development Application had not yet been lodged; and
- We would provide another update when the application was lodged along with details of how submissions can be made.

Following this correspondence, the Project design was amended in direct response to the concerns raised. In summary, the following amendments were made:

- In excess of 7 km of visual buffering in the form of landscape screening is proposed at a direct Project cost estimated to exceed $750,000;
- Reducing the land area allocated to solar panels by approximately 24 hectares, equivalent to a reduction of 36,000 panels and equating to approximately $5,000,000 in relinquished income over the life of the Project; and
- Relocating Power Conditioning Units (inverters) away from adjoining boundaries to reduce the potential for noise impact.

On 30/01/2019 EPS Energy sent a letter to Group A advising the Project had received Crown Sponsorship and a Development Application had now been lodged, information on the exhibition period and a summary of how the feedback from the May – June 2018 Consultation has informed the Project's preliminary design. At this time an invitation was also sent to the February 2019 Neighbour and Community Information Session which was being held on 12-13/02/2019 to coincide with the public exhibition period.

A personalised follow-up email was sent to Group A on 13/02/2019 inviting them to the session. Group A did not respond and did not attend the sessions.

4.1.2. Group B

EPS Energy, on behalf of Bungama Solar, had contact with Group B prior to receiving written submissions.

In summary, an individual from Group B contacted the Project on 22/06/2018 and had a 50-minute, detailed telephone conversation in relation to questions and concerns held about the Project. Specifically, matters raised were:

- Property value;
- Visual amenity; and
- Project approval status.

During the phone-call the individual from Group B was directed to the Bungama Project website, where a Frequently Asked Questions document was uploaded with information about property value and visual amenity. The individual from Group B was also provided a detailed overview of the Project approval status. Specifically, it was noted that a Development Application was yet to be lodged and that feedback was being sought from stakeholders to inform the next round of Project design. The individual from Group B was invited to call back if they had any further questions after reviewing the information provided.

Individuals from Group B were invited via letterbox drop and media advertisement to both the May – June 2018 and February 2019 Community Information Sessions. Individuals from Group B did not attend either sessions.

No further contact was received from Group B following 22/06/2018.

4.1.3. Group C

EPS Energy, on behalf of Bungama Solar, had contact with Group C prior to receiving their written submission.

In summary, Group C are directly adjacent neighbouring landowners. As such, it was important to the Project that they were the first to find out information about the Project, and they had a direct line of contact with the Project from the outset of public consultation.

EPS Energy, on behalf of Bungama Solar, first contacted directly adjacent neighbouring landowners via telephone to invite them to the dedicated neighbour information session in May/June 2018. Regarding Group C, the following attempts were made:

- 08/05/2018 – 3.30pm: No answer, left message.
- 09/05/2018 – 1.23pm: No answer, left message.
- 09/05/2018 – 6.27pm: No answer, left message.

Having not received any return telephone correspondence, an information brochure and invitation to the neighbour information session was sent via Express Post to Group C on 11/05/2018.

Group C called and left a message outside of business hours on 20/05/2018. EPS Energy returned the call within business hours on 23/05/2018. During the phone-call, which lasted approximately 30 minutes, the following concerns and questions about the Project were raised:

- Visual amenity;
- Property values;
- Location;
- Project approval status; and
- Compensation.

Group C were encouraged to attend the May/June 2018 neighbour information session at the Napperby Tennis Club to meet representatives of the Project who would be able to talk with them further about their specific concerns.

Group C proceeded to attend the May/June 2018 neighbour information sessions and reiterated their concerns. Group C talked at length with a Project Manager and the Director of Bungama Solar. The outcome of the conversation was organisation of a meeting and site inspection at Group C's property and neighbouring properties.

As agreed at the session, a Project Manager and the Director of Bungama Solar attended Group C's property the following day to understand their specific concerns in further detail so they could be considered in the next round of Project design. Detailed information and photographs were captured at this meeting and subsequently fed back to the design team resulting in the amenity buffer and landscaping screen, as described in Section 4.1.1.

Emails, telephone calls and text messages with Group C were exchanged over the following seven months. The focus of correspondence from the Project was keeping Group C informed of Project design modifications in accordance with their input. The focus of correspondence from Group C was request for financial recompense. Within this period Group C was the subject of a local newspaper article, 'Land-holder's bitter fight with developer of solar farm'.

On 30/01/2019 EPS Energy sent a letter via email to Group C advising the Project had received Crown Sponsorship and a Development Application had now been lodged, information on the exhibition period and a summary of how the feedback from the May – June 2018 Consultation has informed the Project's preliminary design. At this time an invitation was also sent to the February 2019 Neighbour and Community Information Session which was being held on 12-13/02/2019 to coincide with the public exhibition period.

Group C responded to the correspondence but did not attend the February 2019 Neighbour and Community Information Session.

4.2. RESPONSES

An overview of the matters raised in the submissions is depicted in Table 4-1.

Table 4-1: Summary of matters raised in submissions.

	Submission 1	Submission 2	Submission 3	Submission 4	Submission 5	Submission 6	
Matter	**Group A**		**Group B**			**Group C**	**Total**
Visual Amenity	X	X	X	X	X	X	6
Zoning	X	X	X			X	4
Location	X	X		X		X	4
Property Value			X	X	X	X	4
Glint and Glare	X	X		X		X	4
Operational Noise	X	X				X	3
Construction Noise	X	X					2
Construction Dust	X	X					2
Socio-Economic				X			1
Loss of Agricultural Land					X		1
Construction Traffic						X	1
Heat Island Effect						X	1
EMF and RFI						X	1

The specific matters contained within the written submissions, and Bungama Solar responses, are provided in the following sections.

4.2.1. Visual Amenity

Two submissions from Group A, three submissions from Group B, and the Group C submission refer to potential for visual amenity impacts. Visual Amenity was the common theme throughout the submissions and one that is normally raised in objections for renewable energy projects.

Port Pirie Regional Council Development Plan (Consolidated – 31 October 2017) details Councils position on visual amenity impacts from renewable energy facilities.

In summary, the Development Plan anticipates and encourages the introduction of solar farm infrastructure as new components of the landscape in the Primary Production Zone, accepting that it is difficult to mitigate the visual impacts and any potential visual impact needs to be considered alongside other relevant Development Plan provisions, including the aim for an increase in renewable energy generation.

In support of a thorough Planning Report, a Visual Impact Assessment of the Project was completed. The Visual Impact Assessment assessed the existing area surrounding the Project to determine the visual impact of the Project during the operational phase.

The Visual Impact Assessment concluded that the overall visual impact rating to residential and viewpoint receptors was 'Low' and 'Moderate-Low' respectively.

Additionally, the extensive consultation undertaken with the community (including with the groups of individuals that lodged objections), indicated that some residents living in close proximity to the Project were concerned about the visual impact of the Project, while others were impartial. The concerned residents include existing residences (e.g. Group A) and those who own land adjacent to the Project but do not reside on the land as there is no dwelling (e.g. Group C).

In direct response to the concerns raised by some residents, a key mitigation measure was proposed within the Planning Report to further ameliorate the Project visibility. The key mitigation measure is inclusion of in excess of 7 kilometres of landscape screening to form a "amenity buffer zone" in targeted sections of the Project area to further screen the Project. The visual amenity buffer will:

- Setback the PVS behind a 50m amenity buffer zone from parts of the Project boundary for residential receptors, including potential future receptors, and consequently reduce the physical size and scale of the Project, which also reduces the renewable energy production of the Project;
- Establish and maintain within the 50m amenity buffer zone a 10m wide landscape screen of vegetation approximately 3 – 5m in height, further reducing views of the Project; and
- As a result, ameliorate the degrees of visibility of the Project from other receptors located further away from the Project.

This mitigation measure was exhibited at the February 2019 consultation events and received positive feedback from the majority of attendees.

With reference to specific matters contained within the submissions, Group A's comments on visual amenity are particular to preserving views from Olive Grove Road, Napperby towards Port Pirie. Group B's comments on visual amenity are specific to Scenic Drive, Napperby and West Terrace, Napperby towards the Project area. Group C's comments on visual amenity are related to Gulf View Road, Napperby and are concerned with changes to the existing landscape.

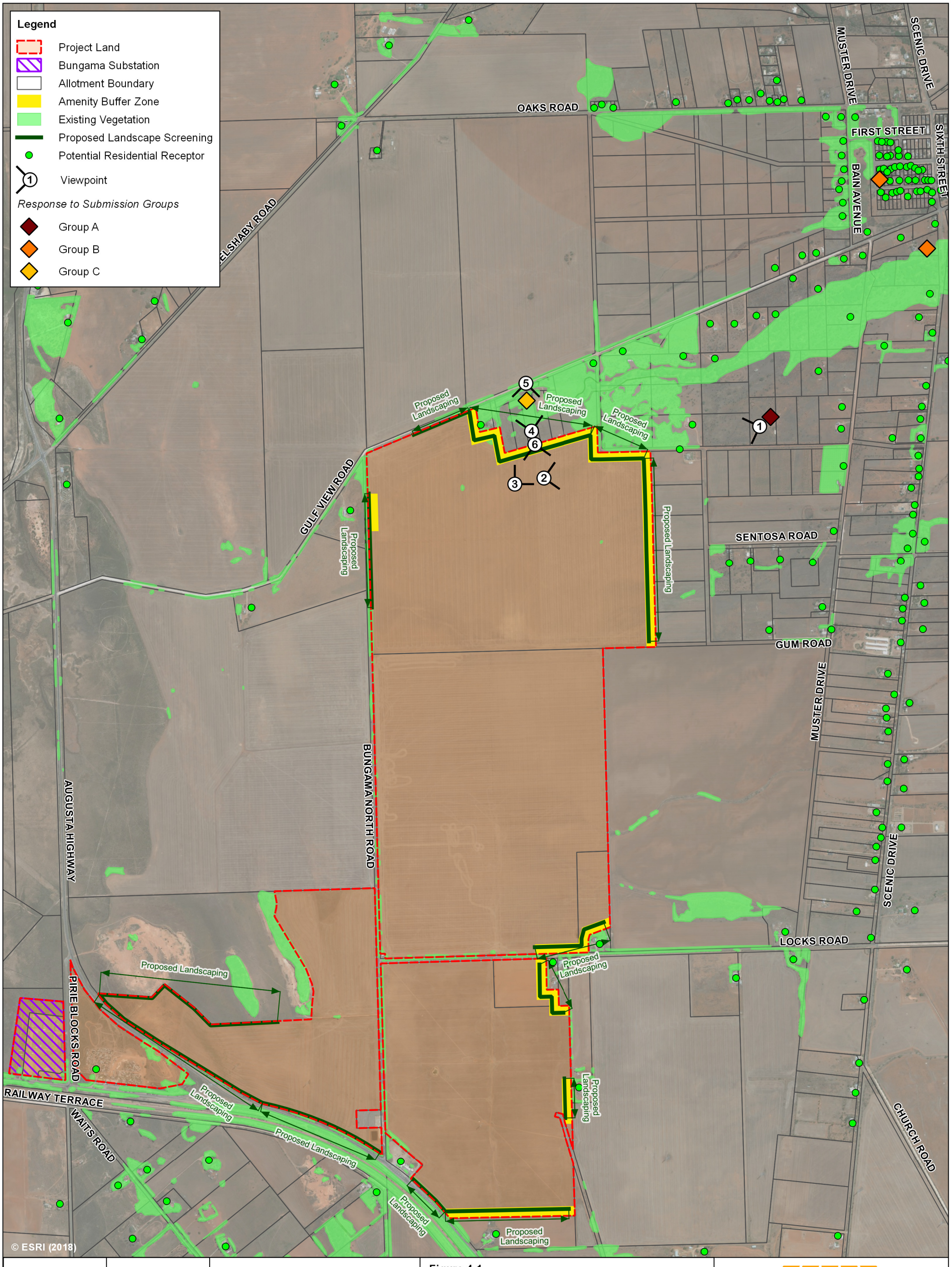
The Visual Impact Assessment determined the significance of visual effect on the Group A residence is classified as 'Moderate-Low' as it is obstructed by other rural residences and scattered vegetation. Plate 1 taken from Viewpoint 1 in Figure 4-1 illustrates the filtered view from the property of the Project area.

The Project area is behind vegetation and built structures (including powerlines) on the cropping land in the middle of the viewshed. The Group A property can also been seen in the centre of in Plate 2 taken from Viewpoint 2 in Figure 4-1. In this photograph, the existing vegetation screening the Project area from the Group A residence is further demonstrated.

