Appendix G

VISUAL IMPACT ASSESSMENT

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Visual impact assessment

Sundown Solar Farm

Prepared for Sundown Solar Pty Limited

January 2023

Visual impact assessment

Sundown Solar Farm

Sundown Solar Pty Limited

J210075 Sundown Solar EIS - VIA

January 2023

Version	Date	Prepared by	Approved by	Comments
V1	14 November 2022	David Richards	Paul Freeman	
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Executive Summary

Sundown Solar Pty Limited (Sundown Solar) proposes to develop the Sundown Solar Farm, a large-scale solar photovoltaic (PV) generation facility and battery energy storage system (BESS) along with associated infrastructure in Spring Mountain, approximately 30 kilometres (km) east of Inverell in the New England Tablelands region of northern New South Wales (the project).

A visual impact assessment (VIA) has been conducted from eight representative viewpoints surrounding the site. The representative viewpoints were selected based on the following criteria:

- proximity to the development footprint
- the location of receptors (i.e. dwellings)
- the positioning of regional and local roads and potential impacts on passing motorists
- the location of items of local heritage significance listed within the *Inverell Local Environmental Plan 2012*
- local topography
- presence of remnant vegetation with potential to provide screening.

Due to existing mature vegetation, variable elevation and undulation in the landscape, and the height of the dominant project infrastructure, namely the PV panels, infrastructure within the development footprint will be shielded from view at the majority of viewpoints considered as part of this assessment.

The visual assessment determined that, of the viewpoints assessed, infrastructure may be visible from one of the eight viewpoints. Based on variable elevation and undulation in the landscape and the presence of vegetation, combined with the height of the PV panels, the impact assessment predicts:

- a negligible visual impact for Viewpoint 4
- a slight visual impact for Viewpoints 1, 2, 5, 6, 7 and 8
- a slight/moderate visual impact for Viewpoint 3.

Due to the methodology adopted as part of this assessment, a slight visual impact has been assigned to six viewpoints that are not predicted to be exposed to any views of project infrastructure. This is due to the visual sensitivity of the viewpoints. However, it is reiterated that the viewshed analysis results indicate no views of project infrastructure are anticipated from these viewpoints and associated dwellings.

Motorists travelling along the Gwydir Highway may experience transitory and distant views of project infrastructure within the development footprint; however, any potential views are considered insignificant.

The construction of the project will expand the overall area within the Inverell LGA that is occupied by renewable energy infrastructure. Based on the height of the dominant project infrastructure, namely the PV panels, variable elevation and undulation in the landscape, the presence of vegetation and separation distances between the development footprint and the footprints for other wind and solar developments in the area, it is anticipated that there is limited potential for combined views of the project and other renewable energy developments.

This VIA concludes that the project will not have any significant adverse visual impacts on the locality.

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1 Introduction

1.1 Background

Sundown Solar Pty Ltd (Sundown Solar) proposes to develop the Sundown Solar Farm, a large-scale solar photovoltaic (PV) generation facility and battery energy storage system (BESS) in Spring Mountain, approximately 30 kilometres (km) east of Inverell in the New England Tablelands region of northern New South Wales (NSW) (Figure 1.1) (the project).

The project will be assessed as a State significant development (SSD) under *State Environmental Planning Policy (State and Regional Development) 2011* (SRD SEPP). Accordingly, an environmental impact statement (EIS) for the project is required under the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act).

Secretary's Environmental Assessment Requirements (SEARs) for the project were issued in 2017, and then re-issued in August 2020. Sundown Solar has engaged EMM Consulting Pty Limited (EMM) to prepare the EIS and supporting technical assessments. This visual impact assessment (VIA) report forms part of the EIS. It documents the VIA methods and results.

