APPENDIX F VISUAL IMPACT ASSESSMENT

First Solar.

Visual Impact Assessment

WELLINGTON SOLAR FARM

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1 INTRODUCTION

1.1 PROJECT OVERVIEW

The Wellington Solar Farm (SF) proposal site is located approximately 2km north east of Wellington, in western central NSW, within the Dubbo Regional Local Government Area (LGA). The Wellington SF proposal would comprise the installation of a solar plant with an upper capacity of 174 MW that would supply electricity to the National Electricity Market (NEM). The power generated would be transmitted via overhead powerline to the existing substation south of Goolma Road.

The proposal would comprise an array of solar panels covering an area of approximately 316 hectares, a 132kV substation, and related infrastructure as follows:

- PV modules mounted on a horizontal tracking structure.
- Site office and maintenance building.
- A site access road off Goolma Road, approximately 4.6km north east of Mitchell Highway junction.
- Overhead transmission lines for grid connection to the adjacent substation (132kV or 330kV).
- Overhead or underground electrical conduits and cabling to connect the arrays on the array site.
- An onsite substation or substation within the existing Transgrid substation containing one transformer and associated switchgear.
- Internal inverter stations to allow conversion of DC module output to AC electricity.
- Energy storage, if required.
- Internal access tracks to allow for site maintenance.
- Perimeter security fencing.
- Native vegetation screening, where required to break up views of infrastructure to specific nearby receivers, will be planted prior to commencement of operations.

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

- Material laydown areas.
- Temporary construction site offices.
- Temporary car and bus parking areas for construction worker's transportation. Once the plant has been commissioned, a small car park would remain for the minimal staff required and occasional visitors during operation.

Refer to Section 4 for further detail on the visual character of these elements.

The Wellington SF would be expected to operate for approximately 30 years. The construction phase of the proposal would take approximately 12 months. After the initial 30 year operating period, the solar farm would either be decommissioned, removing all above ground infrastructure and returning the site to its existing land capability, or repowered with new PV equipment. The proposal is considered highly reversible with regard to land capability and land use options.

An indicative layout is shown in Figure 1-2. Detailed design may lead to some minor layout changes. The layout shown represents the maximum impact areas that would be required.

1.2 OBJECTIVES OF THIS REPORT

This Visual Impact Assessment includes a full assessment of the visual impacts associated with the proposed Wellington Solar Farm. Specifically, it includes an assessment of:

- Landscape character and scenic vistas in the locality.
- Stakeholder values regarding visual amenity.
- Potential impacts on representative viewpoints, including residences and road corridors.

This report addresses the Secretary's Environmental Assessment Requirements (SEARs) for the proposed Wellington Solar Farm, provided by NSW Department of Planning and Environment (DPE) on 20 July 2017, which require:

- Consideration of reflectivity and glare (Section 4).
- An evaluation and discussion of potential visual impacts (Section 5.2). The evaluation uses representative viewpoints of residences and road corridors.
- A discussion of significant vistas in the locality (Section 3.2), with reference to community values and perceptions.
- Consideration of the *Dark Sky Planning Guideline: Protecting the observing conditions at Siding Spring* (Section 5.2).
- A draft landscaping plan (mitigation measures in Section 6, proposed screening provided in Appendix C).

Air traffic is not considered in this report but it is noted that, as discussed in Section 4, glare and reflectivity are not considered an impact for aircraft.

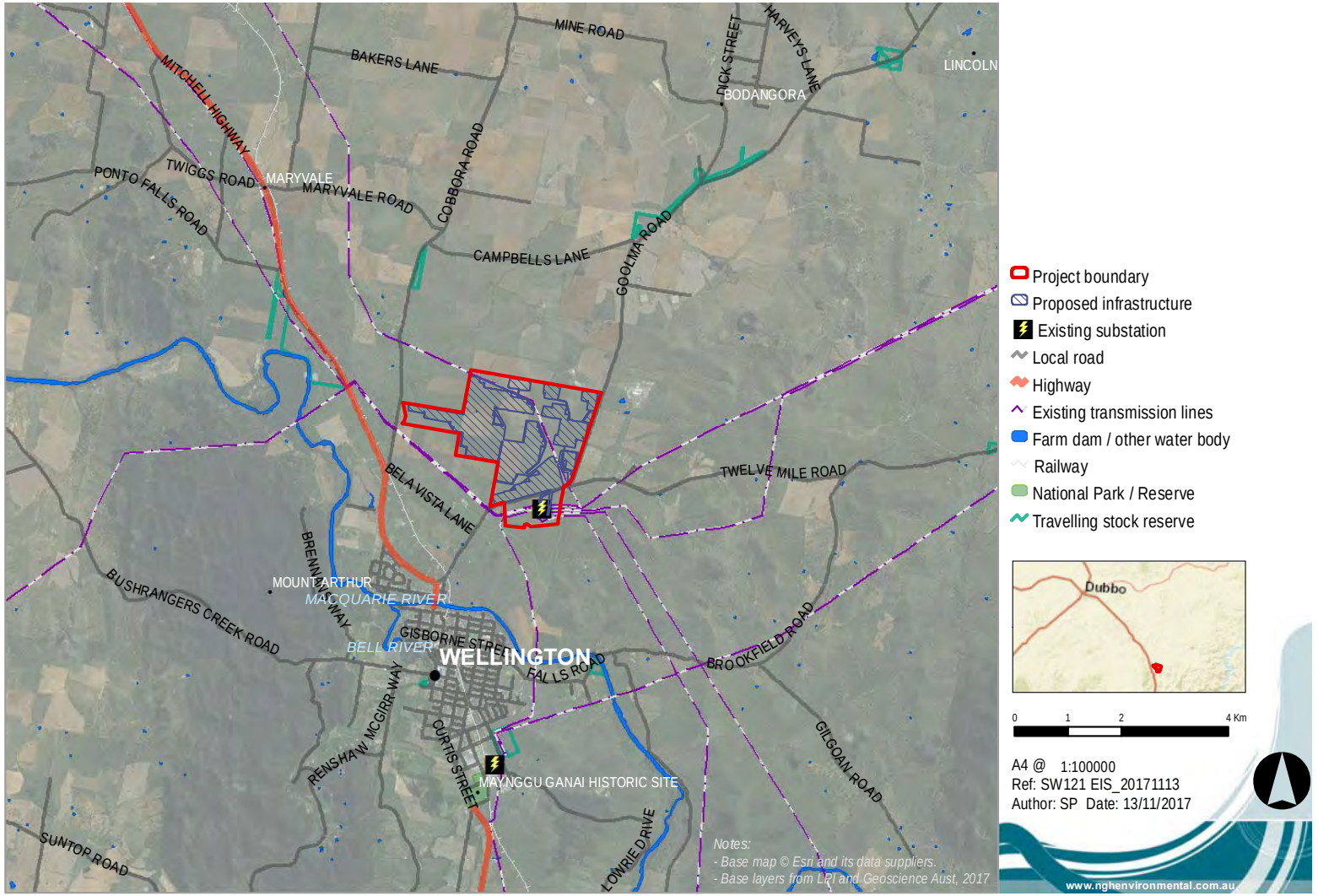

Figure 1-1 Proposal location

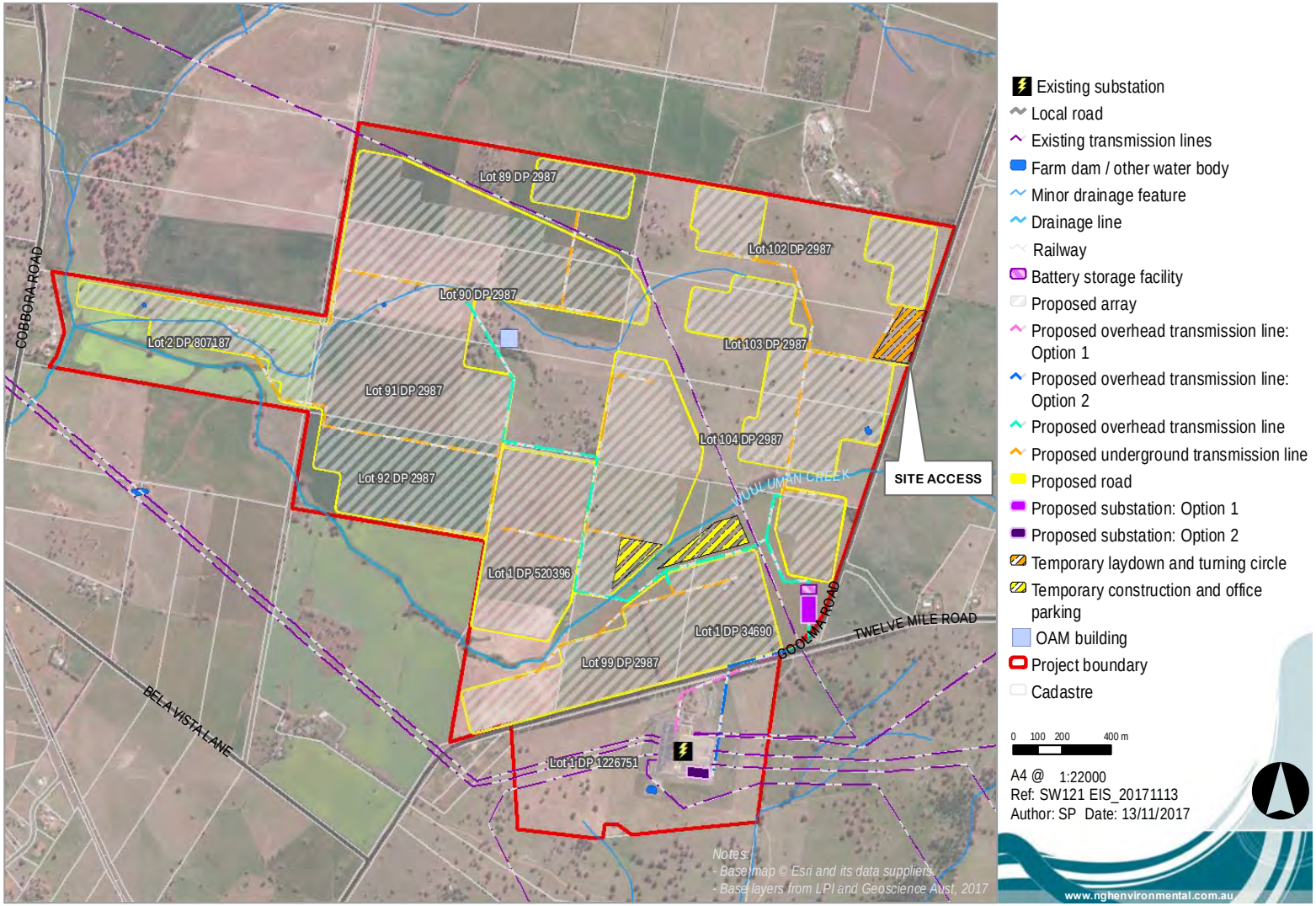

Figure 2-1 Indicative proposal layout

1.3 TERMINOLOGY

Terminology used in this report includes:

Study area	Defined as within 15km of the proposed solar farm site.
Solar farm site / site	The lot boundaries within which the solar farm development is proposed, excluding offsite infrastructure such as transmission lines and connections.
Project	All infrastructure and activities required for the construction, operation and decommissioning of the solar farm.
Landscape Character Unit (LCU)	LCUs take into account topography, vegetation, land use, and other distinct landscape features. They are a way to categorise the existing scenic quality of the receiving environment and consider the ability of the environment to absorb visual change at the landscape scale.
Viewer sensitivity	Viewer sensitivity is subject but can be assumed based on factors such as whether the view relates to recreational or work environments, or whether the view is experienced continuously or intermittently.
Landscape Management Zone (LMZ)	LMZs are derived by combining scenic quality with viewer sensitivity and proximity to the proposed infrastructure at the landscape scale. A three-tiered management hierarchy sets out appropriate management objectives for each zone.
Zone of Visual Influence (ZVI)	ZVI modelling uses GIS modelling and topography to determine areas which would be shielded from views of infrastructure at the proposed solar site. It does not take into account other existing or proposed screening features such as vegetation or built structures.