The Visual Impact Assessment determined the significance of visual effect on both the Group B residences to be 'Low' as the project is not anticipated to be visible from these receptors. Plate 2 taken from Viewpoint 2 in Figure 4-1 shows the density of existing vegetation which prevents any views of the Project area from the Group B residences in Napperby.

The Visual Impact Assessment accompanying the Planning Report did not review the significance of visual effect on the Group C residence, as there is currently no residence located on the property. The Visual Impact Assessment considered properties adjacent to Group C that have existing residences, and also reviewed views relevant to the Group C property. Extensive consultation with Group C, including analysis of visual impacts informed by a site inspection, has been completed in addition to the Visual Impact Assessment reporting. As can be seen from Plate 3 taken from Viewpoint 3, and Plate 4 taken from Viewpoint 4, and Plate 5 taken from Viewpoint 5 in Figure 4-1, the views from the northern 2/3 of the Group C property are filtered by existing vegetation. Plate 5 from Viewpoint 5 in Figure 4-1 looks towards the Project area with an unobstructed view from near the southern boundary of the Group C property. The unobstructed view at the boundary was one of the reasons the Project design was amended to include the amenity buffer and landscape screening.

The inclusion of mitigation measures outlined in the Visual Impact Assessment and Planning Report, specifically, implementation of an amenity buffer that includes a landscaping screen, will further lower the degree of visibility of the Project from the Group A and Group B residences, and the proposed future residence at the Group C property.



Author:	SW
Reviewer:	SMC/JB
Scale:	1:17,500
Job Ref/Version:	11297/V01

0 200 400 600 800 m

Map Projection: GDA 1994 MGA Zone 54

Figure 4-1

Submission Group Property, Viewpoint and Visual Buffer Zone Locations

Bungama Solar | Bungama SA Australia

21/3/2019

BUNGAMA SOLAR

11297_RTSGroups.qgs

Plate 1: Photograph taken from Viewpoint 1 on Group A's property and insert showing Group A residence facing towards Bungama Solar project area.

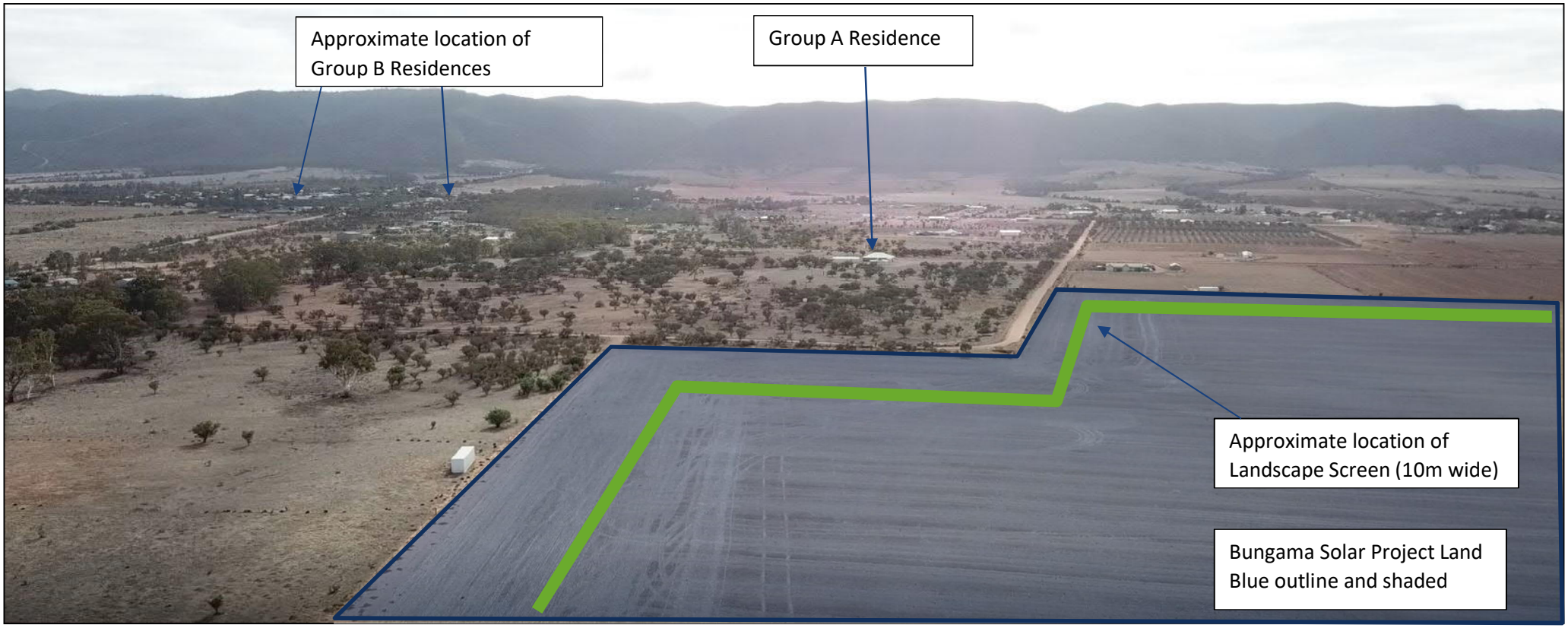


Plate 2: Drone photograph taken from Viewpoint 2 in the Project area towards Group A's property and Group B's properties.

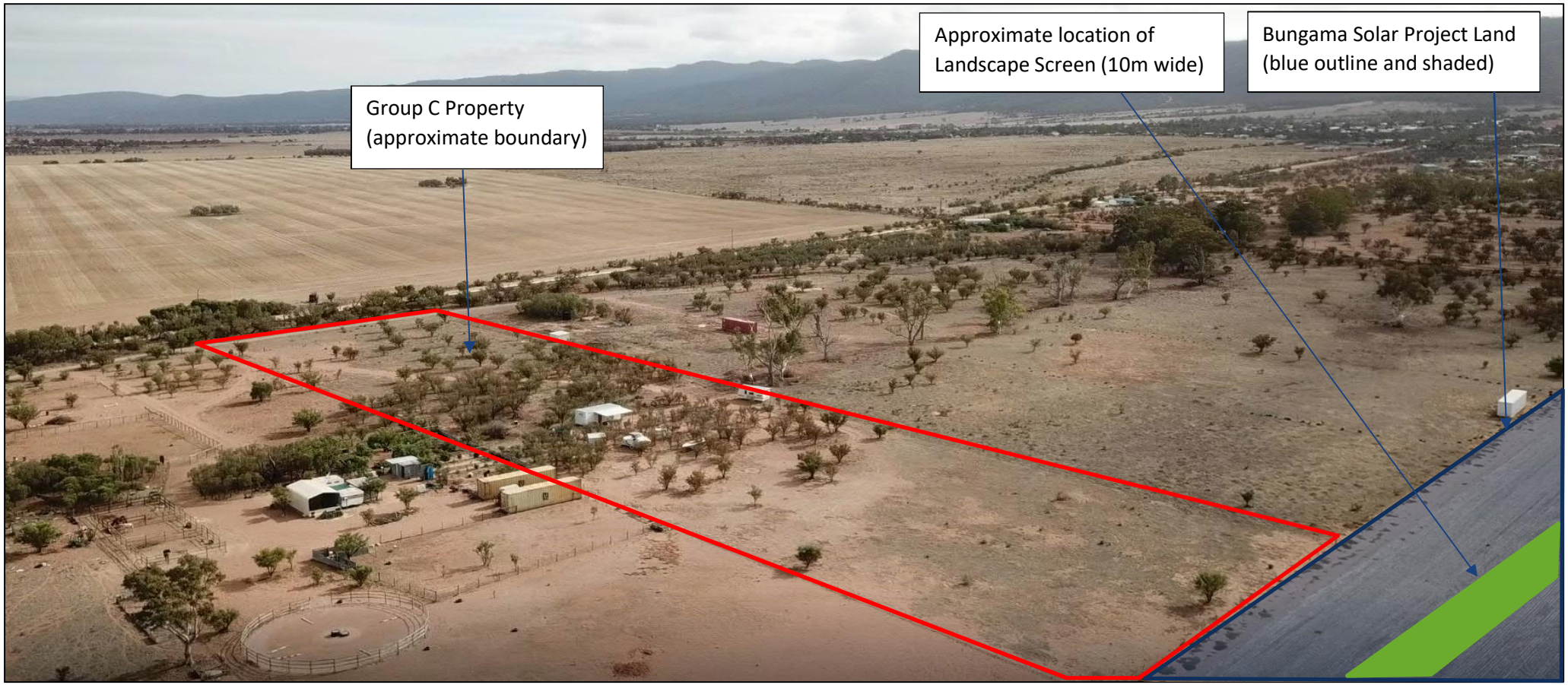


Plate 3: Drone photograph taken from Viewpoint 3 in the Project area overlooking Group C's property

Plate 4: Photograph taken from Viewpoint 4 in Group C's property looking north towards existing vegetation.

Plate 5: Photograph taken from Viewpoint 5, from an internal access road bordering Group C's property, looking south across Group C's property towards the Project area.

Plate 6: Photograph taken from Viewpoint 5 Group C's property looking south towards the Project area.

4.2.2. Zoning

Two submissions from Group A, one submission from Group B, and the Group C submission raise concerns that the Project is located in an area that is not zoned for solar development. The Group C submission further raises concerns that the Project seeks to alter the zoning for the development.

The Project is located within the Primary Production Zone as shown in Zone Map PtPi/14 and Pt/Pi 16.

The Project is a type of renewable energy facility envisaged within the zone and constitutes a component of the zone's desired character, as specified in Port Pirie Regional Council Development Plan (Consolidated – 31 October 2017).

Under the Primary Production Zone provisions, on Page 148 of the Development Plan, it states:

> *Land Use:*
>
> *1. The following forms of development are envisaged in the zone:*
>
> - *solar and ancillary development;*
> - *wind farm and ancillary development;*
> - *wind monitoring mast and ancillary development.*

It is therefore considered that the zoning is appropriate for the Project.

The Project is not seeking to alter the zoning for the development, as it is appropriately zoned for solar development.

4.2.3. Location

Two submissions from Group A, one submission from Group B and the submission from Group C refer to the location of the Project.

The submissions from Group A suggest that the land north of Bungama Substation, west of Augusta Highway would be a more suitable location for the Project.

The individual submission from Group B raised concern that the Project was located *"out at the entrance to Port Pirie".*

The individual submission from Group C suggests relocating the Project to Port Davis.

The site selection process for the Bungama Solar Project was an extensive undertaking. Ultimately the site was selected as it met the following key criteria:

- The Project area is close to, and can access, the Bungama Substation;
- Bungama Substation has the capacity to accept new electricity generation;
- The area has a strong electrical transmission network;
- The landowners of the Project area were receptive to hosting a solar development;

- The Project area is used for agricultural land uses, including cropping and grazing thereby reducing the likelihood of the Project encountering significant areas of native vegetation, Aboriginal cultural heritage items or other environmental constraints;
- Suitable infrastructure surrounding the Project area, including good State and Local road access to the Project area for construction and operation of a solar development;
- Good irritation levels;
- Proximity to the city of Port Pirie, but equally enough distance between the Project area and Port Pirie.

The land located north of the Bungama Substation, west of Augusta Highway was not selected because it did not meet the site selection criteria. Specifically, the land is:

- Identified as 'Wetlands of International Importance' on PtPi/14 Natural Resources map within Port Pirie Regional Council Development Plan (Consolidated – 31 October 2017);
- Covered in Native Vegetation which would require extensive ecological assessment and application for Native Vegetation Clearance to the Native Vegetation Council, likely with the requirement for extensive biodiversity offsets.

The land at Port Davis was not selected because it did not meet the site selection criteria. Specifically, the land is:

- Removed from an appropriate electrical grid connection point;
- Majority zoned 'Costal Conservation' on PtPi/22 Zone map within Port Pirie Regional Council Development Plan (Consolidated – 31 October 2017); and
- Identified as 'Wetlands of International Importance' on PtPi/22 Natural Resources map within Port Pirie Regional Council Development Plan (Consolidated – 31 October 2017).

With respect to the concern raised about the placement of the Project "out at the entrance to Port Pirie" we note the Project is distanced from two defined areas that signal the entrance to Port Pire, which are:

1. The Augusta Highway information signage for Port Pirie (Plate 7), located approximately 4.5km south-east;
2. The built infrastructure along Warnertown Road that physically defines the entrance Port Pirie, located approximately 5km west.