1.2 Purpose of this report

The key objectives of this report are to:

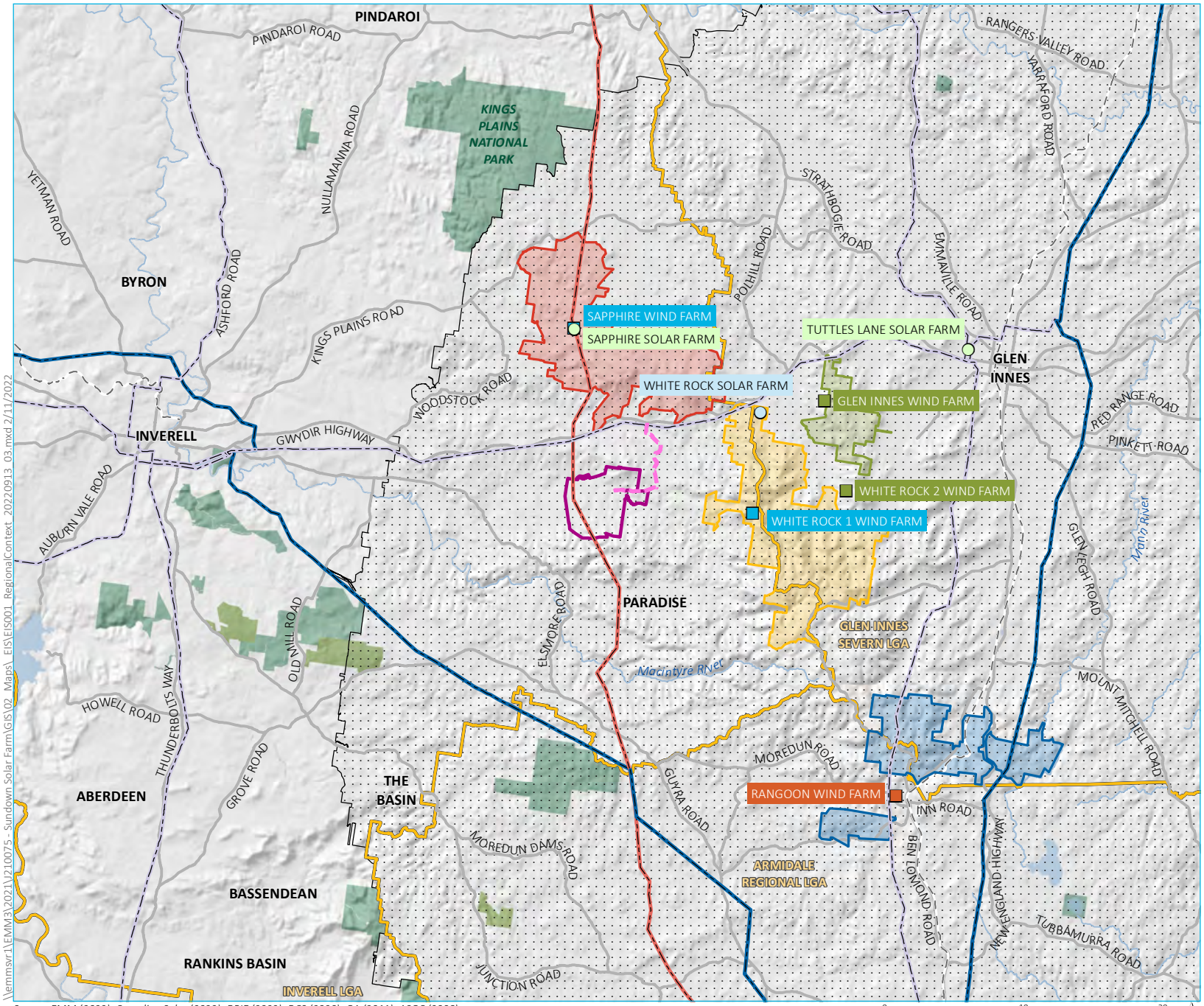
- describe the character of the visual components of the project and the staging of project development (Chapter 2)
- describe and characterise the existing landscape within which the project will be sited (Chapter 3)
- identify the relevant assessment requirements (Chapter 4)
- describe the VIA methodology adopted in the preparation of this report (Chapter 5)
- describe the impacts of the project from representative viewpoints around the site (Chapter 6)
- identify mitigation and management measures to address the project's predicted visual impacts (Chapter 7).

1.3 Project terminology

For the purposes of this report, the following definitions have been adopted (Table 1.1).