2 METHODOLOGY

2.1 OVERVIEW

The Visual Impact Assessment has been completed in the following stages:

1. Background investigations, mapping and modelling.
2. Field survey including reconnaissance, ground truthing and photography.
3. Community consultation.
4. Impact assessment.
5. Development of a visual impact mitigation strategy.

These methods are detailed below.

2.2 BACKGROUND INVESTIGATIONS, MAPPING AND MODELLING

Background investigations included identifying key landscape features within the landscape that may be affected by the visual impacts of the proposed solar farm. This was done using existing literature and aerial photos.

Mapping and modelling were undertaken to:

- Identify and classify LCUs within 15km of the proposed solar farm. This was done based on aerial imagery and later validated with field inspection. LCUs are a way to summarise differences in landscape amenity and the sensitivity of different areas within the landscape to visual impacts.
- Define areas in which the infrastructure may be visible, using ZVI modelling. A map identifying the ZVI (or viewshed) of the proposed solar farm was produced. This method uses topographic information to determine areas in which views of infrastructure may be visible. The infrastructure was modelled as a 4.5 m high rectangular block, equivalent to the project boundaries. Topography was based on a 25m resolution Digital Elevation Model (DEM) derived from 25m contours. Modelling does not take into account screening that may be provided by existing vegetation or structures.
- Identify key viewpoints such as major travel routes, public recreation areas, potential receivers (dwellings and other structures), and built up areas. This step excluded areas deemed not to be visible from the ZVI modelling.
- Understand the feasibility of screening to mitigate visual impacts.

The ZVIs for the fore (1km) and mid ground (5km) are provided in Appendices A.1 and A.2, respectively.

The results were used to inform the field survey.

2.3 FIELD SURVEY

With reference to the mapping and modelling, field reconnaissance and ground truthing was undertaken to:

- Verify and document the existing LCUs in the study area.
- Identify representative viewpoints within the LCUs, including foreground, middle ground and background viewpoints.
- Understand the likely sensitivity of the LCUs to views of the proposed solar farm.

Fieldwork consisted of driving along publicly accessible roads, investigating and documenting dominant visual character elements and potential views to the proposed infrastructure. Photographs were taken at representative locations. No residences were specifically targeted however, nearby roadside viewpoints have been tagged 'residential' where they occur near a residence.

Representative view point locations and their associated LCUs are provided in Appendix A.3.

Representative panoramas for selected locations are provided in Appendix A.4.

The property involved in the project is not represented by a specific viewpoint. Impacts on the involved residence are not considered in this assessment.

2.4 COMMUNITY CONSULTATION

Community consultation specific to this assessment of visual impacts was required to:

- Understand how the community values existing visual amenity in the study area.
- Document the perceptions of the community to the proposed development.

Community consultation was undertaken as part of the Development Application process, in accordance with a Community Consultation Plan. As part of the plan, respondents were surveyed on their views regarding solar farm development and local visual amenity. The feedback form questions are included in Appendix B. The results are used in the impact assessment and are summarised in Section 3.3.2.

2.5 IMPACT ASSESSMENT

The impact assessment methodology used in this Visual Impact Assessment is based on the Bureau of Land Management (BLM) Visual Resource Management System, developed by the BLM, US Department of the Interior (n.d). The BLM developed a systematic process to analyse the visual impact of proposed developments. The basic philosophy states that the degree to which a development affects the visual landscape depends on the visual contrast imposed by the project.

Key steps undertaken to assess the visual impact are as follows:

- Define LMZs for the representative viewpoints, based on:
    - The scenic quality of the study area's LCUs.
    - The expected sensitivity at representative viewpoints.
    - The proximity of each representative viewpoint.
- Evaluate the degree of contrast the solar farm would result in at representative viewpoints in consideration of the management objectives of the relevant LMZ.
- Determine the acceptability of the contrast with the management objectives of the relevant LMZ; this is the resultant visual impact, rated as high, medium or low.

Criteria for scenic quality, sensitivity, proximity, contrast and visual impact are included in the assessment, in Section 5.

Mitigation measures are considered for 'high impact' receivers, for whom unmitigated impacts are considered greater than what is acceptable. For 'medium impact' receivers, the contrast is considered acceptable. For 'low impact' receivers, the contrast is considered unlikely to be perceived or acceptable.

3 EXISTING ENVIRONMENT

3.1 WELLINGTON LOCALITY

The proposed solar farm is located approximately 2km north east of the town of Wellington, NSW (refer Figure 1-1). The land surrounding the proposal site includes irrigated crops and grazing land. Agriculture is the key industry in Wellington, with the steeper land to the east supporting mainly grazing activities and the gentle undulating land to the west supporting mainly cereal production. Mining exploration activity is of continuing interest, with a number of mineral deposits within the locality (Regional Development Australia – Orana, 2016).

The population of Wellington was 4,540 at 2011 Census (ABS, 2017). There are approximately 19 residences within one kilometre of the Wellington SF proposal site, and approximately 169 residences within 2 kilometres. Aside from the dwelling that is located within the proposal site, the closest receiver is located 30 metres west of the proposal site.

3.2 SIGNIFICANT VISTAS AND FEATURES

3.2.1 National park tracks and viewing locations

Mount Arthur Reserve is situated outside the town of Wellington and approximately 5km from the proposed Wellington Solar Farm. Rising to 563 m above sea-level (ASL), this 2,123ha reserve lies within the northern most section of the Catombal Range and takes in three main peaks - Mounts Arthur, Wellesley and Duke.

The Mount Arthur Reserve is a Crown Reserve set aside for public recreation and environmental protection. The reserve provides for picnicking, bushwalking, horse riding and bike riding, and is also popular with birdwatchers and botany enthusiasts. Seven marked walking trails, varying in length and difficulty, are available within the reserve with scenic vantage points from the three main peaks providing views over Wellington, the valley and the Bell and Macquarie Rivers.

Of the three peaks, Mount Artur summit Ningana lookout is located directly west of the town of Wellington and is the closest peak to the proposed solar farm; approximately 5.5km distant. Mt. Wellesley Summit and Mt. Duke Summit are located to the south west of Wellington. They are 6.8km and 6.4km from the proposed site, respectively.

The solar farm site is not visible from existing public roads though the reserve, accessed off Bushranger Creek Road. It is possible that, given the elevation of the peaks (ranging from 520-540m ASL) that the solar farm infrastructure may be visible from some areas within the reserve, including walking tracks and lookouts that face the east and north east.

3.2.2 Dark sky region

Siding Spring Observatory is located approximately 130km south of the proposed Wellington Solar Farm. The Dark Sky Region in NSW is centred upon the site of this observatory which is considered Australia's most important visible-light observatory. The Dark Sky region consists of land within a 200km radius of the observatory, which therefore includes the solar farm proposal site.

The Dark Sky Region Guidelines have been prepared to ensure the night sky is free of light pollution and increased levels of atmospheric dust which may impact on the observatory[1]. These guidelines are referenced in clause 5.14 of the Dubbo Regional Local Environmental Plan (LEP) and the SEARs for the Wellington Solar Farm proposal.

General measures to minimise light pollution include control of upward spill night lighting (such as the use of shields), reducing the overall number of lights and the duration that they are used for, using asymmetric beams when using floodlights, ensuring lights are not directed towards reflective surfaces and using warm white colours.

Relevant environmental considerations for the solar farm, given its location within the Dark Sky Region include:

- Construction phase
    - Control of dust from vehicle haulage, excavation, any clearing required, stockpiles. Water or other means can be used to control dust.
    - Night works should be strictly limited and if required, undertaken with the above prescriptions to minimise its impact.
- Operational phase
    - Control of dust from the operation; maintenance of ground cover beneath panels, minimising traffic movements on unsealed tracks during operation.
    - Night lighting limited and if required, undertaken with the above prescriptions to minimise its impact.

These measures have been incorporated into environmental mitigation measures for the proposal, Section 6 of this report.

3.3 COMMUNITY VALUES

3.3.1 General attitudes to solar infrastructure

A high percentage (77%) of Australian's believe that large scale solar farms could supply a significant source of Australia's energy requirements (ARENA, 2015). Attitudes in Australia are greatly divided about the visual impacts of large scale solar farms; 30% agree and 26% disagree that large-scale wind farms have a negative visual impact (ARENA, 2015). The large scale solar energy sector is still at a relatively early stage of development in Australia, however. While most members of the community are aware of large scale solar energy, many do not know a great deal about their impacts (ARENA, 2015), including visual impacts.

Three approaches to improving community understanding of the visual impacts of large scale installations include:

- Provision of images (from many angles) of large scale solar facilities, particularly in the early stages of a proposal.
- Understanding the similarities between highly supported domestic scale installations and large scale facilities.
- Understanding the current function of the land proposed to hold the facility and the additional value the installation allows for.

(Source: extracted from ARENA, 2015).

[1] Dust tends to scatter light and increase light pollution.

This report endeavours to address these issues.

3.3.2 Values of the local community

The Community Open Day took place on the 27 September 2017 at the Wellington Civic Centre. In total, 28 people participated in the open day. Feedback from the participants included:

- Positive feedback regarding the creation of jobs. Local contractors and local labour will be utilized when possible.
- Two neighbouring landowners raised concerns regarding visual impact of the site. Photomontages were prepared for these landowners.
- Two participants raised concerns regarding water supply for their property from watermills that are in close proximity to the development. First Solar staff agreed to complete a site visit to ensure no watermills would be impacted by the proposal.
- Land value concerns were raised by one community member with regard to another solar farm adjacent to her property.

First Solar Australia Pty Ltd received six completed community feedback forms. Five residents lived five kilometres or less from the proposal site and one resident lived greater than five kilometres. This resident was not a member of the local community. Important local values identified by the respondents included:

- To be living in an area where soils are ideal for agriculture use/farming activities.
- Modern enhancements through the creation of wind farms.
- Historic significance values.
- Scenic views of the existing landscape; river valleys, hills and greenery.

Residents were generally very positive and supportive of the project with responses highlighting the need for innovation in the area, less reliance on coal and welcoming the addition of a practical and economical energy source.

Key concerns raised by members of the community were the impact to land value, impacts to agricultural businesses, landscape impacts, glare from the panels, noise emissions during construction and possibility of increased temperature to the immediate surroundings residents. All these matters have been discussed directly with the local community.

3.4 LANDSCAPE CHARACTER UNITS

LCUs take into account topography, vegetation, land use, and other distinct landscape features. They are a way to summarise differences in the receiving environment that may affect the visual impact of the proposed solar farm at different locations.

Four key LCUs were identified within 15km of the proposed solar farm site:

1. Agricultural (grazing lands and cropping lands, with low density dwellings and sheds).
2. Rural residential and commercial facilities.
3. Urban (Wellington town centre and residential areas).
4. Forest (surrounding ranges).

The scenic quality was rated in each LCU as follows:

- A high scenic quality rating describes areas with outstanding, unusual or diverse features.
- A moderate scenic quality rating applies to areas with the features and variety normally present in the character type.
- A low scenic quality rating is given for areas lacking features and variety.

The four LCUs identified within 15km of the proposed solar farm site are characterised in Table 3-1 in terms of their scenic quality and illustrated in the following plates.

Table 3-1 Agricultural Landscape Character Unit

Landscape Character Unit	Key visual features and scenic quality
Agricultural	**Visual features** The pastures with scattered trees are of low relief to undulating. Pastures are generally not irrigated and so are dull green through to beige and brown with the season. Some cropping occurs in the locality. Scattered trees are either at low density, remnants of an open woodland, or planted as wind breaks or amenity planting along roadsides or near dwellings. Cropped paddocks and more intensively cleared area have less variety. The ranges to the west and south-west of the site are a dominant feature in higher locations, contrasting with low open expanses of the lower landscape. The colour would change from dusky green-blue to purple hues with season and time of day. Less continuous ranges and ridges occur to the east and south-east. Unsealed roads and bare paddocks are light beige. Most local roads are however, sealed. Local roads are generally straight within minor curves that reflect the gently undulating terrain. Such curves and minor dips limit short sight lines such that extensive views are limited to minor rises. Residences within this landscape are sparsely distributed and commonly associated with additional landscape plantings and out buildings (sheds, yards). Low paddock fencing, electricity lines and roads reinforce a linear pattern of production over the more organic pattern of the terrain. **Scenic quality** Scenic quality is generally considered moderate. Elements have subtle variety and contrast and feature naturally pleasing element such as the ranges and scattered native vegetation remnants. Built elements are production related. Cropped areas are considered to have low scenic quality, due to lesser variety and visual interest. This LCU is common in the study area, but has features and variety. The proposed solar farm site is located within this LCU.
	