Plate 7: Port Pirie Information Signage on Highway

As noted in the Bungama Solar Planning Report, when travelling along the Augusta Highway at the signposted limit, partial views of the Project land occur for approximately 1 minute and 48 seconds. A substantial amount of electrical infrastructure is already present in this area, including the Bungama Substation and both 275kV and 132kV transmission lines.

Following consultation with the community and Council in May – June 2018, a landscape screen of along all Project boundaries facing the Augusta Highway was incorporated into the Project design. This screen is proposed in addition to the existing vegetation along Augusta Highway. The existing and proposed vegetation is considered appropriate ameliorate any potential impacts on landscape receptors.

4.2.4. Property Value

Three submissions from Group B and the submission from Group C raise concerns about potential influences on surrounding property values.

The submissions essentially raise two concerns in this regard:

1. That properties in the locality would become unsaleable; and/or
2. That the value of properties in the locality would be reduced.

These concerns have been considered with specific regard to:

1. The limited direct sales evidence that is available in the proposed project locality; and
2. A literature review of the most recent and relevant industry and academic studies into the land value impacts of solar and other similar projects.

Direct Sales Evidence

Domain.com.au data shows that there have been five (5) sales of residential land and/or dwellings in the adjoining suburb of Napperby, in the ~10 month period following the initial community engagement for the project (May 2018 to March 2019).

It is reasonable to assume that in a small community, such as Napperby, the project proposal would have been well known by the community and property market participants from this time.

The sales that occurred during this period are listed below:

- Scenic Drive Napperby, Feb 2019;
- Sixth Street Napperby, Oct 2018;
- West Terrace, Napperby, Sep 2018;
- Third Street, Napperby, Aug 2018; and
- First Street, Napperby, May 2018.

By way of comparison, there were four (4) sales that occurred in Napperby over the ~10 months immediately prior to the project's announcement (July 2017 to April 2018).

The sales that occurred during this period are listed below:

- Gulf View Road, Napperby Jan 2018;
- Gulf View Road, Napperby Nov 2017;
- Scenic Drive, Napperby, Sep 2017; and
- Muster Drive, Napperby, July 2017.

Due to the small number of sales available, and the variances between the quality and size of the land and improvements for each of these sales, it is not possible to draw meaningful conclusions regarding any overall change in property market values over this limited period.

However, the sales evidence does provide strong anecdotal evidence that the volume of sales has remained steady or slightly increased following the announcement of the project in May 2018. Certainly, the evidence clearly demonstrates that property in the locality has not become unsaleable.

Literature Review

A literature review was also undertaken. It considered the most recent and relevant industry and academic studies into the land value impacts of solar and other similar projects.

Perhaps due to the relative infancy of the solar industry in Australia, there is a limited body of studies directly considering the property value impacts of Australian solar projects. As such, studies of overseas property markets and the impacts of similar project typologies (such as wind energy) were also considered.

The identified research studies are outlined below in Table 4-2.

Table 4-2: Literature review for property value.

Title	Author	Study Area / Locality	Publication Date
Review of the Impact of Wind Farms on Property Values	Urbis (on behalf of NSW Office of Environment and Heritage)	NSW, Australia	21 July 2016
An Exploration of Property-Value Impacts Near Utility-Scale Solar Installations	The University of Texas, Austin	USA	May 2018
Property Value Impact Study – Proposed Newark Road Solar Energy Use	CohnReznick Valuation Advisory Services	Illinois, USA	2 May, 2018

These studies considered available direct market evidence of project property value impacts, as well as undertaking a 'meta-analysis' of previously published relevant studies.

The Urbis report, being the most relevant Australian based research identified, undertook a meta-analysis of an additional fifteen (15) relevant Australian and international research publications. This included the 2009 NSW Valuer-General's Assessment of the Impact of Wind Farms on Property Prices (August 2009, PRP Valuers).

Overall these studies conclude that:

- Proximity to solar projects has not deterred sales of nearby agricultural or residential property; or
- That there is insufficient direct market data to provide a definitive answer to the question of renewable energy project impacts to surrounding property values; and/or
- Literature review of available Australian and international studies show that the majority of published reports conclude that there is likely no impact or a limited definable impact of renewable energy projects on property values.

It is important to highlight that the Project will not preclude any future uses of either the project site (following the Project operation period) or surrounding properties. The proposed solar facility does not alienate the use of any surrounding properties, nor impose encumbrances on the adjoining properties.

However, it is appreciated that impacts to amenity can be associated with perceptions of property value impacts. Accordingly, the project has due regard to the value of surrounding properties, by minimizing amenity impacts wherever possible, both for the general locality and to specific surrounding properties.

While respecting that some members of the community will not regard the public interest of the renewable energy project to outweigh the more immediate impacts to amenity, the development of the Project is permissible and must be considered on its planning merits.

The planning merits are not a question of whether it does or does not have impacts, but rather whether those impacts to amenity are reasonable, have public interest and are sufficiently consistent with planning regulations.

4.2.5. Glint and Glare

The two submissions from Group A, and one submission from Group B, and the submission from Group C refer to potential for glint and glare impacts on their properties located to the north and north-east of the Project area.

The Glint and Glare Analysis included with the Bungama Solar Planning Report used a conservative approach to model the potential glint and glare impacts of the Project. The model did not take into account existing obstacles (e.g. vegetation and built structures) and considered a typical clear day solar irradiance profile (i.e. the worst-case scenario for glare).

The Glint and Glare Analysis indicated that the properties located to the north-east of the Project area may experience Green Glare (low-level glare) during some early mornings or late evenings in Autumn and/or Winter when looking towards the panel area, if the view was unimpeded.

As a result of these findings, and extensive stakeholder consultation, a visual buffer zone (including a landscape screen) was proposed in addition to retention of existing obstacles (e.g. vegetation and structures) to ameliorate potential the low-level glare identified within the Glint and Glare Analysis report.

Specific to the properties identified in the submissions, the Glint and Glare Analysis noted that, without existing vegetation, Group A may experience some limited Green Glare (low-level glare) during the early hours of the day. It was modelled that this glare would only be experienced for up to 12 minutes per day in Autumn through to Spring. The Glint and Glare Analysis concluded the existing vegetation is sufficient to ameliorate any Green Glare (low-level glare) at this property. The landscape screen is proposed in addition to the existing vegetation, therefore appropriately addressed any concerns raised in the submission.

The Glint and Glare Analysis identified that the Group B is not expected to experience any glare at either of their properties. No mitigation measures were identified as required for either of the Group B properties. Nonetheless, the landscape screen is proposed along all boundaries of the Project facing the Group B properties.

The Glint and Glare Analysis did not specifically analyse Group C's property because there is no existing residence. However, extrapolating based on the results from the nearest analysed point, it is anticipated, without existing vegetation, the Group C property may experience Green Glare (low-level glare) for up to 45 minutes in the early morning and later afternoon of days in Autumn through to Spring. It was concluded that this glare would be screened by existing vegetation.

A recent Expert Witness Report prepared for the Council of the City of Greater Shepparton found modern solar panels reflect only 2% of incoming sunlight, as they are designed to absorb as much as possible to convert into electricity efficiently (Guthrie, 2018).

The report also found the typical maximum tilt of tracking panels (approximately 60%), does not enable reflection onto neighbouring properties, as when the sun is at its lowest points the light is reflected upwards (Guthrie, 2018).

Figure 4-1 demonstrates the location of existing and proposed screening vegetation in relation to the Group's properties. In summary, as supported by the figure, while the existing obstacles are considered appropriate to ameliorate the limited potential for low-level glare, the additional measure of implementing a landscaping screen is considered appropriate to address the any concerns raised in the submissions.

4.2.6. Operational Noise

The two submissions from Group A and the Group C submission refer to operational noise of the Project.

The Project amenity buffer ensures that all noise generating components will be setback by a minimum of 50 metres from the boundary in the north-east areas of the site.

The Noise Assessment included with the Bungama Solar Planning Report used a 'worst-case' scenario to model the operational noise of the Project. The results of the modelling calculated noise levels to be less than 35dBA during the daytime and 38dBA during the night time at all existing and identified potential future residences.

At the Group A residence, the modelled operational noise emissions are: 25dBA day period, 28dBA night period. At the Group C potential future residence, the modelled operational noise emissions are 32dbA day period, 35dBA night period. For reference, the following figure illustrates the Decibel Scale with commonly recognised examples of equivalent noise levels across the Decibel Scale.

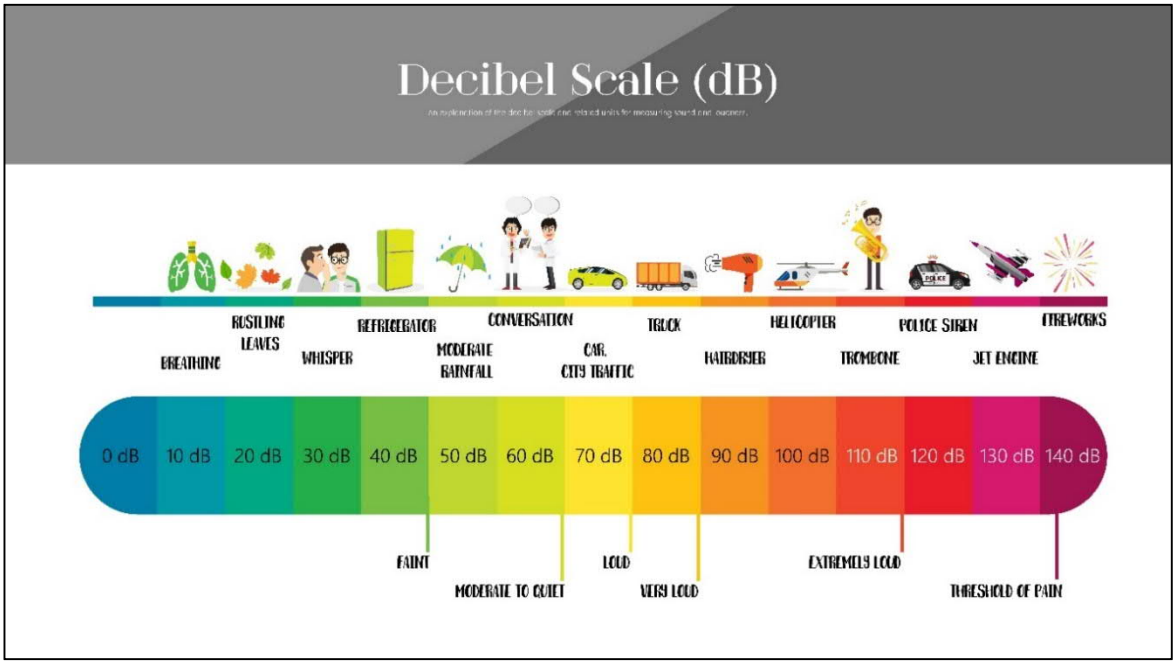


Figure 4-2: Depiction of Decibel Scale

The results of the Noise Assessment show compliance with the relevant operational noise criteria.

It is important to note the inverters and panels do not operate at night, which will further reduce the anticipated operational noise to daylight hours.

4.2.7. Construction Dust

The two submissions from Group A refer to dust generation in the construction phase of the Project.

The dust generated during the construction phase will be managed through a dust management plan, which will form part of the Construction Environmental Management Plan (CEMP).

In the Bungama Solar Planning Report, a number of mitigation measures have been identified for management of dust during the construction phase, including provision for dust suppression activities.

4.2.8. Construction Noise

The two submissions from Group A refer to noise from vehicles and construction work during the construction phase of the Project.

A Noise Assessment was completed as part of the Bungama Solar Planning Report. The Noise Assessment found noise emissions during the construction phase are expected to be less than 45dBA at existing and identified potential future receptors and therefore will be compliant with the *Environment Protection (Noise) Policy 2007* and not cause adverse impacts. Further, the Noise Assessment demonstrated that the road noise criteria, as specified in the Road Traffic Noise Guideline will be satisfied at all receptors on the proposed transport route.

The results of the Noise Assessment show compliance with the relevant construction and traffic criteria.

4.2.9. Socio-Economic

One submission from Group B suggests that the Project will have a destructive effect on the community.

Extensive community consultation has been completed for the Project, including:

- Four days of on-ground community engagement spread over two years with an estimated total of 173 attendees, including 77% of directly adjacent neighbouring landowners; and
- Over 200 telephone-calls, emails and meetings with the public and neighbouring landowners.