Table 1.1 Key terminology

Terminology	Description
The project	The Sundown Solar Farm. This refers to all elements that comprise the project for which approval is sought.
The site	The area proposed to be developed as Sundown Solar Farm.
Project area	Comprises the three lots on which the project will be developed. The project area comprises the development footprint as well as the areas that will remain undeveloped. The project area comprises an area of approximately 2,097 hectares (ha).
Development footprint	The extent of surface area within the project area that will comprise project-related infrastructure (such as the PV panels, BESS, substation, switchroom, internal access roads etc). The development footprint comprises an area of approximately 651 ha.
Disturbance footprint	The extent of surface area within the project area that will be disturbed to facilitate the construction of the project plus the extent of surface area associated with the access road that will be disturbed to facilitate the construction of the access road and associated intersection. The disturbance footprint comprises an area of approximately 729 ha (including approximately 7.6 ha associated with the access road).



KEY

- Proposed Sundown Solar Farm (Project area)
- Access road
- New England Renewable Energy Zone

Electricity transmission line

- 66 kV
- 132 kV
- 330 kV

Surrounding renewable development

Solar development

- Operational
- Approved

Wind development

- Operational
- Approved
- In planning
- Glen Innes Wind Farm
- Rangoon Wind Farm
- Sapphire Wind and Solar Farm
- White Rock Wind and Solar Farm

Existing environment

- Rail line
- Major road
- River
- Named waterbody
- NPWS reserve
- State forest
- Local government area

Source: EMM (2022); Canadian Solar (2022); DPIE (2022); DCS (2020); GA (2011); ASGC (2006)

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Regional context

Sundown Solar Farm
Visual impact assessment
Figure 1.1

EMM creating opportunities

2 Project description

2.1 Overview

The project will have an estimated capacity of 360 megawatts (MW) and will comprise solar arrays, an on-site BESS, transformers, inverters and associated infrastructure. The electricity generated on-site will contribute to and connect to the national electricity grid via an existing 330 kilovolt (kV) transmission line that traverses the site.

The electricity generated from the project will be sold to one or more registered energy retailing organisations, large energy users (governmental or private) or to the National Electricity Market that is operated by the Australian Energy Market Operator (AEMO).