Table 3-2 Rural Residential and Commercial Landscape Character Unit

Landscape Character Unit	Key visual features and scenic quality
Rural residential and commercial facilities	**Visual features** Smaller residential allotments occur to the east of the site, off Twelve Mile Road. A correctional facility and its expansion occur to the north-east of the site. An agricultural research centre occurs to the immediate north of the site. Commercial chicken farms occur just over 1km north-east of the site. Higher residential density development occurs south of the site, off the Mitchell Highway. Density of development increases with proximity to Wellington, see Urban LCU below. In these areas, which are surrounded by agricultural LCU in most cases, dominant elements are dwellings, car ports, gardens and in the case of commercial facilities, large structures and access roads (often tree lined). Built forms are varied. Roofs, cladding, water tanks and sheds are not consistent. Vehicles, yards and gardens produce a residential character. These areas are often separated from the surrounding expansive agricultural areas with rectilinear fencing, creating small boxed in allotments within the broader landscape. Electrical infrastructure includes overhead transmission lines and substation. Streets and access roads are usually sealed and feature vegetation, either native remnants or planted feature trees or avenues. **Scenic quality** Scenic quality is considered moderate in residential locations. These areas have variety in colour and form, including some historic features. Built elements and landscaping contribute to the character type. Scenic quality is considered low in commercial areas, these being commercially focused and having less variety and visual interest. This LCU is not common in the study area.
	

Table 3-3 Urban Landscape Character Unit

Landscape Character Unit	Key visual features and scenic quality
Urban	**Visual features** Wellington is situated mainly south of the Macquarie River. Its tributary, Bell River, also borders the main residential area. These waterways retain connected riparian zones and the deep greens of the shady recreational and public spaces provide the town with a unique character and public amenity. Wellington's main streets have a consistent historic character. In retail and residential building colours, materials and design, historic character and red brick are elements are dominant. There are several large public buildings of exceptional character. There are large agricultural silos that reinforce the history of agricultural production in the area. Frontages feature street trees and formal fencing. Views to the surrounding ranges are sometimes visible. A large recreational area is located on the river and features tree lined avenues. Streets are sealed and often incorporate curbing and footpaths and landscaping. The street layout is generally rectilinear. **Scenic quality** Scenic quality is considered high. These areas have variety in colour and form. They contribute to a unique historic character type, in residential and commercial built form. Elements include recreational facilities, parks and gardens. The character is important in defining the history of land use in the local area. This LCU is not common in the study area.

Table 3-4 Forested ranges and waterways Landscape Character Unit

Landscape Character Unit	Key visual features and scenic quality
Forested ranges and waterways	**Visual features** The vegetated ranges to the west of Wellington, Mt Arthur Reserve, provide a dominant visual element to the town and to surrounding areas. Lookouts and walking tracks are present that allow for views of the town to the east and likely to other areas including the north-east, in the direction of the proposed solar farm site. Limited public roads traverse these ranges. Less continuous vegetated ridges and ranges occur to the east, near Wuuluman. As above, the connected riparian zones of Macquarie River and Bell River, add to the unique character provided by dense, mature vegetation. **Scenic quality** Scenic quality is generally moderate. Colour variation is low. Forms are generally uniform, lacking variety. Areas that appear untouched by settlement provide a pleasing visual contrast to the agricultural, rural residential and urban LCUs. Recreational infrastructure provides a scenic recreational space where groups may congregate. This LCU is not common in the study area.






3.5 VIEWPOINT SENSITIVITY

3.5.1 Identifying viewpoints

The BLM methodology requires identification of representative viewpoints in the study area. These may be travel routes such as roads, waterways and recreational tracks, residential areas, tourist facilities, houses and farmland.

The ZVI modelling produced a set of maps that estimated the areas that would be shielded from views of infrastructure at the proposed solar farm site, based on topography (Appendix A.1 and A.2). A height of 4.5 m was used to model onsite infrastructure. This is realistic approximation of the height of panels and PV containers, as the panel heights may be up to 4.5 m. Viewpoints were not selected in areas predicted to be

shielded from views of the solar farm. Twenty-two representative viewpoints were identified within the ZVI and are mapped in Appendix A.3.

3.5.2 Rating proximity and assessing sensitivity of viewpoints

The predicted sensitivity of each viewpoint can be determined, considering its proximity to the proposed solar farm site and factors such as use, scenic quality and regional significance.

Criteria for proximity are as follows:

- Foreground 0 – 1 kilometres
- Middle ground 1 – 5 kilometres
- Background 5 – 15 kilometres

Criteria for sensitivity are as follows:

- High sensitivity:
  - high use routes or areas, or
  - routes or areas of national or state significance, or
  - areas with high scenic quality
- Moderate sensitivity:
  - moderate use routes or areas, or
  - routes or areas of regional or local significance, or
  - areas with moderate scenic quality
- Low sensitivity:
  - low use routes or areas, or
  - routes or areas of low local significance, or
  - areas with low scenic quality

Sensitivity also considers view duration; for access roads and working farms this would be less than for residential and recreational areas.

Considering the sensitivity of local viewpoints, the following general assessments were made:

- Within the Agricultural LCU, viewpoints were assessed to be of low sensitivity on low use roads and moderate sensitivity on higher use road that retained some remnant vegetation. These areas are production related but offer vistas of farming land broken up by native vegetation. Goolma and Cobbora Roads are used to access Wellington.
- Within the Rural residential / commercial LCU, viewpoints were assessed as low sensitivity in commercial locations (the existing substation on Goolma Road, but also including the agricultural research station and correctional facility to the north and north west of the proposal site on Goolma Road) and moderate sensitivity in residential areas (noting the residential areas on Bella Vista Lane and Cadonia Drive are located on low use roads but that views to the ranges and of farming land broken up by native vegetation are assumed to be valued).
- Within the Urban LCU, viewpoints were assessed to have high sensitivity, having high usage, historic character and having recreational, retail and residential land uses.
- Within the Forest LCU (which was a recreational lookout area), the view point was assessed to have high sensitivity, being established specifically to take in views of the local area; including farm land, the town of Wellington and natural areas.

The sensitivity of each viewpoint is tabulated below. The location of each viewpoint is shown in Appendix A.3.

Table 3-5 Representative viewpoints and assessed proximity, scenic quality and sensitivity

ID new	LCU	View location	Proximity	Scenic quality	Sensitivity
1	Agricultural	Road	<1km	Moderate	Moderate
2	Agricultural	Road	<1km	Moderate	Moderate
3	Commercial	Substation	<1km	Moderate	Low
4	Agricultural and rural residence	Road / residence	<1km	Moderate	Moderate
5	Rural residential	Residence	<1km	Moderate	Moderate
6	Rural residential	Residence	<1km	Moderate	Moderate
7	Agricultural	Road	<1km	Moderate	Moderate
8	Rural residential	Road and residence	<1km	Moderate	Moderate
9	Agricultural	Road and residence	1-5km	Moderate	Moderate
10	Agricultural	Road and residence	1-5km	Moderate	Moderate
11	Agricultural	Road	1-5km	Moderate	Moderate
12	Agricultural	Road	1-5km	Moderate	Low
13	Urban	Recreational area	5-15km	High	High
14	Forest	Recreational area	5-15km	High	High

4 VISUAL CHARACTERISTICS OF KEY INFRASTRUCTURE COMPONENTS

The proposed Wellington SF would comprise of the installation of a solar plant with an upper capacity of 174 MW that would supply electricity to the national electricity grid. An indicative proposed infrastructure layout is included in Figure 1-2. Visual characteristics of the development would differ in the construction and operational phases of the development. Decommissioning would be similar but likely of shorter duration than construction.

4.1 CONSTRUCTION AND DECOMMISSIONING

Construction and decommissioning visual impacts during each 12 month phase would include:

- Material laydown areas, site fencing and signage, traffic controls, additional haulage on local roads, associated dust rising from onsite vehicle movements (all offsite access tracks are sealed).
- Temporary construction site offices.
- Temporary car and bus parking areas for construction worker's onsite.

Fencing and buildings would include steel structures. These can generate reflectivity and glare. Material stockpiles may detract from visual amenity, particularly if dispersed across broad areas. Laydown areas for steel posts and rails may produce reflectivity and glare.

Construction litter (such as packaging materials and food/drink packaging from onsite staff), if not controlled, could affect nearby properties.

Construction traffic would increase visual impacts and could add to dust generation once on site (the Goolma Road access and haulage roads are all sealed). Onsite parking areas would be visible from surrounding properties and roads, most visible from Goolma Road.

Areas of bare soil created through grading access tracks, establishing the substation bench, trenching cables and excavation of footings for inverter stations could contribute to dust and detract from visual amenity until they are rehabilitated. These areas would be visible to surrounding properties and most visible from Goolma Road.

While no broad scale land levelling is proposed, it is expected that the combined effect of the onsite construction activities will have an adverse impact on the amount of ground cover, producing dust and detracting from the visual amenity of the site. Dust is manageable and maintaining ground cover beneath the panels once construction is completed is an objective of the proposal; any disturbed areas would be restored to grassed ground cover post construction.

4.2 OPERATION

Operational visual impacts would relate to the permanent infrastructure. It is generally low lying (less than 4.5m) and therefore visibility attenuates rapidly with distance. Minor traffic movements relate to operation. Key permanent infrastructure that would be visible during the 30 year life of the project would include:

- PV modules (solar panels), single Axis horizontal tracking (likely) or fixed mounting frames.
    - The solar arrays would be comprised of approximately 440,000 First Solar thin film solar modules installed on a single-axis tracker in rows aligned in north south

arrangement. The tracker would have an estimated tracking range of 120 degrees, or +/- 60 degrees from the horizontal.

- Approximately 66,600 piles would be driven or screwed into the ground in order to support the solar array's mounting system and solar modules.
- The panel structures would have a height of approximately 4.5m high when tracked to the extent of their range and allowing for undulating topography.

Figure 4-1 First Solar modules and a single axis tracker installed at the Gatton Research Facility in Queensland.

Figure 4-2 Piling installation for a single axis tracker

- Inverter stations with associated transformers. The 30-50 inverter stations are generally installed on piles or a concrete foundation and are slightly elevated above the ground to enable the installation of the AC and DC cabling, with each inverter station containing the following equipment:
    - Inverter – up to fifty inverters
    - Transformer to step the AC voltage up to high voltage for transmission to the substation
    - HV switchgear
    - Communication and ancillary equipment

Figure 4-3 Example 20' skid solution.

Figure 4-4 Example 40' containerised solution.

- Various energy storage solutions are being considered for the proposal to compliment large scale renewable energy generation and to prepare the network for more renewables in the future. An example of a battery energy storage systems is shown in Figure 4-5 below.

Figure 4-5 Example of Powerpack System

- An onsite substation or substation within the existing Transgrid substation containing one transformer and associated switchgear, within the solar farm site boundary immediately north of Goolma Road (refer to Figure 1-2).
    - This will be constructed on a prepared bench of compacted material, approximately 30m x 30m, and would be surrounded by security fencing with gravel placed around the equipment and fence to restrict vegetation growth and provide a safe working environment in accordance with Australian Standards.
    - The existing Wellington Substation is roughly 10 times larger than the proposed site substation.