Feedback from the community has mostly been supportive of the development, and of solar projects and technology in general. Specific feedback on preference for solar over wind development has been received from the community.

This sentiment is supported with EPS Energy's industry experience, which suggests wind farms can be more polarising in communities due to visual and other matters.

A Socio-Economic Impact Assessment was completed as part of the Bungama Solar Planning Report. The Socio-Economic Impact Assessment concludes the Project will have a number of local community benefits, such as:

- Industry diversity for the Port Pirie region;
- Generate an estimated economic benefit in the order of $292.5 million for the broader economy and approximately $164 million as direct domestic Project expenditure;
- Generate up to an estimated 275 equivalent full-time jobs during construction, and a further 410 indirect full-time equivalent jobs;
- Generate up to an estimated 8 equivalent full-time jobs during operations; and
- Provide a direct benefit to the community in the form of a community fund.

It is considered that the positive socio-economic benefits of the Project, will outweigh any perceived negative effects.

4.2.10. Loss of Agricultural Land

One submission from Group B raised concerns with the loss of agricultural land.

The properties that comprise the Project area have historically been used for agricultural purposes including cereal cropping and grazing.

The possible medium - term change of land use of approximately 5.3km² of agricultural land is a very minor (0.02%) change on the region's 3.2 million+ hectare agricultural production potential (Based on Australian Bureau of Agricultural and Resource Economics land use data 2011).

Investigations are being undertaken to assess if sheep grazing or other co-located limited agricultural activities under the panels is feasible during the operation phase.

After the Project's decommissioning the Project area will be available for agricultural production. Consequently, the Project will not have an adverse impact on the long-term agricultural use of the land.

4.2.11. Construction Traffic

The Group C submission notes representatives of the Project have confirmed with Group C that their *"communal farm access road"* will not be part of the construction and/or operation traffic route(s) for the Project. The road referred to is a private access road off Gulf View Road to the north of the site.

The Project does not intend to use the *"communal farm access road"* identified in the Group C submission for the construction and/or operation traffic route(s).

A Traffic Management Plan will be prepared for the Project, in consultation with DPTI and Council, which will include definition of construction traffic route(s).

4.2.12. Heat Island Effect

The Group C submission refers to the potential for heat island effect.

Existing research on heat island effect is predominantly focussed on comparing urban environments to surrounding agricultural or greenfield areas. Land use changes can result in variations in temperature due to differences in absorption properties. For example, removing vegetation for urban development, or cropping, can result in localised temperature variations.

A limited number of studies acknowledge the potential for utility scale solar development to slightly vary temperature conditions within project area boundaries and a short distance beyond the project boundary, subject to how close the panels are to the boundary. It is widely accepted that any heat generated from solar development would dissipate rapidly beyond the project boundary and overnight.

Studies on localised temperature variations resulting from solar development note it is important to contextualise the potential heat island effect in terms of projects capacity to reduce greenhouse gas emissions and reduce global warming effects. That is, overall, the likely temperature stabilising benefit of developing a renewable energy facility is anticipated to outweigh localised temperature variation.

A recent Expert Witness Report prepared for the Council of the City of Greater Shepparton found studies on heat island effect of solar development have been on fixed panel systems, rather than tracking panel systems. Tracking systems are spread further apart (i.e. have greater row spacing) than stationary panels and, if parked near vertically overnight (50-60 degrees), can allow radiant heat loss to the sky. Both systems also intercept solar irradiance therefore provide shade to the ground under the array. The Project preference is for tracking over fixed panel systems.

The expert witness concluded that an elevated temperature would be experienced within the solar farm, compared to the same site in its current use. The expert noted this temperature disparity is consistent with any land use change and has even been recorded in Victoria from between different agricultural uses (i.e. dryland vs irrigated).

The expert witness noted there are a number of technical measures that can be employed to address the potential for heat island effect, including:

- Using commercially available high-efficiency panels;
- Turning the tracking systems toward the vertical position overnight to facilitate radiant cooling and natural convection;
- Retaining vegetation under panel area and retaining and planting vegetation around the Project area to contribute to cooling via transpiration.

The use of commercially available high-efficiency panels, and the retention and planting of vegetation already form part of the Project proposal. Tilting of tracking systems overnight will be considered as part of the Operations Management Plan for the site.

One of the potential suppliers for the Projects panel technology note their system is designed specifically to reflect certain wavelengths of light to prevent unnecessary light and heat absorption, as when solar cells are heated, they operate at lower efficiencies.

The Expert Witness Report also analysed potential for off-site impacts from heat island effect. The report noted in situations where there is no screening, air temperatures drop dramatically within the first 100 metres from the perimeter of the solar farm, and approach ambient by 300 metres. The expert witness concluded *"heat flow both by radiation and convection from the PV farm to the surrounding area can be substantially reduced by suitable screening"* (Guthrie, 2018).

The rapid dissipation of heat associated with heat island effect, coupled with the proposed buffer zones, result in the potential for heat island effect impacts on land outside the Project area to be low.

4.2.13. EMF and RFI

The Group C submission raised Electric and Magnetic Fields (EMF) and Radio Frequency Interference (RFI) as *"other concerns"* generally associated with solar facilities.

The Bungama Solar Planning Report addresses both EMF and RFI. A summary of the information contained within the Planning Report is included below.

At present, the Project area and adjacent land contain utility scale electrical infrastructure, including a substation and powerlines.

EMF are produced by all electrical equipment, from high voltage powerlines to hairdryers, with fields increasing with voltage and current respectively. Fields drop away rapidly with distance from the source. For example, in unshielded overhead high voltage transmission lines, EMF would drop to approximately zero within 60 metres.

Some of the Project's EMF generating components will include: photovoltaic panels, transmission lines, inverters and the Battery Energy Storage System.

RFI can be generated by electrical apparatus. Under the *Radio Communications Act 1992,* the Australian Communications Media Authority (ACMA) is responsible for regulating the use of equipment that might affect important telecommunications.

Solar inverters do emit harmonics, but not RFI waves and therefore will not directly affect television transmissions. The inverters being considered for the Project have been tested to international standards and have proven to not disturb radio signals except in the immediate area around the inverter (within 5 metres or less).

The Bungama Solar Planning Report concluded the potential for the Project to adversely impact the existing EMF and RFI environment was low.

Notwithstanding, mitigation measures were proposed in the Planning Report to address EMF and RFI. Some of the key mitigation measures include:

- Installing electrical infrastructure to the relevant Australian standards;
- Siting photovoltaic system back behind the Project boundary;
- Siting inverters for the PVS outside a 200-metre radius of existing and anticipated future dwellings (e.g. Group C's property); and
- Locating high voltage electrical equipment (e.g. the Battery Energy Storage System, Project substation and switchyard) appropriately on the Project area.

5. CONCLUSION

This Response to Submissions has considered comments from Port Pirie Regional Council, prescribed regulatory bodies and the three public groups that provided written submissions objecting to the Project.

In sum, no objections were received from Port Pirie Regional Council or any prescribed regulatory bodies. The comments provided by Council and the prescribed regulatory bodies are acknowledged and will be taken into consideration at the relevant Project stage. It is noted that many of the comments will form the basis of conditions of consent.

The concerns raised by the three groups that provided written objections have been reviewed and responded to within this document. As noted, in direct response to concerns raised by these groups, and other individuals that did not lodge objection submissions, significant design amendments have been made to reduce the potential for adverse impacts, including:

- In excess of 7km of visual buffering in the form of landscape screening is proposed at a direct project cost estimated to exceed $750,000;
- Reducing the land area allocated to solar panels by approximately 24 hectares, equivalent to a reduction of 36,000 panels and equating to approximately $5,000,000 in relinquished income over the life of the project; and
- Power Conditioning Units (inverters) near adjoining boundaries being located in the final Project design no closed than 200m from existing residences to reduce the potential for noise impact.

The Project is committed to ongoing community and stakeholder engagement. As such, the Project will continue to consult with the groups that lodged submissions, and the wider community throughout all stages of Project development.

REFERENCES

Barron-Gafford, G. et al. (2016) *The Photovoltaic Heat Island Effect: Larger solar power plants increase local temperatures*, Scientific Reports 6, Article number: 35070 https://doi.org/10.1038/srep35070

BV Consulting (2018) *Glint and Glare Analysis – Bungama Solar*, South Australia, 06/05/2018

Bungama Solar (2018) *Bungama Solar Planning Report*, prepared by EPS Energy, Reference 11297

CohnReznick Valuation Advisory Services (2018) *Property Value Impact Study – Proposed Newark Road Solar Energy Use*, May 2018, Illinois USA

Guthrie, K. (2018) *Planning Panels Victoria Expert Witness Report*, Solar Farm Planning Permit Application Nox 2017-162, 2019-274, 2017-301 and 2017-344 for Solar Farms at Tatura East, Tallygaroopna, Lemnos and Congupna, report prepared for City of Greater Shepparton by Sustainable Energy Transformation.

MAC (2018) *Noise Assessment – Bungama Solar*, MAC180707RP1, 26/10/2018, Muller Acoustic Consulting Pty Ltd

Urbis (2016) *Review of the Impact of Wind Farms of Property Values, 21/07/2016*

University of Texas (2018) *An Exploration of Property-Value Impacts Near Utility-Scale Solar Installations,* May 2018, The University of Texas, Austin, USA

Development Plan Policies
Port Pirie Regional Council Development Plan
Consolidated 31 October 2017

Primary Production Zone

OBJECTIVES

1 The long term continuation of primary production, including value adding activities associated with primary production.

2 Economically productive, efficient and environmentally sustainable primary production.

3 Allotments of a size and configuration that promote the efficient use of land for primary production.

4 Protection of primary production from encroachment by incompatible land uses and protection of scenic qualities of rural landscapes.

5 Wind farms and ancillary development located in the zone, accepting that this may need to be sited in visually prominent locations to take advantage of natural resources such as wind.

6 Development that contributes to the desired character of the zone.

DESIRED CHARACTER

The zone covers the greater majority of the Council area between the edge of the ranges to the north east and the coastal regions to the west, apart from the specialist zones associated with the existing townships. The natural character of the area is therefore predominantly gently undulating, open cleared rural land that includes the Broughton river system, the Clements Gap Conservation Park and isolated pockets of remnant vegetation.

The area is strategically located in relation to the major infrastructure networks providing transport linkages through the area, including National Highway 1 and the National Rail link. It also contains the alignment of the Morgan-Whyalla pipeline, major power transmission lines and a linkage to the natural gas pipeline network.

Agriculture production within the rural area contributes the most significant component to the local economy, principally in the form of broad acre cropping and livestock production together with diversification and value-adding. The central location and the nature of the land, the accessibility to primary produce sourced from the national transport routes as well as local and the region and the proximity to the range of transport networks, infrastructure and local employment services promotes the area to a wide range of value-adding activities associated with primary produce.

It is envisaged that the area will continue to accommodate agricultural activities as the dominant land uses and that selected value-adding activities will be developed to compliment and expand on the existing rural activities in the region. It is important that all future activity within the area will have regard to the maintenance of agricultural productivity, minimizing fragmentation of rural land, protection of natural resources,

minimizing fire risk, protecting natural views and providing appropriate buffers to adjoining sensitive uses.

Wind farms and ancillary development are an envisage form of development within the zone. Such facilities may be of a large scale, comprise a number of components and require an extended and/or dispersed development pattern. These facilities will need to be located in areas where they can take advantage of the natural resource upon which they rely and, as a consequence may be need to be:

- *located in visually prominent locations such as ridgelines*
- *visible from scenic routes and valuable scenic and environmental areas*
- *located closer to roads than envisaged by generic setback policy.*

This, coupled with the large scale of these facilities (in terms of both height and spread of components), renders it difficult to mitigate the visual impacts of wind farms to the degree expected of other types of development. Subject to implementation of management techniques set out by general / council wide policy regarding renewable energy facilities, these visual impacts are to be accepted in pursuit of benefits derived from increased generation of renewable energy.

PRINCIPLES OF DEVELOPMENT CONTROL

Land Use

1 The following forms of development are envisaged in the zone:

- bulk handling and storage facility
- commercial forestry
- dairy farming
- farming
- horticulture
- intensive animal keeping
- tourist accommodation (including through the diversification of existing farming activities and conversion of farm buildings)
- solar and ancillary development
- value-adding activities associated with primary production
- wind farm and ancillary development
- wind monitoring mast and ancillary development.