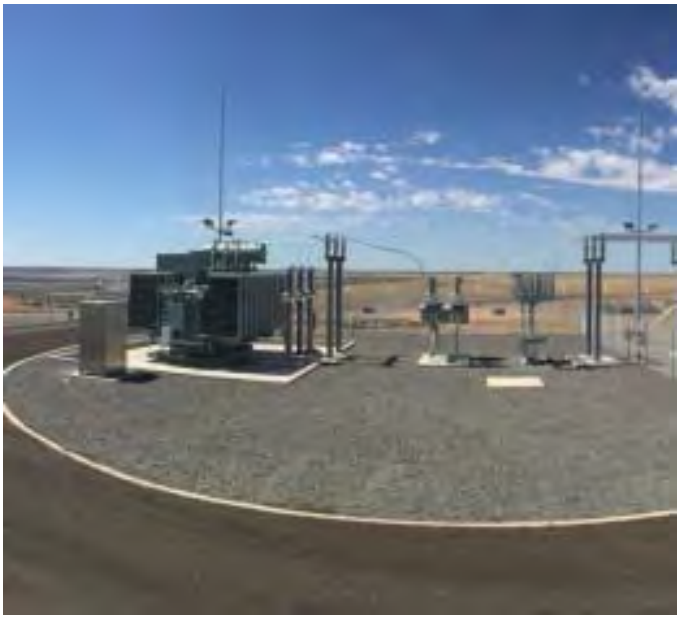

Figure 4-6 Example of a typical substation.

- A 33kV or 132kV or 330kV transmission line to the adjacent existing Wellington Substation (100m).
    - The transmission line would be constructed over a length of approximately 100m from the site substation across Goolma Road to the existing TransGrid Wellington Substation.
    - The new line would be constructed in a similar manner to the existing TransGrid transmission lines utilising either timber or concrete poles, cross member, insulators and strung conductor (Figure 4-7).

Figure 4-7 Example TransGrid transmission line.

- Underground or aboveground electrical conduits and cabling to connect the inverters to the onsite substation as well as 22-33kV Underground and aboveground (mounted to module structure) DC cabling to connect the modules to the inverter stations.
    - All underground cabling would be installed across the site at a depth of at least 500mm with the electrical reticulation buried to either 600mm (low voltage) or 800mm (high voltage) depth, depending on the cables voltage and relevant Australian Standard.
    - Prior to excavating the cable trench, the topsoil would be stripped and stockpiled for use in the rehabilitation of the trench following the cable installation.

Figure 4-8 Examples of underground cable trenches with bedding sand installed.

- An access track off Goolma Road and internal access tracks to allow for site maintenance.
    - The entrance to the site would be constructed off Goolma Road, approximately 4.6 km east of the intersection with the Mitchell Highway (refer to Figure 1-2). A siding lane would be constructed on Goolma Road to accommodate traffic turning left off Goolma Road and into the Wellington SF site.
    - Internal solar farm access roads would be around 6m wide and constructed of compacted but unsealed gravel.
    - If required, water trucks would be used to suppress dust on unsealed access tracks during construction. Stabilising techniques and or environmentally acceptable dust palliatives would be utilised if the wetting down of surfaces proves to be ineffective.
- Perimeter security fencing up to 2.3m high.
    - Fencing is expected to be cyclone fencing with a strands of barbed wire located within the top 450mm. The fence would be designed to ensure adequate access and egress points are provided during both the construction phase and ongoing operational life of the project. An example is provided in Figure 4-9.
    - Some sections of the fenced perimeter would be targeted for landscaping treatment.
- Native vegetation screening, where required to break up views of infrastructure to specific receivers.
    - Specific sections of the site perimeter have been identified in Appendix C.

Figure 4-9 Example of a typical 2.3m high security fence.

Glare and glint

The potential for glare associated with non-concentrating photovoltaic systems which do not involve mirrors or lenses is relatively limited. PV solar panels are designed to reflect as little sunlight as possible (generally around 2% of the light received; Spaven Consulting 2011), resulting in negligible glare. The reason for this is that PV panels are designed to absorb as much solar energy as possible in order to generate the maximum amount of electricity or heat. The panels will not generally create noticeable glare compared with an existing roof or building surfaces (NSW Department of Planning 2010). Seen from above (such as from aircraft) they appear dark grey and do not cause a glare or reflectivity hazard. Solar photovoltaic farms have been installed on a number of airports around the world.

Other onsite infrastructure that may cause glare or reflections depending on the sun angle, include:

- Steel array mounting - array mounting would be steel or aluminium.
- Temporary construction site offices

- Inverter stations
- Transmissions line power poles.

This infrastructure would be relatively dispersed and is considered very unlikely to present a glare or reflectivity hazard to motorists or aircraft.

With the exception of the power poles, infrastructure would be of low height, up to approximately 4.5m. In a low relief landscape.

5 IMPACT ASSESSMENT

The visual impact assessment was undertaken considering:

- The infrastructure components, described in Section 4.
- Their potential to be viewed from representative viewpoints.
- The degree of contrast they would have within identified LMZs.

LMZs were assigned to each viewpoint and the contrast at that viewpoint was evaluated, as described below.

5.1 DEFINITION OF LANDSCAPE MANAGEMENT ZONES

Visual LMZs were assigned to each viewpoint. The zones were derived by combining scenic quality (from the LCU, Section 3.2), viewer sensitivity and the distance to the proposed solar farm site (from Section 3.3). Combined they produce a three-tiered management hierarchy: A – C, as shown in Table 5-1.

Table 5-1 Visual Landscape Management Zone decision matrix

		Proximity / sensitivity						
		Foreground High	**Middle ground High**	**Background High**	**Foreground Moderate**	**Middle ground Moderate**	**Background Moderate**	**Foreground Low**
Scenic quality	**High**	A	A	A	A	B	B	B
	Moderate	A	B	B	B	B	C	C
	Low	B	B	B	B	C	C	C

Each zone has associated objectives to guide management of visual change and to help evaluate proposed project impacts. These are shown in Table 5-2:

Table 5-2 Visual Landscape Management Zone management objectives

Management priority	Management objectives
A	Maximise retention of existing visual amenity. Landscapes are least able to absorb change. Developments may lead to a major change.
B	Maintain existing visual amenity, where possible. Protect dominant visual features. Developments may be allowed to be visually apparent.
C	Less importance for retaining existing visual amenity. Landscapes are able to absorb change. Developments may be allowed to dominate but should reflect existing forms and colours where possible.

5.2 VISUAL IMPACT ASSESSMENT AT REPRESENTATIVE VIEWPOINTS

5.2.1 Evaluation criteria

The ratings for the degree of contrast created by the proposed solar farm infrastructure for each viewpoint have the following definitions (BLM n.d.).

- High contrast: the proposed solar farm would be dominant within the landscape and generally not overlooked by the observer, the visual change would not be absorbed.
- Medium contrast: the proposed solar farm would be moderately dominant and noticed, the visual change would be partially absorbed.
- Low contrast: the proposed solar farm would be seen but would not attract attention, the visual change would be well absorbed.
- Indistinct: contrast would not be seen or would not attract attention, the visual change would be imperceptible.

For the proposed solar farm, this rating is given considering the generally low height of infrastructure, and its likely visible horizontal extent from the viewpoints. This also considers topography and intervening vegetation that may affect the proposed solar farm's visibility from the viewpoints.

To determine whether the objectives of the visual LMZs zone are met, the contrast rating for the viewpoint is compared with the relevant management objectives to give a visual impact level. The visual impact level is consequently defined as:

- High impact: contrast is greater than what is acceptable.
- Medium impact: contrast is acceptable.
- Low impact: visual contrast is little or not perceived and is acceptable.

For high impact viewpoints, mitigation must be considered.

Table 5-3 below evaluates the representative viewpoints. They are ordered in terms of highest visual impact rating. The result summary is presented in Section 5.2.2.

Representative photos (including panoramas for selected locations) of the existing views are provided below. The location of panoramic photos is provided in Appendix B.4. In the panoramas below, the horizontal extent of the infrastructure layout is shown as a red line. This indicates where views of the infrastructure are possible.

Table 5-3 Visual impact at representative viewpoints with reference to the Wellington Solar Farm, in order of highest impact

ID	LCU	Viewpoint	Proximity	LMZ objective		Contrast	Visual impact	Comment
1	Agricultural	Road	<1km	B	Protect dominant visual features	High	Medium	The array infrastructure would be located immediately adjacent to Goolma Road for approximately 1.3 km. While a vegetation screen is located on the south of Goolma Road, little overstorey vegetation is present on the northern solar farm boundary. While existing industrial infrastructure exists in the area (transmission lines, substation), the solar infrastructure would be a new type of structure and contrast with the existing agricultural landscape character while adding some cumulative industrial visual impacts to the locality. Of note, several nearby receivers are elevated higher than the solar farm site, in which case more extensive views may result: R1 and R2. **Mitigation is recommended.** Additional vegetation planting on the site's boundary to Goolma Road is recommended to soften / break up views of infrastructure. Investigation of residence specific views at R1 and R2 should be undertaken to investigate further screening at these locations, if warranted.

Panorama from view point 1, refer to Appendix B.4 for extent.

ID	LCU	Viewpoint	Proximity	LMZ objective		Contrast	Visual impact	Comment
2	Agricultural	Road	<1km	B	Protect dominant visual features	High	Medium	As above, this location further north along Goolma Road would view array infrastructure for an unbroken stretch of approximately 1.3 km. Little overstorey vegetation is present on the northern solar farm boundary. As above, the solar infrastructure would be a new type of structure and contrast with the existing agricultural landscape character while adding some cumulative industrial visual impacts to the locality. **Mitigation is recommended.** Additional vegetation planting on the site's boundary to Goolma Road is recommended to soften / break up views of infrastructure.

Panorama from view point 2, refer to Appendix B.4 for extent. The red line marks horizontal extent of array infrastructure potentially visible from this location.

ID	LCU	Viewpoint	Proximity	LMZ objective		Contrast	Visual impact	Comment
3	Commercial	Substation	<1km	C	Less importance for retaining existing visual amenity.	High	Medium	As above, this location occurs along Goolma Road with a view of array infrastructure for an unbroken stretch of approximately 1.3 km. Little overstorey vegetation is present on the northern solar farm boundary. As above, the solar infrastructure would be a new type of structure and contrast with the existing agricultural landscape character while adding some cumulative industrial visual impacts to the locality. **Mitigation is recommended.** Additional vegetation planting on the site's boundary to Goolma Road is recommended to soften / break up views of infrastructure.

Panorama from view point 3, refer to Appendix B.4 for extent. The red line marks horizontal extent of array infrastructure potentially visible from this location.

ID	LCU	Viewpoint	Proximity	LMZ objective		Contrast	Visual impact	Comment
4	Agricultural and rural residence	Road and residence	<1km	B	Protect dominant visual features	Medium	Medium	Located on Cobbora Road, this is the first location travelling north that the site would be visible from the road. This view is considered indicative of two closest receivers to it, R3 and R4. Existing riparian screening will soften views from the road. Given the low lying infrastructure proposed and distance from the road (in excess of 400m), the contrast and impact would not be high for road corridor views. Given the elevation of R3 and close proximity of R4, these views should be investigated further. **Mitigation is recommended..** Investigation of residence-specific views at R3 and R4 should be undertaken to investigate further screening at these locations, if warranted.

Panorama from view point 4, refer to Appendix B.4 for extent. The red line marks horizontal extent of array infrastructure potentially visible from this location.

ID	LCU	Viewpoint	Proximity	LMZ objective		Contrast	Visual impact	Comment
5	Rural residential	Residence	<1km	B	Protect dominant visual features	Medium	Medium	Approximately 13 residences are located in this area, off either 12 Mile Road or Cadonia Drive. The closest residence is 300m from the solar site boundary. None are likely to be afforded more than glimpse views to the solar farm, given the existing screening of structures and vegetation around the residences and the gradient of the land falling to the west, diminishing western views in the context of foreground screening. Where solar farm infrastructure is located at higher elevation to the north west, existing vegetation screening in this direction would screen views. The contrast is not expected to be high. Furthermore, in this 1.6km stretch of Goolma Road, infrastructure is not located continuously along the project boundary. These breaks would help soften the view of infrastructure from Goolma Road and beyond in this location. **Mitigation is recommended.** Additional vegetation planting on the site's boundary near the site access way may soften the entry to the site.

ID	LCU	Viewpoint	Proximity	LMZ objective	Contrast	Visual impact	Comment

Existing screening provided by structures and plantings, to the east of Goolma Road.

ID	LCU	Viewpoint	Proximity	LMZ objective		Contrast	Visual impact	Comment
6	Rural residential	Residence	<1km	B	Protect dominant visual features	Medium	Medium	Approximately 4 of the above residences are located off 12 Mile Road; the closest residence is 300m from the solar site boundary. The panorama below shows the glimpse views to the solar farm, noting the array will avoid One Tree Hill; the highest rise on the solar farm site, visible in the background view below. Given the existing screening of structures and vegetation around the residence, the contrast is not expected to be high. **Mitigation is recommended.** Additional vegetation planting on the site's boundary near the site access way may soften the entry to the site.

Panorama from view point 6, refer to Appendix B.4 for extent. The red line marks horizontal extent of array infrastructure potentially visible from this location.

ID	LCU	Viewpoint	Proximity	LMZ objective		Contrast	Visual impact	Comment
7	**Agricultural**	Residence and road	<1km	B	Protect dominant visual features	Medium	Medium	Located on Goolma Road, the low lying solar infrastructure is not expected to represent a high contrast in this undulating agricultural landscape. Existing vegetation remnants, particularly those along Wuuluman Creek, and the irregular extent of the array are expected to soften views of the infrastructure further. A large historical style house is located at R8. It appears to face away from site (no windows visible), however the house is elevated. Given the elevation of R8, these views should be investigated further. **Mitigation recommended.** Investigation of residence-specific views at R8 should be undertaken to investigate further screening at these locations, if warranted.

ID	LCU	Viewpoint	Proximity	LMZ objective		Contrast	Visual impact	Comment
8	Rural residence	Road and residence	<1km	B	Protect dominant visual features	Low	Low	Views from Bella Vista Road are to ranges and Wellington; to the south west. While this is a low use road, the views are impressive and evidently valued (reflected in the street naming). The solar farm proposal site is located to the north-east, over a rise. There are limited views north to the site from this road. Views from house on rises (R1, 2 and 3) have been mentioned previously for further investigation. Little to no contrast would be expected from the road corridor itself. **No mitigation required.**
9	Agricultural	Road	1-5km	C	Less importance for retaining existing visual amenity.	Low	Low	Located on Cobbora Road, the low lying solar infrastructure is not expected to result in a high contrast given the intervening vegetation, the distance from the road of proposed infrastructure and the irregular extent of the array in this location. Glimpse views may be afforded to R5 from higher areas on the proposed solar farm site. No views from R6 would be possible, due to terrain. Existing vegetation remnants and distance are expected to be sufficient to soften intermittent views of the infrastructure from the road corridor and R5. **No mitigation recommended.**
10	Agricultural	Road	1-5km	C	Less importance for retaining existing visual amenity.	Low	Low	As above, located further north on Cobbora Road, the solar infrastructure is not expected to be visible from R6 due to terrain. Terrain and distance are expected to be sufficient to soften intermittent views of the infrastructure from the road corridor. **No mitigation recommended.**
11	Agricultural	Road	1-5km	C	Less importance for retaining existing visual amenity.	Low	Low	As above, located further north on Cobbora Road, the solar infrastructure is not expected to be visible in more than glimpse views from this location. Terrain, distance and existing vegetation remnants are expected to be sufficient to soften intermittent views of the infrastructure from the road corridor. **No mitigation recommended.**

ID	LCU	Viewpoint	Proximity	LMZ objective		Contrast	Visual impact	Comment
12	Agricultural	Road	1-5km	C	Less importance for retaining existing visual amenity.	Low	Low	Located on Campbells Lane, the solar infrastructure is not expected to be visible in more than glimpse views on this unsealed low use road. Heading east, a lot of existing screening is present. Terrain, distance and existing vegetation remnants are expected to be sufficient to soften any intermittent views of the infrastructure from the road corridor. **No mitigation recommended.**
13	Urban	Recreational area	5-15km	A	Maximise retention of existing visual amenity.	Indistinct	Low	The solar farm site would not be visible from this location. **No mitigation required.**
14	Forest	Recreational area	5-15km	B	Protect dominant visual features	Indistinct	Low	The solar farm site would not be visible from this location. It is possible it is present from some walking trails. These would be at distances of around 5km and the infrastructure would not be dominant at this distance. **No mitigation required.**

5.2.2 Results summary and recommendations

Representative viewpoints

HIGH VISUAL IMPACT

In high visual impact locations, mitigation is required. No high impact view locations were identified for the project.

MEDIUM VISUAL IMPACT

In medium visual impact locations, mitigation may be recommended to further soften views of infrastructure, either on the solar farm site or at specific offsite locations. Medium impact was identified for seven locations (Viewpoints 1-7). Of these, mitigation is recommended in four cases. The resulting recommendations are that:

1. A sparse vegetation screen be included in specific sections of Goolma Road, to mitigate cumulative impacts and lessen the contrast of the infrastructure given the close proximity of the solar array infrastructure in this location. Additionally, two areas where small groves could be established have been identified. These will provide a more natural structure to the vegetation; akin to small remnants. Refer to Appendix C for the proposed locations of the screen. The screen would be of varying native species and of varying height to soften not block the view of the site. Breaks in the screen, reflecting natural breaks in existing remnants would be appropriate. A hedge or formal row of trees is not proposed.
2. Investigation of specific residential receivers; R1, R2, R3, R4, R8; see below. Assessment from public vantages was not sufficient to understand the acceptability from these locations.

LOW VISUAL IMPACT

The remaining five viewpoints were assessed to have a low visual impact. No mitigation is considered for these locations.

In summary, while the visual *contrast* produced by the development would be high along Goolma Road, the sensitivity of the receiving environment in this area, which includes commercial and industrial developments, reduced the overall visual impact at these locations. Perimeter planting could assist to break up the views of the infrastructure and would also address cumulative impacts of this infrastructure to maintain the landscape character and avoid a more industrial character becoming dominant.

In all other locations surrounding the site, view durations would be less for passing motorists, due to undulating terrain, additional distance of infrastructure from the road, less linear edge of infrastructure boundary and existing vegetation between the site and receivers.

Residential views – additional investigation

In most locations, the road side representative viewpoints were considered sufficient to assess and consider mitigation for the residences in these locations. However, five residences were identified that this road-side assessment could not adequately investigate. First Solar consulted with the land owners of each residence, discussed the proposal and discussed impact mitigation measures. Where requested, photo montages to illustrate the look of the solar farm from specific locations were undertaken; two residences had montages prepared. The before and after montages are presented in the table below, noting that the

infrastructure is difficult to discern due to the distance from the site. Additional mitigation was proposed for these two residences. The outcomes of this additional investigation are provided in Table 5-4.

Table 5-4 Additional assessment of specific residential locations (refer to Appendix A.3 for location of residential receivers)

ID	Street address	Reason for further investigation	Outcome
R1	Off Bella Vista Lane	Elevated site approximately 800m from site boundary. Public road access could not ascertain extent of views from residence and outdoor recreational spaces.	First Solar undertook a site visit to investigate potential impacts and discuss the project with the resident. A montage was not requested. Additional mitigation was not agreed.
R2	Off Bella Vista Lane	Elevated site approximately 850m from site boundary. Public road access could not ascertain extent of views from residence and outdoor recreational spaces.	First Solar undertook a site visit to investigate potential impacts and discuss the project with the resident. Montages were requested. **Additional mitigation was agreed and included in the project mitigation strategy.**

ID	Street address	Reason for further investigation	Outcome
Before (refer to Appendix A.3 for location of R2)			
			
After			
			

ID	Street address	Reason for further investigation	Outcome
Before (refer to Appendix A.3 for location of R2)			
			
After			
			

ID	Street address	Reason for further investigation	Outcome
R3	Off Bella Vista Lane	Elevated site approximately 1000m from site boundary. Public road access could not ascertain extent of views from residence and outdoor recreational spaces.	First Solar undertook a site visit to investigate potential impacts and discuss the project with the resident. A montage was not requested. Additional mitigation was not agreed.
R4	Off Cobbora Road	Close proximity (30m) to site boundary. Public road access could not ascertain extent of views from residence and outdoor recreational spaces.	First Solar undertook a site visit to investigate potential impacts and discuss the project with the resident. A montage was not requested. Additional mitigation was not agreed.
R8	Off Goolma Road	Elevated site approximately 650m from site boundary. Public road access could not ascertain extent of views from residence and outdoor recreational spaces.	First Solar undertook a site visit to investigate potential impacts and discuss the project with the resident. Montages were requested. **Additional mitigation was agreed and included in the project mitigation strategy.**

ID	Street address	Reason for further investigation	Outcome
Before (refer to Appendix A.3 for location of R8)			
			
After			
			

ID	Street address	Reason for further investigation	Outcome
Before (refer to Appendix A.3 for location of R8)			
			
After			
			

Dark Sky region mitigation

Additional impacts are relevant to the proposal, given its location within the *Dark sky region*.

Construction has potential to increase the levels of dust in the locality temporarily. As discussed in Section 4, excavation would be minimal however the traffic on unsealed internal access tracks is likely to increase local dust levels, particularly in dry conditions. Dust would be supressed during construction through the use of water applications and covering of loads. No night lighting, with the exception of limited security lighting, is anticipated.

During operation, the dust generation would likely be less than for existing agricultural land uses. The arrays themselves as well as the ground cover retained beneath the array will limit dust generation and movement. The unsealed perimeter access track would have low traffic levels during operation and is unlikely to generate substantially more dust that existing farm access tracks onsite. Limited security lighting is anticipated.

General measures to minimise light pollution including reducing dust are however, recommended.

6 MITIGATION STRATEGY

The following measures are recommended to address the visual impacts of the proposal.

6.1 VEGETATION SCREENING

- Solar farm vegetation screening:
  - A sparse vegetation screen, 1 -2 rows deep, would be established with reference to Appendix C Proposed onsite screening.
  - The screen would be comprised of varying native species appropriate to the area and of varying height to soften not block the view of the site.
  - Breaks in the screen, reflecting natural breaks in existing remnants would be appropriate.
  - Planting should be undertaken as soon as practical in the construction process depending on the season, as it will take time for the plants to establish and become effective as a screen. Seasonal requirements for planting should also be considered.
  - The screen would be maintained for the operational life of the solar farm. Dead plants would be replaced. Pruning and weeding would be undertaken as required to maintain the screen's visual amenity and effectiveness in breaking up views.
- Residential receiver screening
  - Establish plantings for receivers R2 and R8, in consultation with landowners, based on the as-built views of the solar farm.

6.2 GENERAL MEASURES

6.2.1 Design

- Where feasible, underground rather than overhead power lines would be considered.
- Where feasible, co-location of powerlines would be undertaken to minimise the look of additional power poles. If additional poles are required, these would match existing pole design as much as possible.
- The materials and colour of onsite infrastructure will, where practical, be non-reflective and in keeping with the materials and colouring of existing infrastructure or of a colour that will blend with the landscape. Where practical:
  - Proposed new buildings will be non-reflective and in eucalypt green, beige or muted brown.
  - Pole mounts will be non-reflective.
  - Security fencing posts and wire would be non-reflective; green or black rather than grey would reduce the industrial character of the fence.

6.2.2 Construction

- During construction, dust would be controlled in response to visual cues.
- Areas of soil disturbed by the project would be rehabilitated progressively or immediately post-construction, reducing views of bare soil.

- Ground cover would be maintained beneath the panels and within the site boundary, to break up views of the infrastructure from the side and back views.
- Night lighting would be minimised to the maximum extent possible (i.e. manually operated safety lighting at main component locations).

6.2.3 Operation

- Maintenance of ground cover beneath panels, to reduce dust.
- Minimise traffic movements on unsealed tracks, to reduce dust.
- Night lighting would be minimised to the maximum extent possible (i.e. manually operated safety lighting at main component locations).

7 CONCLUSION

The Wellington Solar Farm (SF) proposal site is located approximately 2km north east of Wellington, in western central NSW. The proposal would comprise an array of solar panels covering an area of approximately 316 hectares, a 132kV substation (either onsite or within the existing Transgrid substation) and ancillary infrastructure. The power generated would be transmitted via overhead powerline to the existing substation south of Goolma Road.