2 Development listed as non-complying is generally inappropriate.

3 Wind farms and ancillary development should be located in areas which provide opportunity for harvesting of wind and efficient generation of electricity and may therefore be sited:

(a) in visually prominent locations in the landscape
(b) closer to roads and not to be subject to the setback requirements of other forms of development.

6 Buildings, other than where required to facilitate wind farms and ancillary development, should primarily to be limited to farm buildings, a detached dwelling associated with primary production or a tourist related use on the allotment and residential outbuildings that are:

(a) grouped together on the allotment and set back from allotment boundaries to minimise the visual impact of buildings on the landscape as viewed from public roads
(b) screened from public roads and adjacent land by existing vegetation or landscaped buffers.

Form and Character

10 Development should not be undertaken unless it is consistent with the desired character for the zone.

11 Development should not occur within 500 metres of a National Park, Conservation Park, Wilderness Protection Area or significant stands of native vegetation if it will increase the potential for, or result in, the spread of pest plants.

12 Development should provide an access way of at least 3 metres wide that provides access for emergency vehicles to the rear of the allotment.

13 Development on land situated between National Highway 1 and **Landscape Protection Policy Area 10** should be designed and sited to ensure the natural view of the ranges is not impaired.

Land Division

14 For land not within a policy area, land division, including boundary realignments, should only occur where it:

(a) will promote economically productive, efficient and sustainable primary production and not create any allotment less than 40 hectares in area.

15 Land division involving boundary realignments should only occur where the number of resulting allotments of less than 40 hectares is not greater than the number that existed prior to the realignment.

Industry Zone

OBJECTIVES

1 A zone primarily accommodating a wide range of industrial, warehouse, storage and transport land uses.

2 A high standard of development which promotes good design, with high visual amenity to improve the character and appearance of the area, particularly along zone interfaces and public roads.

6 A visually attractive appearance of land visible from the Port Pirie to Warnertown Road and Germein Road.

PRINCIPLES OF DEVELOPMENT CONTROL

Land Use

1 The following forms of development are envisaged in the zone:

- industry
- office in association with and ancillary to industry
- transport distribution
- warehouse.

2 Development listed as non-complying is generally inappropriate.

Form and Character

8 Any plant or equipment with potential to cause an environmental nuisance (including a chimney stack or air-conditioning plant) should be sited as far as possible from adjoining non-industrially zoned allotments, and should be designed to minimise its effect on the amenity of the locality.

10 There should be limited access to and egress from land along the Port Pirie to Warnertown Road and, east of Copinger Road, along Germein Road.

11 Development adjacent to the Port Pirie to Warnertown Road and to the Germein Road should include substantial landscaping designed to screen views of buildings and enhance the appearance of land from those roads.

Rural Living Zone

OBJECTIVES

1 A zone consisting of large allotments, detached dwellings and rural activities that do not adversely impact the amenity of the locality.

2 A pleasant rural - residential character as derived from allotments of sufficient size to support mixed small-scale rural activities, landscaping and dwellings.

3 Land developed and managed to avoid degradation of land through over intensive use.

DESIRED CHARACTER

The semi-rural character of the zone should be reinforced and strengthened through the design and sitting of buildings and homesteads, open style fencing and appropriate landscaping to compliment the changing landscape.

PRINCIPLES OF DEVELOPMENT CONTROL

Land Use

1 The following forms of development are envisaged in the zone:

- detached dwelling
- domestic outbuilding in association with a detached dwelling
- domestic structure

- dwelling addition
- farming
- farm building
- stable.

2 Development listed as non-complying is generally inappropriate.

11 Development should be screened with suitable vegetation to ensure that the open and rural character and amenity of the zone is maintained and enhanced.

12 Rural living activities should be of a scale and intensity compatible with the rural living/residential development in and adjacent to the **Rural Living Zone** and **Residential Zone** in particular.

13 Residential developments on allotments that interface with an adjoining **Primary Production Zone** should be located at least 40 metres from the zone boundary specifically designed to minimise potential chemical spray drift.

Rural Living Policy Area 13

OBJECTIVES

1 A policy area accommodating rural living on existing allotments with provision for low intensity animal keeping.

2 No additional allotments.

DESIRED CHARACTER

The policy area includes the existing rural living settlement of Bungama, located east of Port Pirie and the Napperby Creek Estate. This policy area contains allotments of varying sizes, which should primarily accommodate rural living and associated low intensity animal keeping on existing allotments.
The policy area is also located on the western side of the National highway and the township of Warnertown and provides for rural living and associated low intensity animal keeping on existing allotments.

PRINCIPLES OF DEVELOPMENT CONTROL

Land Use

1 The following forms of development are envisaged in the policy area:
- detached dwelling
- domestic outbuilding in association with a detached dwelling
- domestic structure
- dwelling addition
- stable.

Form and Character

2 Development should not be undertaken unless it is consistent with the desired character for the policy area.

3 Development should primarily be detached dwellings with ancillary rural living activities.

GENERAL SECTION

Design and Appearance
OBJECTIVES

1 Development of a high design standard and appearance that responds to and reinforces positive aspects of the local environment and built form.

2 Roads, open spaces, paths, buildings and land uses laid out and linked so that they are easy to understand and navigate.

PRINCIPLES OF DEVELOPMENT CONTROL

1 Buildings should reflect the desired character of the locality while incorporating contemporary designs that have regard to the following:

(a) building height, mass and proportion
(b) external materials, patterns, colours and decorative elements
(c) roof form and pitch
(d) façade articulation and detailing
(e) verandas, eaves, parapets and window screens.

2 Where a building is sited on or close to a side or rear boundary, the boundary wall should minimise:

(a) the visual impact of the building as viewed from adjacent properties
(b) overshadowing of adjacent properties and allow adequate sunlight access to neighbouring buildings.

3 The external walls and roofs of buildings should not incorporate highly reflective materials which will result in glare to neighbouring properties, drivers or cyclists.

4 Structures located on the roofs of buildings to house plant and equipment should be screened from view and should form an integral part of the building design in relation to external finishes, shaping and colours.

6 Transportable buildings and buildings which are elevated on stumps, posts, piers, columns or the like, should have their suspended footings enclosed around the perimeter of the building, and the use of verandas, pergolas and other suitable architectural detailing to give the appearance of a permanent structure.

Visual Privacy

11 Permanently fixed external screening devices should be designed and coloured to complement the associated building's external materials and finishes.

Relationship to the Street and Public Realm

12 Buildings (other than ancillary buildings, group dwellings or buildings on allotments with a battle axe configuration) should be designed so that the main façade faces the primary street frontage of the land on which they are situated.

13 Buildings, landscaping, paving and signage should have a coordinated appearance that maintains and enhances the visual attractiveness of the locality.

14 Buildings should be designed and sited to avoid extensive areas of uninterrupted walling facing areas exposed to public view.

15 Building design should emphasise pedestrian entry points to provide perceptible and direct access from public street frontages and vehicle parking areas.

Outdoor Storage and Service Areas

19 Outdoor storage, loading and service areas should be:

(a) screened from public view by a combination of built form, solid fencing and/or landscaping
(b) conveniently located and designed to enable the manoeuvring of service and delivery vehicles
(c) sited away from sensitive land uses.

Building Setbacks from Road Boundaries

20 Except in areas where a new character is desired, the setback of buildings from public roads should:

(a) be similar to, or compatible with, setbacks of buildings on adjoining land and other buildings in the locality
(b) contribute positively to the function, appearance and/or desired character of the locality.

21 Except where specified in a particular zone, policy area or precinct, buildings and structures should be set back from road boundaries having regard to the requirements set out in *Table PtPi/1 - Building Setbacks from Road Boundaries.*

22 Except where specified in a particular zone, policy area or precinct, the main face of a building should be set back from the primary road frontage in accordance with the following table:

Setback difference between buildings on adjacent allotments	**Setback of new building**
Up to 2 metres	The same setback as one of the adjacent buildings, as illustrated below:
Greater than 2 metres	At least the average setback of the adjacent buildings

Hazards

OBJECTIVES

1 Maintenance of the natural environment and systems by limiting development in areas susceptible to natural hazard risk.

2 Development located away from areas that are vulnerable to, and cannot be adequately and effectively protected from the risk of natural hazards.

3 Critical community facilities such as hospitals, emergency control centres, major service infrastructure facilities, and emergency service facilities located where they are not exposed to natural hazard risks.

4 Development located and designed to minimise the risks to safety and property from flooding.

5 Development located to minimise the threat and impact of bushfires on life and property.

6 Expansion of existing non-rural uses directed away from areas of high bushfire risk.

7 The environmental values and ecological health of receiving waterways and marine environments protected from the release of acid water resulting from the disturbance of acid sulfate soils.

8 Protection of human health and the environment wherever site contamination has been identified or is suspected to have occurred.

9 Appropriate assessment and remediation of site contamination to ensure land is suitable for the proposed use and provides a safe and healthy living and working environment.

10 Minimisation of harm to life, property and the environment through appropriate location of development and appropriate storage, containment and handling of hazardous materials.

PRINCIPLES OF DEVELOPMENT CONTROL

1 Development should be excluded from areas that are vulnerable to, and cannot be adequately and effectively protected from, the risk of hazards.

2 Development located on land subject to hazards as shown on the *Overlay Maps - Development Constraints* should not occur unless it is sited, designed and undertaken with appropriate precautions being taken against the relevant hazards.

3 There should not be any significant interference with natural processes in order to reduce the exposure of development to the risk of natural hazards.

4 Development should minimise airborne dust during both the construction and operational phases through appropriate construction and design management.

Flooding

5 Development should not occur on land where the risk of flooding is likely to be harmful to safety or damage property.

6 Development should not be undertaken in areas liable to inundation by tidal, drainage or flood waters unless the development can achieve all of the following:

(a) it is developed with a public stormwater system capable of catering for a 1-in-100 year average return interval flood event
(b) buildings are designed and constructed to prevent the entry of floodwaters in a 1-in-100 year average return interval flood event.

7 Development, including earthworks associated with development, should not do any of the following:

(a) impede the flow of floodwaters through the land or other surrounding land
(b) increase the potential hazard risk to public safety of persons during a flood event
(c) aggravate the potential for erosion or siltation or lead to the destruction of vegetation during a flood
(d) cause any adverse effect on the floodway function
(e) increase the risk of flooding of other land
(f) obstruct a watercourse.

Bushfire

8 The following bushfire protection principles of development control apply to development of land identified as General, Medium and High bushfire risk areas as shown on the *Bushfire Protection Area BPA Maps PtPi/1 to PtPi/13 - Bushfire Risk*.

9 Development in a Bushfire Protection Area should be in accordance with those provisions of the *Minister's Code: Undertaking development in Bushfire Protection Areas* that are designated as mandatory for Development Plan Consent purposes.

10 Buildings and structures should be located away from areas that pose an unacceptable bushfire risk as a result of one or more of the following:

(a) vegetation cover comprising trees and/or shrubs
(b) poor access
(c) rugged terrain
(d) inability to provide an adequate building protection zone
(e) inability to provide an adequate supply of water for fire fighting purposes.

11 Residential, tourist accommodation and other habitable buildings should:

(a) be sited on the flatter portion of allotments and avoid steep slopes, especially upper slopes, narrow ridge crests and the tops of narrow gullies, and slopes with a northerly or westerly aspect
(b) be sited in areas with low bushfire hazard vegetation and set back at least 20 metres from existing hazardous vegetation
(c) have a dedicated and accessible water supply available at all times for fire fighting.

12 Extensions to existing buildings, outbuildings and other ancillary structures should be sited and constructed using materials to minimise the threat of fire spread to residential, tourist accommodation and other habitable buildings in the event of bushfire.

13 Buildings and structures should be designed and configured to reduce the impact of bushfire through using simple designs that reduce the potential for trapping burning debris against the building or structure, or between the ground and building floor level in the case of transportable buildings.

16 Vehicle access and driveways to properties and public roads created by land division should be designed and constructed to:

(a) facilitate safe and effective operational use for fire fighting and other emergency vehicles and residents
(b) provide for two-way vehicular access between areas of fire risk and the nearest public road.

Site Contamination

23 Development, including land division, should not occur where site contamination has occurred unless the site has been assessed and remediated as necessary to ensure that it is suitable and safe for the proposed use.

Containment of Chemical and Hazardous Materials

24 Hazardous materials should be stored and contained in a manner that minimises the risk to public health and safety and the potential for water, land or air contamination.

25 Development that involves the storage and handling of hazardous materials should ensure that these are contained in designated areas that are secure, readily accessible to emergency vehicles, impervious, protected from rain and stormwater intrusion and other measures necessary to prevent:

(a) discharge of polluted water from the site
(b) contamination of land
(c) airborne migration of pollutants
(d) potential interface impacts with sensitive land uses.