This Visual Impact Assessment includes a full assessment of the visual impacts associated with the proposed Wellington Solar Farm. This report addresses the Secretary's Environmental Assessment Requirements (SEARs) for the proposed Wellington Solar Farm, provided by NSW Department of Planning and Environment (DPE) on 20 July 2017, which require consideration of reflectivity and glare, an evaluation and discussion of potential visual, the evaluation uses representative viewpoints of residences and road corridors, a discussion of significant vistas in the locality, with reference to community values and perceptions, consideration of the *Dark Sky Planning Guideline: Protecting the observing conditions at Siding Spring* and a draft landscaping plan. Air traffic is not considered in this report but it is noted that, as discussed in Section 4, glare and reflectivity are not considered an impact for aircraft.

No high visual impacts would result from the project. Specific sections of Goolma Road are proposed to be targeted for additional vegetation screening to mitigate cumulative impacts and lessen the contrast of the infrastructure given the close proximity of the solar array infrastructure to the road in this location. Refer to Appendix C for the location of the screen. While the visual *contrast* produced by the development would be high along Goolma Road, the sensitivity of the receiving environment in this area, which includes commercial and industrial developments, reduces the overall visual impact at these locations. The proposed planting, which includes sections of perimeter planting as well as groves, could assist to break up the views of the infrastructure and would also address cumulative impacts of this infrastructure to maintain the landscape character and avoid a more industrial character becoming dominant.

Five residential locations were investigated in more detail. Their elevated locations off publicly accessible roads meant that this road-side assessment could not adequately investigate potential visual impacts. For two locations, the proponent has committed to additional planting, in consultation with the land owners.

A set of general mitigation measures, including the design, construction and operational phases of the project are included primarily to lessen the contrast of new structures and manage dust and light spill of the project. The measures are aimed at retaining the visual values the community has identified; existing views of river valleys, hills and greenery.

Large scale solar farms are still relatively new in Australia. While they enjoy support from many in the community, provision of information on expected visual impacts and involvement in mitigating impacts (for affected receivers) is considered very important to obtaining social license to operate. With the involvement of the affected landowners in the mitigation strategy set out in Section 6, the visual impacts of the proposed solar farm are considered acceptable and manageable.

8 REFERENCES

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APPENDIX A ZONE OF VISUAL INFLUENCE AND REPRESENTATIVE VIEW POINTS

The ZVI (or viewshed) of the proposed solar farm was produced using topographic information.

A height of 4.5m was used to model onsite infrastructure. This is a realistic approximation of the height of panels and PV containers, which may be up to 4.5m.

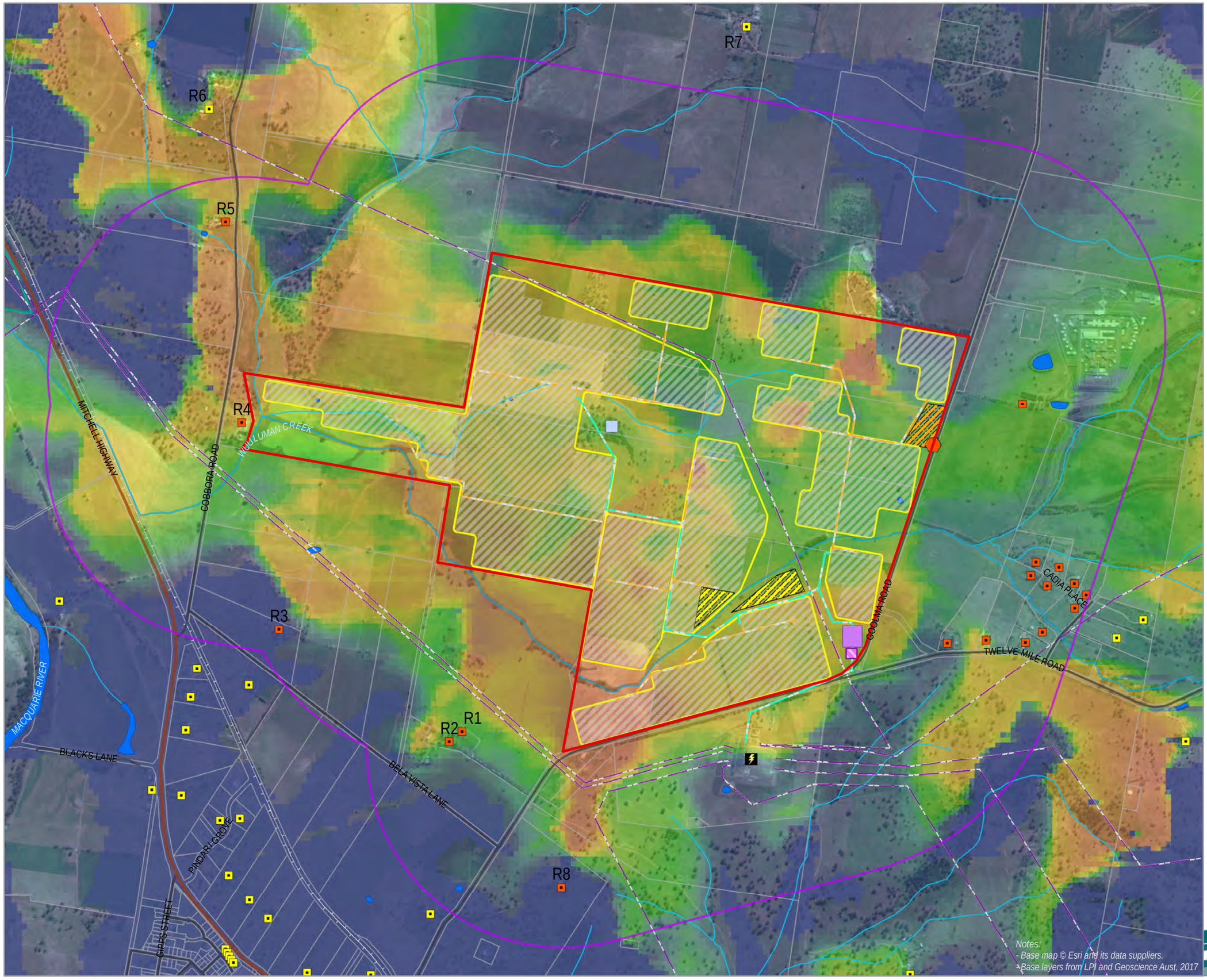
The visibility is then modelled based on the number of points of the infrastructure block that can be seen. 100% means all points can be seen and equates to the highest visibility. The lowest score is 0%; none of the points of the infrastructure block can be seen.

Topography was based on a 25m resolution Digital Elevation Model (DEM) derived from 25m contours. The ZVI does not take into account screening such as vegetation or infrastructure and on this basis is considered a 'worst case' model.

Representative viewpoints assessed in this report are also shown for the study area on the ZVI maps; A.1 and A.2.

The location of representative viewpoints (and associated LCUs) and panorama are shown in A.3 and A.4, respectively.

A.1 ZVI FOREGROUND (1KM)



- Project boundary
- Site access
- Proposed array
- Battery storage facility
- Proposed overhead transmission line
- Proposed underground transmission line
- Proposed road
- Proposed substation
- Temporary laydown and turning circle
- Temporary construction and office parking
- Foreground (1 km)
- OAM building
- House (0-1 km)
- House (1-2 km)
- Substation
- Local road
- Highway
- Existing transmission lines
- Farm dam / other water body
- Minor drainage feature
- Railway
- Travelling stock reserve
- Cadastre
- Shielded (Project not visible)

Visibility

High : 93

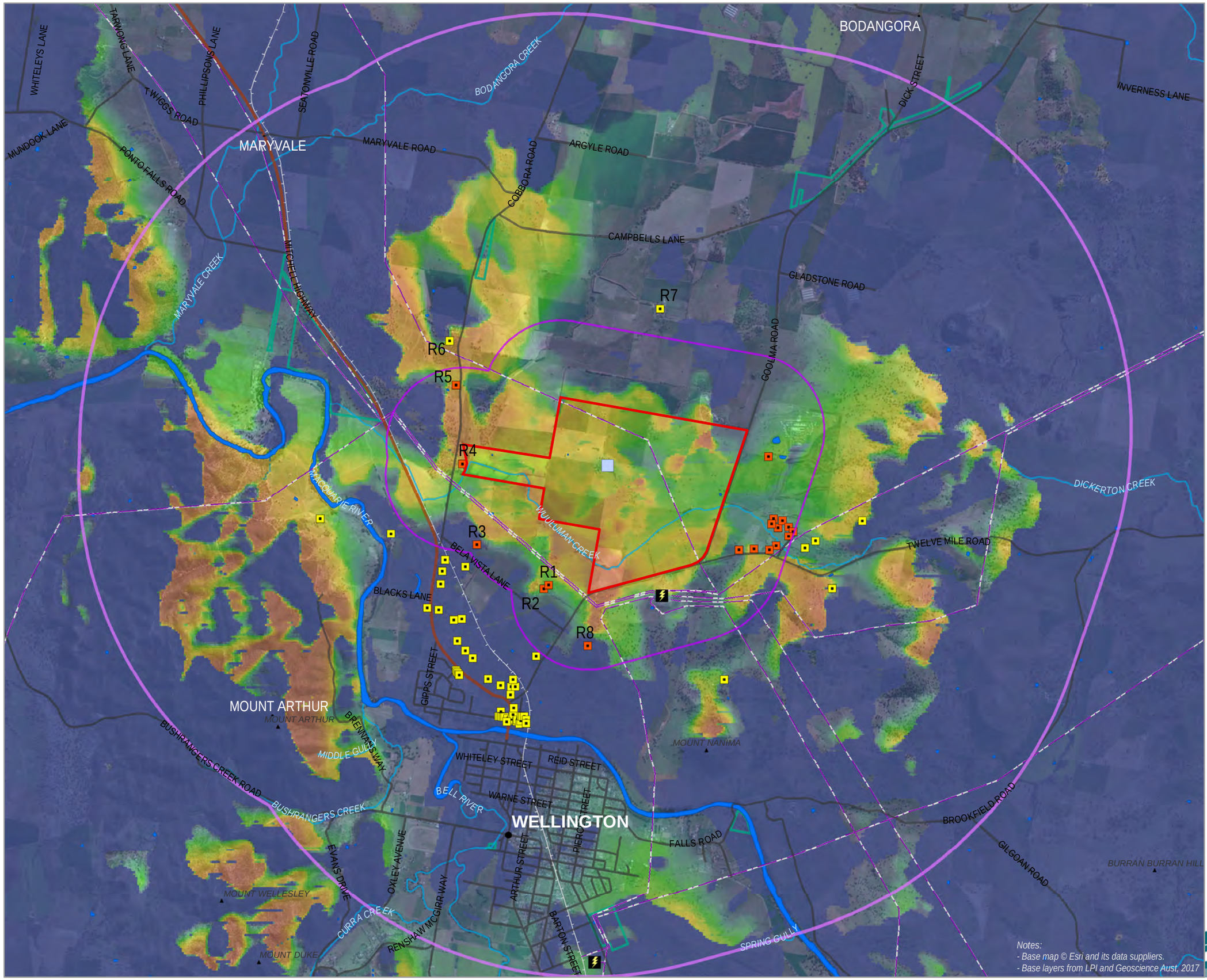
Low : 1

0 100 200 400 m

A3 @ 1:18000
Ref: SW121 Wellington SF
Author: SP Date: 30/10/2017

www.nghenvironmental.com.au

A.2 ZVI MIDGROUND (5KM)



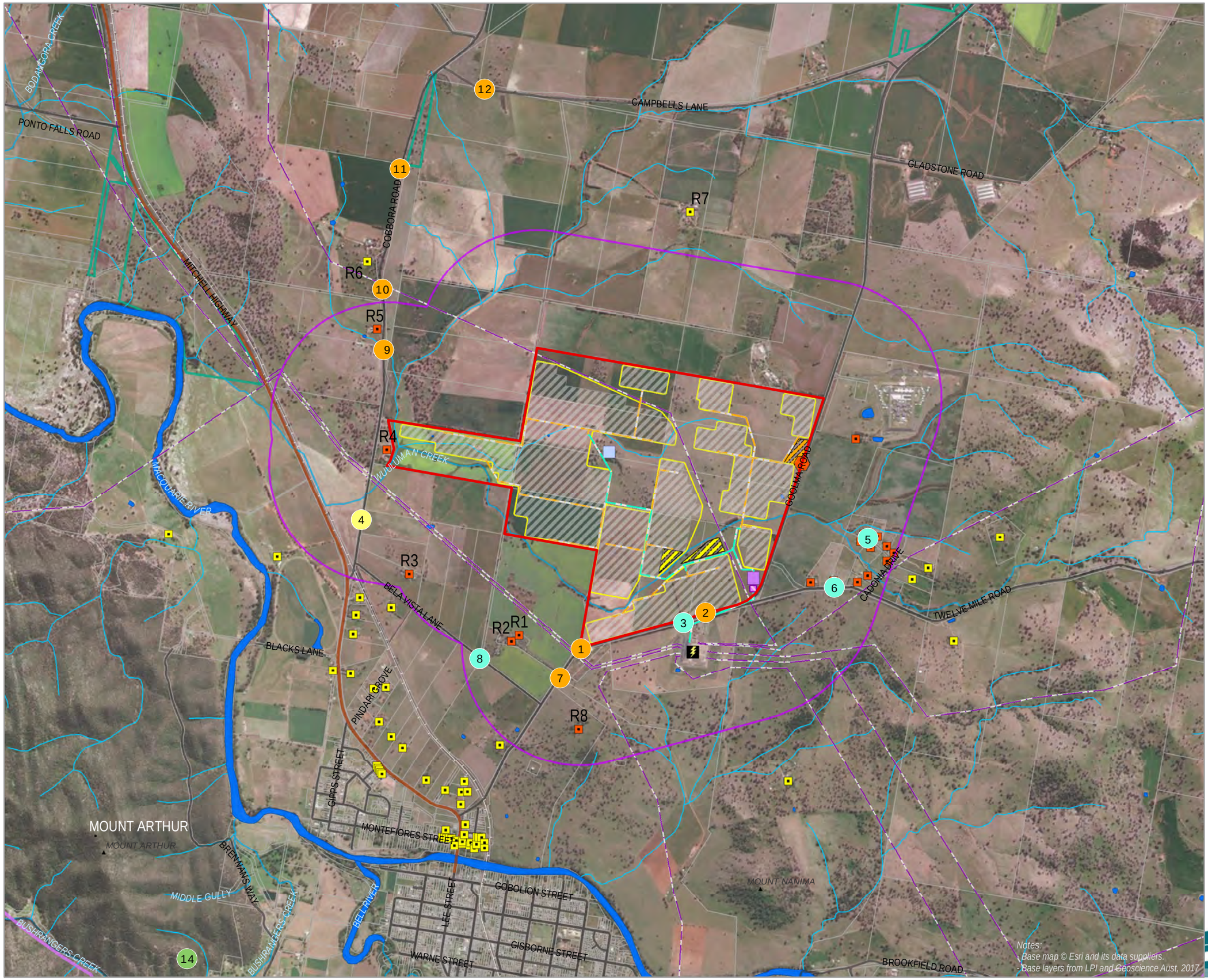
Project boundary
Foreground (1 km)
Midground (5 km)
OAM building
House (0-1 km)
House (1-2 km)
Substation
Local road
Highway
Existing transmission lines
Farm dam / other water body
Railway
National Park / Reserve
Travelling stock reserve
Shielded (Project not visible)

Visibility
High : 93
Low : 1

0 0.5 1 2 Km

A3 @ 1:46000
Ref: SW121 Wellington SF
Author: SP Date: 30/10/2017

A.3 LOCATION OF REPRESENTATIVE VIEWPOINTS (AND ASSOCIATED LCUS) FOREGROUND



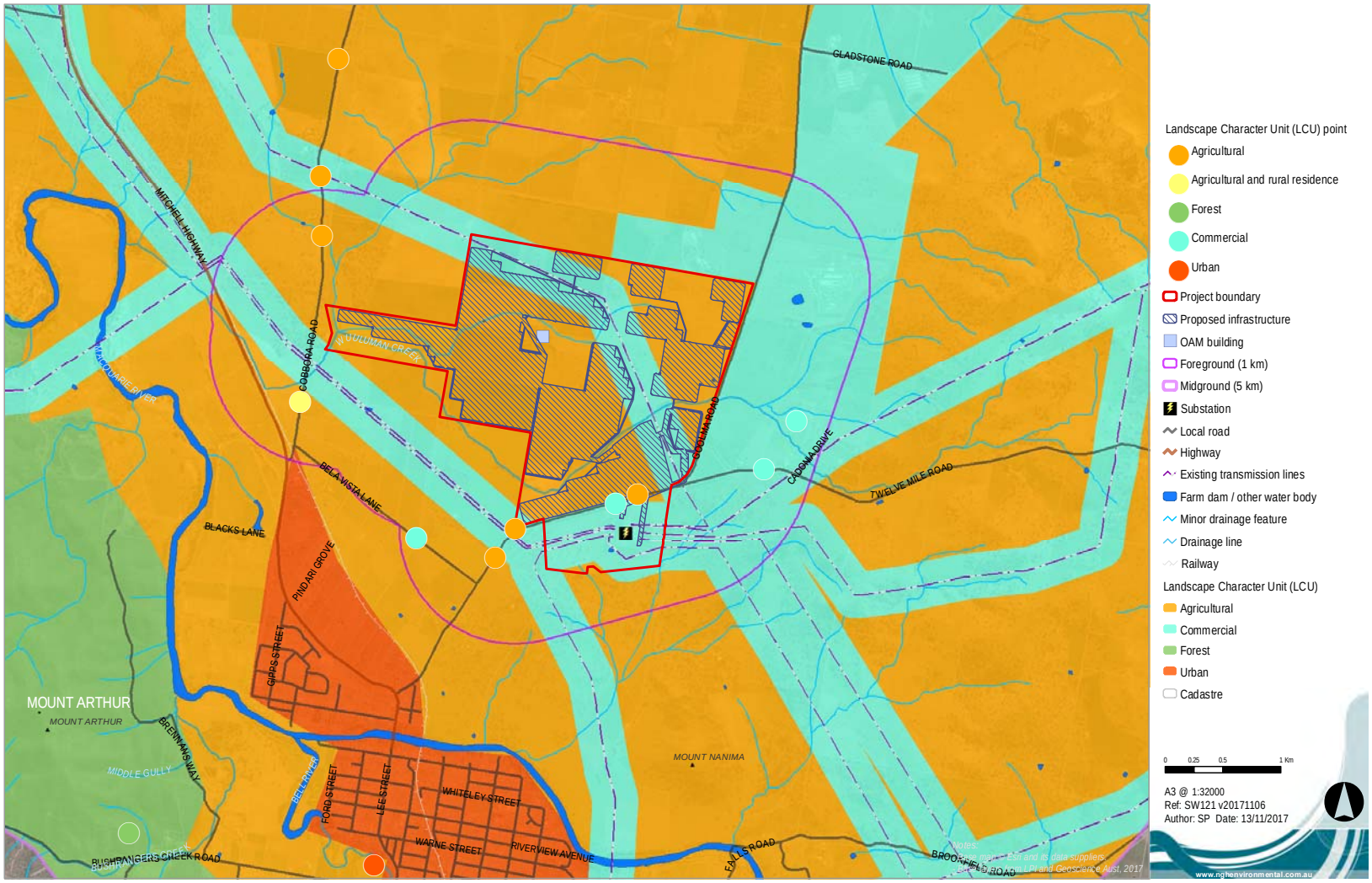
Landscape Character Unit (LCU)

- Agricultural
- Agricultural and rural residence
- Forest
- Rural residential / commercial
- Project boundary
- Site access
- Proposed array
- Battery storage facility
- Proposed overhead transmission line
- Proposed underground transmission line
- Proposed road
- Proposed substation
- Temporary laydown and turning circle
- Temporary construction and office parking
- Foreground (1 km)
- Midground (5 km)
- OAM building
- House (0-1 km)
- House (1-2 km)
- Substation
- Local road
- Highway
- Existing transmission lines
- Farm dam / other water body
- Minor drainage feature
- Railway
- Travelling stock reserve
- Cadastre

0 100 200 400 m

A3 @ 1:30000
Ref: SW121 Wellington SF
Author: SP Date: 30/10/2017

Notes:
Base map © Esri and its data suppliers.
Base layers from LPI and Geoscience Aust, 2017


GLADSTONE ROAD
MITCHELL HIGHWAY
CORBORA ROAD
WOLLOMAN CREEK
BELA VISTA LANE
BLACKS LANE
PINDARI GROVE
GIPPS STREET
GOOLMA ROAD
CADOMA DRIVE
TWELVE MILE ROAD
MOUNT ARTHUR
MOUNT ARTHUR
BRENNAN HAS WAY
MIDDLE GULLY
BELL RIVER
FORD STREET
LEE STREET
WHITELEY STREET
WARNE STREET
RIVERVIEW AVENUE
MOUNT NANIMA
FALLS ROAD
BUSHRANGERS CREEK ROAD
Landscape Character Unit (LCU) point
Agricultural
Agricultural and rural residence
Forest
Commercial
Urban
Project boundary
Proposed infrastructure
OAM building
Foreground (1 km)
Midground (5 km)
Substation
Local road
Highway
Existing transmission lines
Farm dam / other water body
Minor drainage feature
Drainage line
Railway
Landscape Character Unit (LCU)
Agricultural
Commercial
Forest
Urban
Cadastre
0 0.25 0.5 1 Km
A3 @ 1:32000
Ref: SW121 v20171106
Author: SP Date: 13/11/2017
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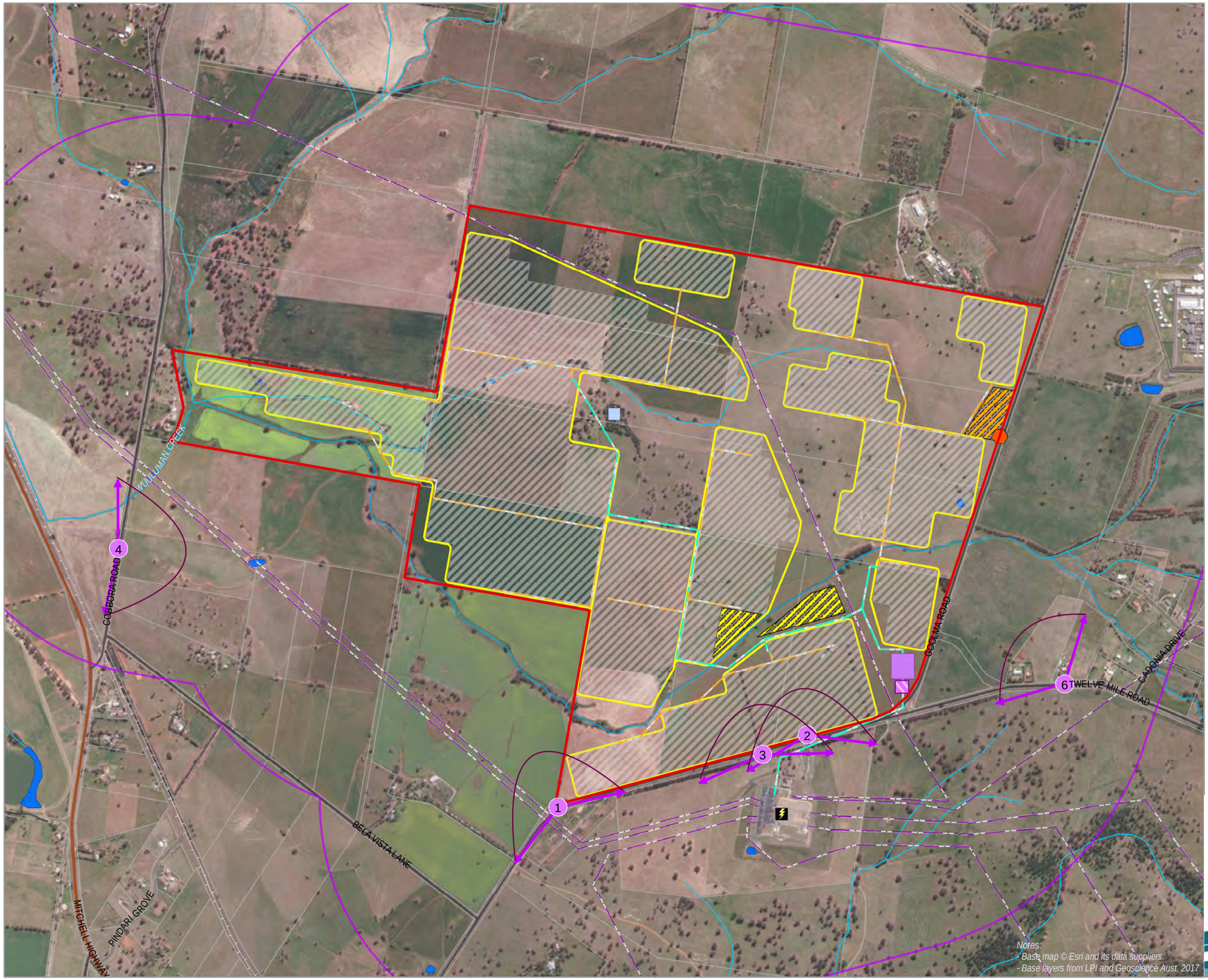
A.4 LOCATION OF PANORAMIC PHOTOS, SHOWN IN SECTION 5.2.