Industrial Development

OBJECTIVES

1 Industrial, warehouse, storage and transport distribution development on appropriately located land, integrated with transport networks and designed to minimise potential impact on these networks.

2 The development of small scale agricultural industries, wineries, mineral water extraction and processing plants, and home based industries in rural areas.

3 Industrially zoned allotments and uses protected from encroachment by adjoining uses that would reduce industrial development or expansion.

4 Industrial development occurring without adverse effects on the health and amenity of occupiers of land in adjoining zones.

5 Compatibility between industrial uses within industrial zones.

6 The improved amenity of industrial areas.

7 Co-location of industries in townships to enable promotion and implementation of innovative waste recovery practices, methods of power generation and reuse of by-products.

PRINCIPLES OF DEVELOPMENT CONTROL

1 Offices and showrooms associated with industrial, warehouse, storage and transport development should be sited at the front of the building with direct and convenient pedestrian access from the main visitor parking area.

3 Industrial development should enable all vehicles to enter and exit the site in a forward direction.

4 Industrial development abutting an arterial road, a non-industrial zone boundary, or significant open space should be developed in a manner that does not create adverse visual impacts on the locality.

5 Building facades facing a non-industrial zone, public road, or public open space should:

(c) use a variety of building finishes
(d) not consist solely of metal cladding
(e) contain materials of low reflectivity
(f) incorporate design elements to add visual interest
(g) avoid large expanses of blank walls.

6 Industrial development should minimise significant adverse impact on adjoining uses due to hours of operation, traffic, noise, fumes, smell, dust, paint or other chemical over-spray, vibration, glare or light spill, electronic interference, ash or other harmful or nuisance creating impacts.

7 Landscaping should be incorporated as an integral element of industrial development along non-industrial zone boundaries.

8 Fencing (including colour-coated wire mesh fencing) adjacent to public roads should be setback in one of the following ways:

(a) in line with the building facade
(b) behind the building line
(c) behind a landscaped area that softens its visual impact.

Small-scale agricultural industries, home-based industries, mineral water extraction and processing plants, and wineries in rural areas

10 Agricultural industries, home-based industries, mineral water extraction and processing plants, and wineries in rural areas should:

(a) use existing buildings and, in particular, buildings of heritage value, in preference to constructing new buildings
(b) be setback at least 50 metres from:
    (i) any bore, well or watercourse, where a watercourse is identified as a blue line on a current series 1:50 000 government standard topographic map
    (ii) a dam or reservoir that collects water flowing in a watercourse
    (iii) a lake or wetland through which water flows
    (iv) a channel into which water has been diverted
    (v) a known spring
    (vi) sink hole
(c) be located within the boundary of a single allotment, including any ancillary uses
(d) not result in more than one industry located on an allotment
(e) include a sign that facilitates access to the site that is sited and designed to complement the features of the surrounding area and which:
    (i) does not exceed 2 square metres in area
    (ii) is limited to one sign per establishment (for agricultural and home-based industries)
    (iii) is not internally illuminated.

11 Agricultural industries, home-based industries, mineral water extraction and processing plants, and wineries in rural areas should not:

(a) necessitate significant upgrading of public infrastructure including roads and other utilities
(b) generate traffic beyond the capacity of roads necessary to service the development
(c) result in traffic and/or traffic volumes that would be likely to adversely alter the character and amenity of the locality
(d) be located on land with a slope greater than 20 per cent (1-in-5).

12 Agricultural industries, wineries and mineral water extraction and processing plants should not be located:

(a) on land that is classified as being poorly drained or very poorly drained
(b) within 800 metres of a high water level of a public water supply reservoir
(c) closer than 300 metres (other than a home-based industry) to a dwelling or tourist accommodation that is not in the ownership of the applicant.

Infrastructure

OBJECTIVES

1 Infrastructure provided in an economical and environmentally sensitive manner.
2 The visual impact of infrastructure facilities minimised.
3 The efficient and cost-effective use of existing infrastructure.

PRINCIPLES OF DEVELOPMENT CONTROL

1 Development should only occur where it has access to adequate utilities and services, including:

(a) electricity supply
(b) water supply
(c) drainage and stormwater systems
(d) effluent disposal systems
(e) formed all-weather public roads
(f) telecommunications services
(g) gas services.

2 Development should incorporate any relevant and appropriate social infrastructure, community services and facilities.

3 Development should only occur where it provides, or has access to, relevant easements for the supply of infrastructure.

4 Development should incorporate provision for the supply of infrastructure services to be located within common service trenches where practicable.

5 Development should not occur until adequate and coordinated drainage of the land is provided.

6 Development in urban areas should not occur without provision of an adequate reticulated domestic quality mains water supply and an appropriate waste treatment system.

7 In areas where no reticulated water supply is available, buildings whose usage is reliant on a water supply should be equipped with an adequate and reliable on-site water storage system with a total capacity not less than 45 000 litres.

8 Urban development should have a direct water supply.

9 Electricity infrastructure should be designed and located to minimise visual and environmental impacts.
10 Utilities and services, including access roads and tracks, should be sited on areas already cleared of native vegetation. If this is not possible, their siting should cause minimal interference or disturbance to existing native vegetation and biodiversity.

11 Utility buildings and structures should be grouped with non-residential development, where possible.

12 Development in proximity to infrastructure facilities should be sited and be of a scale to ensure adequate separation to protect people and property.

13 Incompatible uses should not encroach upon the easements of infrastructure corridors for existing and proposed transmission lines.

14 In urban areas, electricity supply (except transmission lines) serving new development t should be installed underground, excluding lines having a capacity greater than or equal to 33kV.

15 Provision should be made for new transmission and distribution substations and overhead major electricity line corridors (having a capacity greater than or equal to 33kV) in areas which have the required buffer distance to protect people and allow for adequate access.

16 Land division for the purpose of residential and other sensitive land uses should not occur within electricity line corridors or existing electricity easements unless the resultant allotments are large enough to enable accommodation of safe clearances and expected structures.

17 Development should not compromise the viability of transmission line corridors and substation sites identified on *Overlay Map(s) - Development Constraints*.

Interface Between Land Uses
OBJECTIVES

1 Development located and designed to minimise adverse impact and conflict between land uses.
2 Protect community health and amenity from adverse impacts of development.
3 Protect desired land uses from the encroachment of incompatible development.

PRINCIPLES OF DEVELOPMENT CONTROL

1 Development should not detrimentally affect the amenity of the locality or cause unreasonable interference through any of the following:

(a) the emission of effluent, odour, smoke, fumes, dust or other airborne pollutants
(b) noise
(c) vibration
(d) electrical interference
(e) light spill
(f) glare
(g) hours of operation
(h) traffic impacts.

2 Development should be sited and designed to minimise negative impacts on existing and potential future land uses desired in the locality.

3 Development adjacent to a **Residential Zone** or residential area within a **Township Zone** should be designed to minimise overlooking and overshadowing of adjacent dwellings and private open space.

4 Residential development adjacent to non-residential zones and land uses should be located, designed and/or sited to protect residents from potential adverse impacts from non-residential activities.

5 Sensitive uses likely to conflict with the continuation of lawfully existing developments and land uses desired for the zone should be designed to minimise negative impacts.

6 Non-residential development on land abutting a residential zone should be designed to minimise noise impacts to achieve adequate levels of compatibility between existing and proposed uses.

Noise Generating Activities

7 Development that emits noise (other than music noise) should include noise attenuation measures that achieve the relevant *Environment Protection (Noise) Policy* criteria when assessed at the nearest existing noise sensitive premises.

8 Development with the potential to emit significant noise (e.g. industry) should incorporate noise attenuation measures that prevent noise from causing unreasonable interference with the amenity of noise sensitive premises.

Air Quality

11 Development with the potential to emit harmful or nuisance-generating air pollution should incorporate air pollution control measures to prevent harm to human health or unreasonable interference with the amenity of sensitive uses within the locality.

Rural Interface

13 The potential for adverse impacts resulting from rural development should be minimised by:

(a) not locating horticulture or intensive animal keeping on land adjacent to townships
(b) maintaining an adequate separation between horticulture or intensive animal keeping and townships, other sensitive uses and, where desirable, other forms of primary production.

14 Traffic movement, spray drift, dust, noise, odour and the use of frost fans and gas guns associated with primary production should not lead to unreasonable impact on adjacent land uses.

15 Existing primary production and mineral extraction should not be prejudiced by the inappropriate encroachment of sensitive uses such as urban development.

16 Development that is adjacent to land used for primary production (within either the zone or adjacent zones) should include appropriate setbacks and vegetative plantings designed to minimise the potential impacts of chemical spray drift and other impacts associated with primary production.

17 New urban development should provide a buffer of at least 40 metres wide (inclusive of any fuel break, emergency vehicle access or road) separating urban and rural activities.

Landscaping, Fences and Walls

OBJECTIVES

1 The amenity of land and development enhanced with appropriate planting and other landscaping works, using locally indigenous plant species where possible.

2 Functional fences and walls that enhance the attractiveness of development.

PRINCIPLES OF DEVELOPMENT CONTROL

1 Development should incorporate open space and landscaping and minimise hard paved surfaces in order to:

(a) complement built form and reduce the visual impact of larger buildings (eg taller and broader plantings against taller and bulkier building components)
(b) enhance the appearance of road frontages
(c) screen service yards, loading areas and outdoor storage areas
(d) minimise maintenance and watering requirements
(e) enhance and define outdoor spaces, including car parking areas
(f) maximise shade and shelter
(g) assist in climate control within and around buildings
(h) minimise heat absorption and reflection
(i) maintain privacy
(j) maximise stormwater re-use
(k) complement existing vegetation, including native vegetation
(l) contribute to the viability of ecosystems and species
(m) promote water and biodiversity conservation.

2 Landscaping should:

(a) include the planting of locally indigenous species where appropriate
(b) be oriented towards the street frontage
(c) result in the appropriate clearance from powerlines and other infrastructure being maintained.

3 Landscaping should not:

(a) unreasonably restrict solar access to adjoining development
(b) cause damage to buildings, paths and other landscaping from root invasion, soil disturbance or plant overcrowding
(c) introduce pest plants
(d) increase the risk of bushfire
(e) remove opportunities for passive surveillance
(f) increase leaf fall in watercourses
(g) increase the risk of weed invasion
(h) obscure driver sight lines
(i) create a hazard for train or tram drivers by obscuring sight lines at crossovers.

4 Fences and walls, including retaining walls, should:

(a) not result in damage to neighbouring trees
(b) be compatible with the associated development and with existing predominant, attractive fences and walls in the locality
(c) enable some visibility of buildings from and to the street to enhance safety and allow casual surveillance
(d) incorporate articulation or other detailing where there is a large expanse of wall facing the street
(e) assist in highlighting building entrances
(f) be sited and limited in height, to ensure adequate sight lines for motorists and pedestrians especially on corner sites

(g) in the case of side and rear boundaries, be of sufficient height to maintain privacy and/or security without adversely affecting the visual amenity or access to sunlight of adjoining land
(h) be constructed of non-flammable materials.

Natural Resources

OBJECTIVES

1 Retention, protection and restoration of the natural resources and environment.

2 Protection of the quality and quantity of South Australia's surface waters, including inland, marine and estuarine and underground waters.

3 The ecologically sustainable use of natural resources including water resources, including marine waters, ground water, surface water and watercourses.

4 Natural hydrological systems and environmental flows reinstated, and maintained and enhanced.

5 Development consistent with the principles of water sensitive design.

6 Development sited and designed to:

(a) protect natural ecological systems
(b) achieve the sustainable use of water
(c) protect water quality, including receiving waters
(d) reduce runoff and peak flows and prevent the risk of downstream flooding
(e) minimise demand on reticulated water supplies
(f) maximise the harvest and use of stormwater
(g) protect stormwater from pollution sources.

7 Storage and use of stormwater which avoids adverse impact on public health and safety.

8 Native flora, fauna and ecosystems protected, retained, conserved and restored.

9 Restoration, expansion and linking of existing native vegetation to facilitate habitat corridors for ease of movement of fauna.

10 Minimal disturbance and modification of the natural landform.

11 Protection of the physical, chemical and biological quality of soil resources.

12 Protection of areas prone to erosion or other land degradation processes from inappropriate development.

13 Protection of the scenic qualities of natural and rural landscapes.

PRINCIPLES OF DEVELOPMENT CONTROL

1 Development should be undertaken with minimum impact on the natural environment, including air and water quality, land, soil, biodiversity, and scenically attractive areas.

2 Development should ensure that South Australia's natural assets, such as biodiversity, water and soil, are protected and enhanced.

3 Development should not significantly obstruct or adversely affect sensitive ecological areas such as creeks, wetlands, estuaries and significant seagrass and mangrove communities.

4 Development should be appropriate to land capability and the protection and conservation of water resources and biodiversity.

Water Sensitive Design

5 Development should be designed to maximise conservation, minimise consumption and encourage re-use of water resources.

6 Development should not take place if it results in unsustainable use of surface or underground water resources.

7 Development should be sited and designed to:

(a) capture and re-use stormwater, where practical
(b) minimise surface water runoff
(c) prevent soil erosion and water pollution
(d) protect and enhance natural water flows
(e) protect water quality by providing adequate separation distances from watercourses and other water bodies
(f) not contribute to an increase in salinity levels
(g) avoid the water logging of soil or the release of toxic elements
(h) maintain natural hydrological systems and not adversely affect:
(i) the quantity and quality of groundwater
(ii) the depth and directional flow of groundwater
(iii) the quality and function of natural springs.

8 Water discharged from a development site should:

(a) be of a physical, chemical and biological condition equivalent to or better than its pre-developed state
(b) not exceed the rate of discharge from the site as it existed in pre-development conditions.

9 Development should include stormwater management systems to protect it from damage during a minimum of a 1-in-100 year average return interval flood.

10 Development should have adequate provision to control any stormwater over-flow runoff from the site and should be sited and designed to improve the quality of stormwater and minimise pollutant transfer to receiving waters.

11 Development should include stormwater management systems to mitigate peak flows and manage the rate and duration of stormwater discharges from the site to ensure the carrying capacities of downstream systems are not overloaded.

12 Development should include stormwater management systems to minimise the discharge of sediment, suspended solids, organic matter, nutrients, bacteria, litter and other contaminants to the stormwater system.

13 Stormwater management systems should preserve natural drainage systems, including the associated environmental flows.

14 Stormwater management systems should:

(a) maximise the potential for stormwater harvesting and re-use, either on-site or as close as practicable to the source
(b) utilise, but not be limited to, one or more of the following harvesting methods:
(i) the collection of roof water in tanks
(ii) the discharge to open space, landscaping or garden areas, including strips adjacent to car parks
(iii) the incorporation of detention and retention facilities
(iv) aquifer recharge.

15 Where it is not practicable to detain or dispose of stormwater on site, only clean stormwater runoff should enter the public stormwater drainage system.

Water Catchment Areas

17 Development should ensure watercourses and their beds, banks, wetlands and floodplains are not damaged or modified and are retained in their natural state, except where modification is required for essential access or maintenance purposes.

18 No development should occur where its proximity to a swamp or wetland will damage or interfere with the hydrology or water regime of the swamp or wetland.

19 A wetland or low-lying area providing habitat for native flora and fauna should not be drained, except temporarily for essential management purposes to enhance environmental values.

20 Along watercourses, areas of remnant native vegetation, or areas prone to erosion, that are capable of natural regeneration should be fenced off to limit stock access.

21 No development should be located within 50 metres of:

(a) a watercourse identified as a blue line on a current series 1:50 000 SA Government topographic map
(b) any river, stream, creek or channel in which water is contained or flows permanently, intermittently or occasionally.
(c) revegetated with locally indigenous vegetation comprising trees, shrubs and other groundcover plants to filter runoff so as to reduce the impacts on native aquatic ecosystems and to minimise soil loss eroding into the watercourse.

23 Development resulting in the depositing of an object or solid material in a watercourse or floodplain or the removal of bank and bed material should not:

(a) adversely affect the migration of aquatic biota
(b) adversely affect the natural flow regime

(c) cause or contribute to water pollution
(d) result in watercourse or bank erosion
(e) adversely affect native vegetation upstream or downstream that is growing in or adjacent to a watercourse.

24 The location and construction of dams, water tanks and diversion drains should:

(a) occur off watercourse
(b) not take place in ecologically sensitive areas or on erosion prone sites
(c) provide for low flow by-pass mechanisms to allow for migration of aquatic biota
(d) not negatively affect downstream users
(e) minimise in-stream or riparian vegetation loss
(f) incorporate features to improve water quality (eg wetlands and floodplain ecological communities)
(g) protect ecosystems dependent on water resources.

26 Development should comply with the current *Environment Protection (Water Quality) Policy*.

Biodiversity and Native Vegetation

28 Development should retain existing areas of native vegetation and where possible contribute to revegetation using locally indigenous plant species.

29 Development should be designed and sited to minimise the loss and disturbance of native flora and fauna, including marine animals and plants, and their breeding grounds and habitats.

30 Native vegetation should be conserved and its conservation value and function not compromised by development if the native vegetation does any of the following:

(a) provides an important habitat for wildlife or shade and shelter for livestock
(b) has a high plant species diversity or includes rare, vulnerable or endangered plant species or plant associations and communities
(c) provides an important seed bank for locally indigenous vegetation
(d) has high amenity value and/or significantly contributes to the landscape quality of an area, including the screening of buildings and unsightly views
(e) has high value as a remnant of vegetation associations characteristic of a district or region prior to extensive clearance for agriculture
(f) is growing in, or is characteristically associated with a wetland environment.

31 Native vegetation should not be cleared if such clearing is likely to lead to, cause or exacerbate any of the following:

(a) erosion or sediment within water catchments
(b) decreased soil stability
(c) soil or land slip
(d) deterioration in the quality of water in a watercourse or surface water runoff
(e) a local or regional salinity problem
(f) the occurrence or intensity of local or regional flooding.

32 Development that proposes the clearance of native vegetation should address or consider the implications that removing the native vegetation will have on the following:

(a) provision for linkages and wildlife corridors between significant areas of native vegetation
(b) erosion along watercourses and the filtering of suspended solids and nutrients from runoff
(c) the amenity of the locality
(d) bushfire safety
(e) the net loss of native vegetation and other biodiversity.

33 Where native vegetation is to be removed, it should be replaced in a suitable location on the site with locally indigenous vegetation to ensure that there is not a net loss of native vegetation and biodiversity.

34 Development should be located and occur in a manner which:

(a) does not increase the potential for, or result in, the spread of pest plants, or the spread of any non-indigenous plants into areas of native vegetation or a conservation zone
(b) avoids the degradation of remnant native vegetation by any other means including as a result of spray drift, compaction of soil, modification of surface water flows, pollution to groundwater or surface water or change to groundwater levels
(c) incorporates a separation distance and/or buffer area to protect wildlife habitats and other features of nature conservation significance.

35 Development should promote the long-term conservation of vegetation by:

(a) avoiding substantial structures, excavations, and filling of land in close proximity to the trunk of trees and beneath their canopies
(b) minimising impervious surfaces beneath the canopies of trees
(c) taking other effective and reasonable precautions to protect both vegetation and the integrity of structures and essential services.

38 Trees and other vegetation should be conserved which is of:

(a) special visual significance or interest
(b) existing or possible future value in the screening of a building or unsightly views
(c) existing or possible future value in the provision of shade or as a windbreak
(d) existing or possible future value in the prevention of soil erosion
(e) existing or possible future value in preventing the movement of lead dust
(f) special historical or heritage significance (including Aboriginal or European)
(g) scientific interest
(h) value as a habitat for native fauna.

Soil Conservation

39 Development should not have an adverse impact on the natural, physical, chemical or biological quality and characteristics of soil resources.

40 Development should be designed and sited to prevent erosion.

41 Development should take place in a manner that will minimise alteration to the existing landform.

42 Development should minimise the loss of soil from a site through soil erosion or siltation during the construction phase of any development and following the commencement of an activity.

Orderly and Sustainable Development

OBJECTIVES

1 Orderly and economical development that creates a safe, convenient and pleasant environment in which to live.

2 Development occurring in an orderly sequence and in a compact form to enable the efficient provision of public services and facilities.

3 Development that does not jeopardise the continuance of adjoining authorised land uses.

4 Development that does not prejudice the achievement of the provisions of the Development Plan.

5 Development abutting adjoining Council areas having regard to the policies of that Council's Development Plan.

6 Urban development located only in zones designated for such development.

7 Urban development contained within existing townships and settlements and located only in zones designated for such development.

PRINCIPLES OF DEVELOPMENT CONTROL

1 Development should not prejudice the development of a zone for its intended purpose.

2 Land outside of townships and settlements should primarily be used for primary production and conservation purposes.

3 The economic base of the region should be expanded in a sustainable manner.

4 Urban development should form a compact extension to an existing built-up area.

5 Ribbon development should not occur along the coast, water frontages or arterial roads shown in *Overlay Maps - Transport*.

6 Development should be located and staged to achieve the economical provision of public services and infrastructure, and to maximise the use of existing services and infrastructure.

7 Where development is expected to impact upon the existing infrastructure network (including the transport network), development should demonstrate how the undue effect will be addressed.

8 Vacant or underutilised land should be developed in an efficient and co-ordinated manner to not prejudice the orderly development of adjacent land.

9 Development should be undertaken in accordance with the following Concept Plan Maps:

- *Concept Plan Maps PtPi/1 - Regional Centre*
- *Concept Plan Maps PtPi/2 - Regional Centre*
- *Concept Plan Maps PtPi/3 - Solomontown Centre*
- *Concept Plan Maps PtPi/4 - North East Industrial Area*
- *Concept Plan Maps PtPi/5 - Policy Area 6 Industry Policy Area*
- *Concept Plan Maps PtPi/6 - Solomontown Beach Development Area*
- *Concept Plan Maps PtPi/7 - Augusta Highway Development Area*.

Renewable Energy Facilities

OBJECTIVES

1 Development of renewable energy facilities that benefit the environment, the community and the state

2 The development of renewable energy facilities, such as wind farms and ancillary development, in areas that provide opportunity to harvest natural resources for the efficient generation of electricity.

3 Location, siting, design and operation of renewable energy facilities to avoid or minimise adverse impacts on the natural environment and other land uses.

PRINCIPLES OF DEVELOPMENT CONTROL

1 Renewable energy facilities, including wind farms, solar farms and ancillary development, should be:

(a) located in areas that maximize efficient generation and supply of electricity
(b) designed and sited so as not to impact on the safety of water or air transport and the operation of ports, airfields and designated landing strips.

Wind Farms and Ancillary Development

2 The visual impacts of wind farms and ancillary development (such as substations, maintenance sheds, access roads and wind monitoring masts) should be managed through:

(a) wind turbine generators being:
  (i) setback at least 1000 metres from non-associated (non-stakeholder) dwellings and tourist accommodation
  (ii) setback at least 2000 metres from defined and zoned township, settlement or urban areas (including deferred urban areas)
  (iii) regularly spaced
  (iv) uniform in colour, size and shape and blade rotation direction
  (v) mounted on tubular towers (as opposed to lattice towers)
(b) provision of vegetated buffers around substations, maintenance sheds and other ancillary structures.

3 Wind farms and ancillary development should avoid or minimise the following impacts on nearby property owners / occupiers, road users and wildlife:

(a) shadowing, flickering, reflection or glint
(b) excessive noise
(c) interference with television and radio signals and geographic positioning systems
(d) interference with low altitude aircraft movements associated with agriculture
(e) modification of vegetation, soils and habitats
(f) striking of birds and bats.

4 Wind turbine generators should be setback from dwellings, tourist accommodation and frequently visited public places (such as viewing platforms) a distance that will ensure that failure does not present an unacceptable risk to safety

Short-Term Workers Accommodation

OBJECTIVES

1 A range of appropriately located accommodation types supplied for seasonal and short-term workers.

PRINCIPLES OF DEVELOPMENT CONTROL

1 Accommodation intended to be occupied on a temporary basis by persons engaged in employment relating to the production or processing of primary produce including minerals should be located within existing townships or within primary production areas, where it directly supports and is ancillary to legitimate primary production activities or related industries.

2 Buildings used for short-term workers accommodation should:

(a) be designed and constructed to enhance their appearance
(b) provide for the addition of a carport, verandas or pergolas as an integral part of the building
(c) where located outside of townships, not jeopardise the continuation of primary production on adjoining land or elsewhere in the zone
(d) be supplied with service infrastructure such as power, water, and effluent disposal sufficient to satisfy the living requirements of workers.