Panorama location (and view extent)
Project boundary
Site access
Proposed array
Battery storage facility
Proposed overhead transmission line
Proposed underground transmission line
Proposed road
Proposed substation
Temporary laydown and turning circle
Temporary construction and office parking
OAM building
Foreground (1 km)
Substation
Local road
Highway
Existing transmission lines
Farm dam / other water body
Minor drainage feature
Railway
Cadastre

0 100 200 400m

A3 @ 1:15000
Ref: SW121 Wellington SF
Author: SP Date: 30/10/2017

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APPENDIX B COMMUNITY FEEDBACK FORM QUESTIONS

COMMUNITY FEEDBACK FORM: WELLINGTON SOLAR FARM

Your feedback is important to develop a solar farm project that best suits the local area and community.

Your comments ensure local feedback is understood by the developers and assessment team.

Please send your feedback to (or seek further information directly, from):
Mirjam Tome, First Solar Australia Pty Ltd
Level 3 16 Spring Street, Sydney, NSW 2000
wellington@firstsolar.com

For further information about the project, please see the project website at www.wellingtonsolarfarm.com.au

Your contact details: (this information will be treated as confidential)

Name: ..... Address: ..... Ph: .....

Circle which best describes how far you live from the proposed Wellington Solar Farm:

<1 km 1-2 km 2-5 km >5 kilometres Not a member of the local community

Tell us what you value about the local area:

What do you value most about the local area?

.....
.....
.....
.....

What views or landscape characteristics in the region and local area are important to you?

.....
.....
.....
.....

What do you like about solar farms?

.....
.....
.....
.....

Do you have any concerns about solar farms?

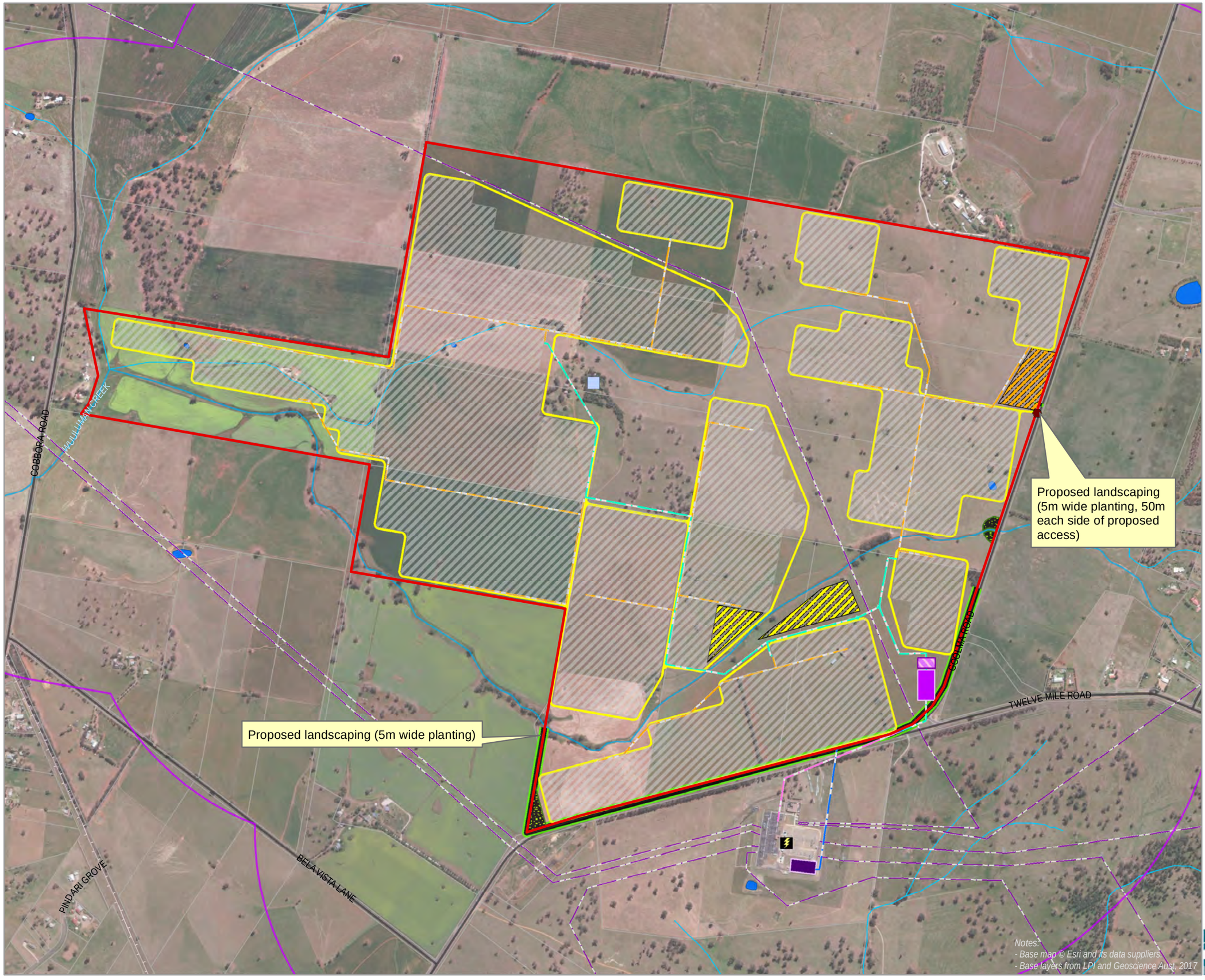
.....
.....
.....
.....

Do you have any specific concerns regarding the proposed solar farm at Wellington?

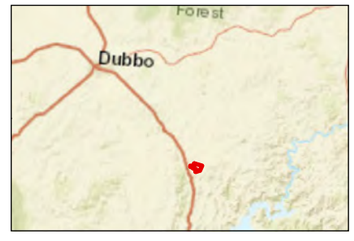
.....
.....
.....
.....

First Solar

APPENDIX C PROPOSED ONSITE SCREENING



- Site access
- Project boundary
- Battery storage facility
- Proposed array
- Proposed overhead transmission line: Option 1
- Proposed overhead transmission line: Option2
- Proposed overhead transmission line
- Proposed underground transmission line
- Proposed road
- Proposed substation: Option 1
- Proposed substation: Option 2
- Temporary laydown and turning circle
- Temporary construction and office parking
- OAM building
- Proposed landscaping (grove)
- Proposed landscaping (5m wide planting)
- Foreground (1 km)
- Substation
- Local road
- Existing transmission lines
- Farm dam / other water body
- Minor drainage feature
- Railway
- Cadastre



0 100 200 400 m

A3 @ 1:13000
Ref: SW121 v20171106
Author: SP Date: 6/11/2017

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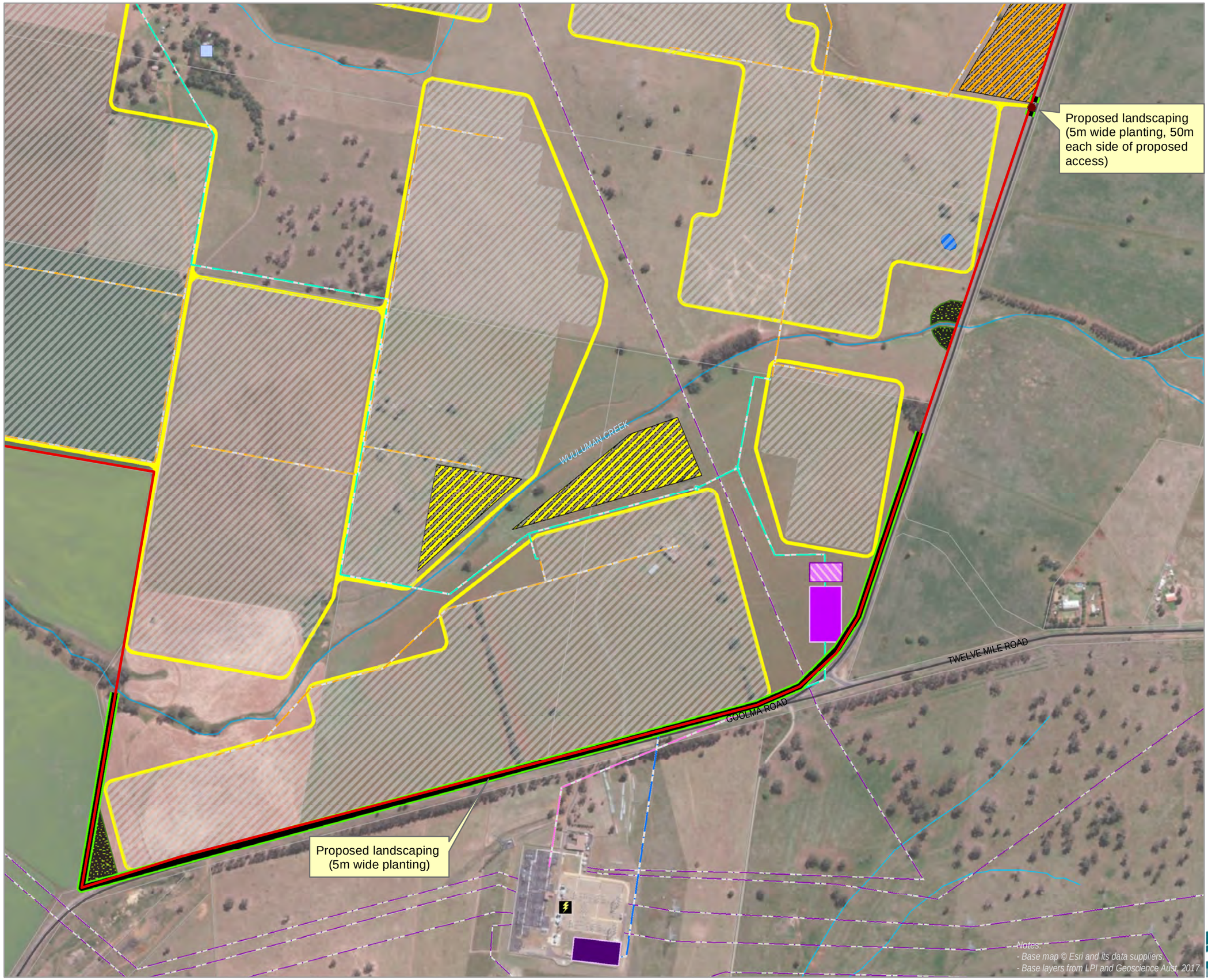

- Site access
- Project boundary
- Proposed landscaping (5m wide planting)
- Battery storage facility
- Proposed array
- Proposed overhead transmission line: Option 1
- Proposed overhead transmission line: Option2
- Proposed overhead transmission line
- Proposed underground transmission line
- Proposed road
- Proposed substation: Option 1
- Proposed substation: Option 2
- Temporary laydown and turning circle
- Temporary construction and office parking
- OAM building
- Proposed landscaping (grove)
- Substation
- Local road
- Existing transmission lines
- Farm dam / other water body
- Minor drainage feature
- Cadastre

0 50 100 200 m

A3 @ 1:7000
Ref: SW121 v20171106
Author: SP Date: 6/11/2017

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