3 Short-term workers accommodation should not be adapted or used for permanent occupancy.

4 A common amenities building should be provided for temporary forms of short-term accommodation such as caravan and camping sites.

Siting and Visibility

OBJECTIVES

1 Protection of scenically attractive areas, particularly natural, rural and coastal landscapes.

PRINCIPLES OF DEVELOPMENT CONTROL

1 Development should be sited and designed to minimise its visual impact on:

(a) the natural, rural or heritage character of the area
(b) areas of high visual or scenic value, particularly rural and coastal areas
(c) views from the coast, near-shore waters, public reserves, tourist routes and walking trails
(d) the amenity of public beaches
(e) public trails such as the Heysen and Mawson Trails.

2 Buildings should be sited in unobtrusive locations and, in particular, should:

(a) be grouped together
(b) where possible be located in such a way as to be screened by existing vegetation when viewed from public.

3 Buildings outside of urban areas and in undulating landscapes should be sited in unobtrusive locations and in particular should be:

(a) sited below the ridgeline
(b) sited within valleys or behind spurs
(c) sited in such a way as to not be visible against the skyline when viewed from public roads
(d) set well back from public roads, particularly when the allotment is on the high side of the road.

4 Buildings and structures should be designed to minimise their visual impact in the landscape, in particular:

(a) the profile of buildings should be low and the roof lines should complement the natural form of the land
(b) the mass of buildings should be minimised by variations in wall and roof lines and by floor plans which complement the contours of the land

(c) large eaves, verandas and pergolas should be incorporated into designs so as to create shadowed areas that reduce the bulky appearance of buildings.

5 The nature of external surface materials of buildings should not detract from the visual character and amenity of the landscape.

6 The number of buildings and structures on land outside of urban areas should be limited to that necessary for the efficient management of the land.

7 Driveways and access tracks should be designed and surfaced to blend sympathetically with the landscape and to minimise interference with natural vegetation and landforms.

8 Development should be screened through the establishment of landscaping using locally indigenous plant species:

(a) around buildings and earthworks to provide a visual screen as well as shade in summer, and protection from prevailing winds
(b) along allotment boundaries to provide permanent screening of buildings and structures when viewed from adjoining properties and public roads

(c) along the verges of new roads and access tracks to provide screening and minimise erosion.

Transportation and Access

OBJECTIVES

1 A comprehensive, integrated, affordable and efficient air, rail, sea, road, cycle and pedestrian transport system that will:

(a) provide equitable access to a range of public, community and private transport services for all people
(b) ensure a high level of safety
(c) effectively support the economic development of the State
(d) have minimal negative environmental and social impacts
(e) maintain options for the introduction of suitable new transport technologies.

2 Development that:

(a) provides safe and efficient movement for all transport modes
(b) ensures access for vehicles including emergency services, public infrastructure maintenance and commercial vehicles
(c) provides off-street parking
(d) is appropriately located so that it supports and makes best use of existing transport facilities and networks
(e) provides convenient and safe access to public transport stops.

3 A road hierarchy that promotes safe and efficient transportation in an integrated manner throughout the State.

4 Provision of safe, pleasant, accessible, integrated and permeable pedestrian and cycling networks that are connected to the public transport network.

5 Safe and convenient freight and people movement throughout the State.

PRINCIPLES OF DEVELOPMENT CONTROL

Land Use

1 Land uses arranged to support the efficient provision of sustainable transport networks and encourage their use.

Movement Systems

2 Development should be integrated with existing transport networks, particularly major rail, road and public transport corridors as shown on *Location Maps* and *Overlay Maps - Transport*, and designed to minimise its potential impact on the functional performance of the transport network.

3 Transport corridors should be sited and designed so as to not unreasonably interfere with the health and amenity of adjacent sensitive land uses.

4 Roads should be sited and designed to blend with the landscape and be in sympathy with the terrain.

5 Land uses that generate large numbers of visitors such as shopping centres, places of employment, schools, hospitals and medium to high density residential uses should be located so that they can be serviced by the public transport network and encourage walking and cycling.

6 Development generating high levels of traffic, such as schools, shopping centres and other retail areas, and entertainment and sporting facilities should incorporate passenger pick-up and set-down areas. The design of such areas should minimise interference to existing traffic and give priority to pedestrians, cyclists and public and community transport users.

7 The location and design of public and community transport set-down and pick-up points should maximise safety and minimise the isolation and vulnerability of users.

8 Development should provide safe and convenient access for all anticipated modes of transport.

9 Development at intersections, pedestrian and cycle crossings, and crossovers to allotments should maintain or enhance sightlines for motorists, cyclists and pedestrians to ensure safety for all road users and pedestrians.

10 Driveway crossovers affecting pedestrian footpaths should maintain the level and surface colour of the footpath.

11 Driveway crossovers should be separated and the number minimised to optimise the provision of on-street visitor parking (where on-street parking is appropriate).

12 Development should be designed to discourage commercial and industrial vehicle movements through residential streets and adjacent other sensitive land uses.

13 Industrial/commercial vehicle movements should be separated from passenger vehicle car parking areas.

14 Development should provide for the on-site loading, unloading and turning of all traffic likely to be generated.

Cycling and Walking

17 New developments should give priority to and not compromise existing designated bicycle routes.

Access

22 Development should have direct access from an all-weather public road.

23 Development should be provided with safe and convenient access which:

(a) avoids unreasonable interference with the flow of traffic on adjoining roads
(b) provides appropriate separation distances from existing roads or level crossings

(c) accommodates the type and volume of traffic likely to be generated by the development or land use and minimises induced traffic through over-provision
(d) is sited and designed to minimise any adverse impacts on the occupants of and visitors to neighbouring properties.

24 Development should not restrict access to publicly owned land such as recreation areas.

25 The number of vehicle access points onto arterial roads shown on *Overlay Maps - Transport* should be minimised and, where possible, access points should be:

(a) limited to local roads (including rear lane access)
(b) shared between developments.

26 Development with access from arterial roads or roads as shown on *Overlay Maps - Transport* should be sited to avoid the need for vehicles to reverse onto or from the road.

27 Structures such as canopies and balconies that encroach onto the footpath of an arterial road should not cause visual or physical obstruction to:

(a) signalised intersections
(b) heavy vehicles
(c) street lighting
(d) overhead electricity lines
(e) street trees
(f) bus stops.

28 Driveways, access tracks and parking areas should be designed and constructed to:

(a) follow the natural contours of the land
(b) minimise excavation and/or fill
(c) minimise the potential for erosion from surface runoff
(d) avoid the removal of existing vegetation
(e) be consistent with *Australian Standard AS: 2890 - Parking facilities*.

Access for People with Disabilities

29 Development should be sited and designed to provide convenient access for people with a disability.

30 Where appropriate and practical, development should provide for safe and convenient access to the coast and beaches for disabled persons.

Vehicle Parking

31 Development should provide off-street vehicle parking and specifically marked accessible car parking places to meet anticipated demand in accordance with *Table PtPi/2 - Off Street Vehicle Parking Requirements* unless all the following conditions are met:

(a) an agreement is reached between the Council and the applicant for a reduced number of parking spaces
(b) a financial contribution is paid into the Council Car Parking Fund specified by the Council, in accordance with the gazetted rate per car park.

32 Development should be consistent with *Australian Standard AS: 2890 - Parking facilities*.

33 Vehicle parking areas should be sited and designed to:

(a) facilitate safe and convenient pedestrian linkages to the development and areas of significant activity or interest in the vicinity of the development
(b) include safe pedestrian and bicycle linkages that complement the overall pedestrian and cycling network
(c) not inhibit safe and convenient traffic circulation
(d) result in minimal conflict between customer and service vehicles
(e) avoid the necessity to use public roads when moving from one part of a parking area to another
(f) minimise the number of vehicle access points onto public roads
(g) avoid the need for vehicles to reverse onto public roads
(h) where practical, provide the opportunity for shared use of car parking and integration of car parking areas with adjoining development to reduce the total extent of vehicle parking areas and the requirement for access points
(i) not dominate the character and appearance of a site when viewed from public roads and spaces
(j) provide landscaping that will shade and enhance the appearance of the vehicle parking areas
(k) include infrastructure such as underground cabling and connections to power infrastructure that will enable the recharging of electric vehicles.

34 Where vehicle parking areas are not obviously visible or navigated, signs indicating the location and availability of vehicle parking spaces associated with businesses should be displayed at locations readily visible to users.

35 Vehicle parking areas that are likely to be used during non-daylight hours should provide floodlit entry and exit points and site lighting directed and shaded in a manner that will not cause nuisance to adjacent properties or users of the parking area.

36 Vehicle parking areas should be sealed or paved to minimise dust and mud nuisance.

37 To assist with stormwater detention and reduce heat loads in summer, outdoor vehicle parking areas should include soft landscaping.

38 Vehicle parking areas should be line-marked to delineate parking bays, movement aisles and direction of traffic flow.

39 On-site visitor parking spaces should be sited and designed to:

(a) not dominate internal site layout
(b) be clearly defined as visitor spaces not specifically associated with any particular dwelling
(c) be accessible to visitors at all times.

Waste

OBJECTIVES

1 Development that, in order of priority, avoids the production of waste, minimises the production of waste, re-uses waste, recycles waste for re-use, treats waste and disposes of waste in an environmentally sound manner.

2 Development that includes the treatment and management of solid and liquid waste to prevent undesired impacts on the environment including, soil, plant and animal biodiversity, human health and the amenity of the locality.

PRINCIPLES OF DEVELOPMENT CONTROL

1 Development should be sited and designed to prevent or minimise the generation of waste (including wastewater) by applying the following waste management hierarchy in the order of priority as shown below:

(a) avoiding the production of waste
(b) minimising waste production
(c) reusing waste
(d) recycling waste
(e) recovering part of the waste for re-use
(f) treating waste to reduce the potentially degrading impacts
(g) disposing of waste in an environmentally sound manner.

2 The storage, treatment and disposal of waste materials from any development should be achieved without risk to health or impairment of the environment.

3 Development should avoid as far as practical, the discharge or deposit of waste (including wastewater) onto land or into any waters (including processes such as seepage, infiltration or carriage by wind, rain, sea spray, stormwater or by the rising of the water table).

4 Untreated waste should not be discharged to the environment, and in particular to any water body.

5 Development should include appropriately sized area to facilitate the storage of receptacles that will enable the efficient recycling of waste.

6 Development that involves the production and/or collection of waste and/or recyclable material should include designated collection and storage area(s) that are:

(a) screened and separated from adjoining areas
(b) located to avoid impacting on adjoining sensitive environments or land uses
(c) designed to ensure that wastes do not contaminate stormwater or enter the stormwater collection system
(d) located on an impervious sealed area graded to a collection point in order to minimise the movement of any solids or contamination of water
(e) protected from wind and stormwater and sealed to prevent leakage and minimise the emission of odours

(f) stored in such a manner that ensures that all waste is contained within the boundaries of the site until disposed of in an appropriate manner.

Wastewater

7 The disposal of wastewater to land should only occur where methods of wastewater reduction and reuse are unable to remove the need for its disposal, and where its application to the land is environmentally sustainable.

8 Wastewater lagoons should not be sited in any of the following areas:

(a) within land subject to a 1-in-100 year average return interval flood event
(b) within 50 metres of the top of the bank of a watercourse
(c) within 500 metres of the coastal high water mark
(d) where the base of the lagoon would be below any seasonal water table.

9 Artificial wetland systems for the storage of treated wastewater, such as wastewater lagoons, should be:

(a) sufficiently separated from adjoining sensitive uses to minimise potential adverse odour impacts
(b) sited and designed to minimise potential public health risks arising from the breeding of mosquitoes.

Waste Treatment Systems

10 Development that produces any sewage or effluent should be connected to a waste treatment system that complies with (or can comply with) the relevant public and environmental health legislation applying to that type of system.

11 The methods for, and siting of, effluent and waste storage, treatment and disposal systems should minimise the potential for environmental harm and adverse impacts on:

(a) the quality of surface and groundwater resources
(b) public health
(c) the amenity of a locality
(d) sensitive land uses.

12 Waste treatment should only occur where the capacity of the treatment facility is sufficient to accommodate likely maximum daily demands including a contingency for unexpected high flows and breakdowns.

13 Any on-site wastewater treatment system/ re-use system or effluent drainage field should be located within the allotment of the development that it will service.

14 A dedicated on-site effluent disposal area should not include any areas to be used for, or could be reasonably foreseen to be used for, private outdoor open space, driveways, car parking or outbuildings.