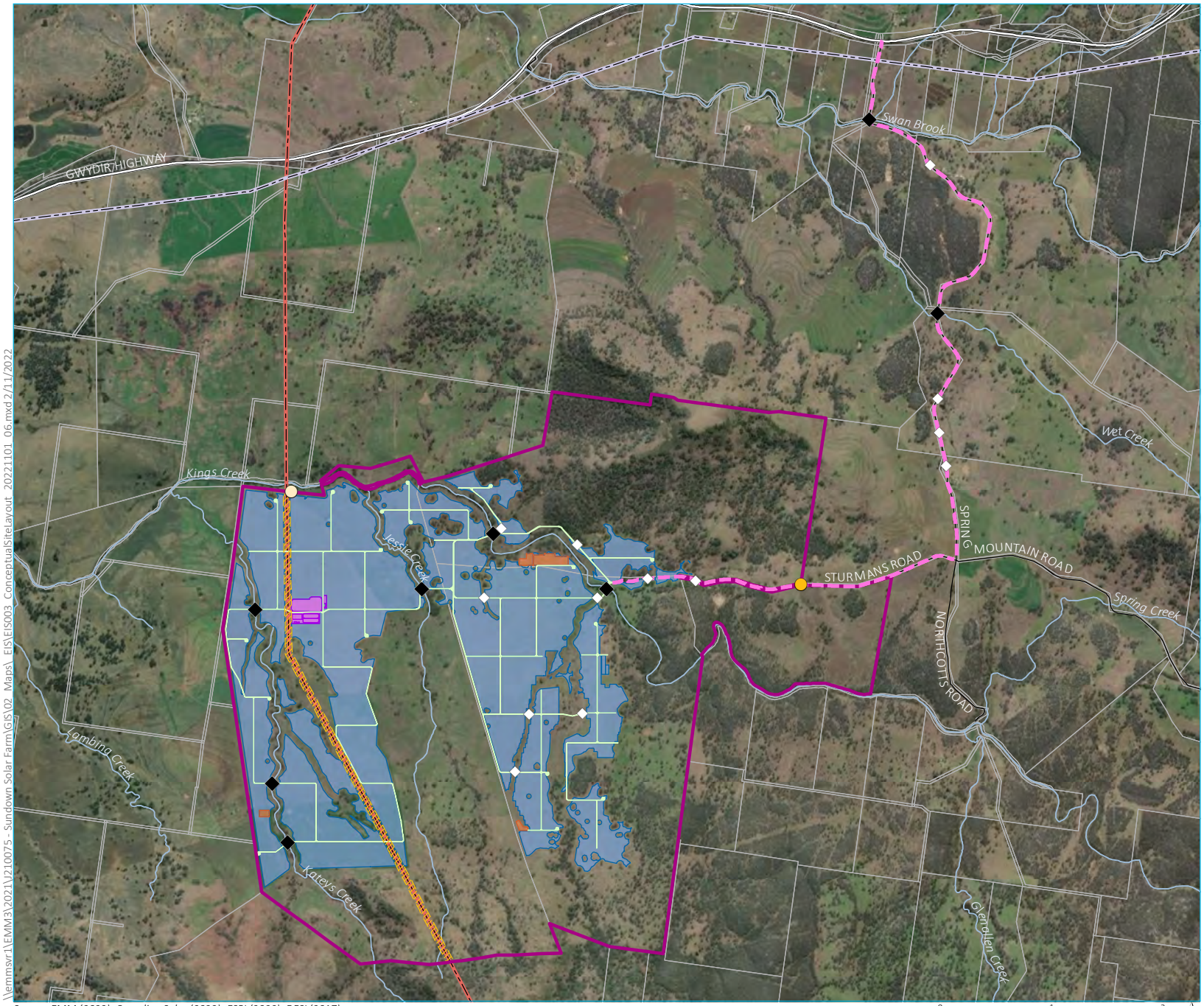
As well as generating energy, the project also aims to improve electricity grid reliability and network stability by storing energy for dispatch to the grid during peak periods. The BESS will have the capacity to store up to 150 MW of energy.

The project will play an important role in reducing the market reliance on fossil fuel generation. Australia's energy market is undergoing significant changes and utility-scale solar farms and batteries are pivotal to enabling the shift from a fossil fuel energy baseload to renewable energy.

The project will comprise the following key components:

- a network of approximately 660,000 panels and associated mounting infrastructure
- a 150 MW BESS
- an onsite 330 kV substation
- electrical collection and conversion systems, including inverter and transformer units, switchyard and control room
- underground and aboveground cables
- a management hub (including demountable offices and amenities and equipment sheds)
- on-site creek crossings
- security fencing
- temporary laydown areas (during construction and decommissioning)
- parking and internal access roads
- lighting
- firefighting infrastructure.

A conceptual site layout is provided in Figure 2.1.



KEY

- Proposed Sundown Solar Farm (Project area)
- Major road
- Minor road
- Named watercourse
- Cadastral boundary

Existing overhead transmission line

- Armidale to Dumaresq (330 kV)
- Glen Innes to Inverell (132 kV)

Development footprint

- Access road
- 330 kV OHL easment (60 m)
- Internal access road
- BESS/switchroom/substation
- Construction and laydown
- Potential PV area

Emergency access/egress point

- Primary
- Secondary

Potential water crossing

- Named watercourse
- Drainage line

\\emmsvr1\EMM3\2021\P21\0075 - Sundown Solar Farm\GIS\02 Maps\ EIS\EIS003 ConceptualSiteLayout 20221101 06.mxd 2/11/2022

Source: EMM (2022); Canadian Solar (2022); ESRI (2022); DFSI (2017)

0 1 2 km

GDA2020 MGA Zone 56

N

Conceptual site layout

Sundown Solar Farm
Visual impact assessment
Figure 2.1

EMM creating opportunities

2.2 Construction

2.2.1 Stage 1: Site establishment

Due to the development footprint's relatively flat terrain and predominantly cleared landscape, limited site preparation and civil works will be required. Site establishment works will include:

- upgrades to the Gwydir Highway/Spring Mountain Road intersection
- upgrades to the site access road (Spring Mountain Road and Sturmans Road)
- removal of internal fencing
- relocation of one project-related house and one shearing shed
- scrub, grade and minor cut and fill (as required) to prepare the site surface
- establish a secured temporary construction laydown area (including site office, containers for storage and parking areas)
- survey to confirm infrastructure positioning
- geotechnical investigations
- installation of boundary fencing.

2.2.2 Stage 2: Civil, mechanical and electrical works

Key activities during the civil, mechanical and electrical works stage include:

- drive piles into the ground to support the PV panel mounting structure
- assemble tracker frames and PV panels on top of the piles
- install underground cabling between the PV panels and the inverters, and to the on-site substation
- prepare foundations for the inverter blocks, switchyard and management hub structures
- install combiner boxes, inverters, on-site substation, switchgear and BESS
- construct the management hub
- construct internal access tracks
- construct transmission infrastructure between the project electrical switchyard and the existing overhead transmission line
- install external and internal security fencing and CCTV.

2.2.3 Stage 3: Commissioning and testing

Project elements will be tested to ensure they are properly installed.

2.2.4 Construction timing

Construction of the project will take approximately 21 months from the commencement of site establishment works to project commissioning. Construction activities will be undertaken during standard daytime construction hours only (i.e. 7.00 am–6.00 pm Monday to Friday and 8.00 am–1.00 pm Saturday).

2.2.5 Construction plant and equipment

Plant and equipment required for construction will include:

- earthmoving machinery and equipment for site preparation
- cable trenching and laying equipment
- post-driving equipment
- assisted material handling equipment (forklifts and cranes)
- vibratory rolling equipment for ground compaction
- machinery and equipment for connection infrastructure establishment
- water trucks for dust suppression, as required.

2.2.6 Delivery of construction materials and infrastructure

Construction materials and infrastructure will be transported to the site via the New England, Newell and Gwydir highways, then Spring Mountain Road then Sturmans Road. Construction materials and infrastructure delivered to site will include:

- PV panels, piles, tracker mounting structures and frames
- electrical equipment and infrastructure including cabling, inverters, switchgear and the substation
- BESS infrastructure
- construction and permanent buildings and associated infrastructure
- earthworks and lifting machinery and equipment.

Oversized vehicle movements will be required for the delivery of the substation.

2.3 Key project components

2.3.1 PV panels

The PV panels will be installed in a series of rows aligned in a north-south direction and spaced approximately 5–7 m apart. The PV panels will be mounted onto a single axis tracker (SAT) system. The SAT system is designed to track the movement of the sun so that the panels constantly move to align towards the sun. An example of rows of PV panels utilising single axis tracking technology is provided in Photograph 2.1.

Photograph 2.1 PV panel row with single axis tracker

Source: NexTracker 2018

The PV panels and the associated SAT will be supported on ground-mounted frames consisting of vertical posts (piles) and horizontal rails (tracking tubes). Rows of piles will be driven or screwed into the ground, depending on the geotechnical conditions, and the supporting racking framework will be mounted on top.

The height of the PV panels at their maximum tilt angle (typically up to 60 degrees) will be up to 4 m. Additional site-specific clearance of up to around 400 mm may be required to avoid flooding risk or to improve access for sheep to graze underneath the PV panels. If installed at this height, the leading edge of each PV panels may be up to 1.2 m from the ground. This would enable sheep to graze fully unimpeded beneath the PV panel rows, if desired.

The panels will be configured in a portrait orientation, to maximise the area of ground available.

The panels will be connected to the inverters via underground cabling.

2.3.2 Battery energy storage system

The BESS will have a capacity of up to 150 MW with up to 4 hours of energy storage. The BESS will draw and store energy from the grid and/or from the Sundown Solar Farm during off-peak periods. This energy will be dispatched back into the grid during peak periods, thereby improving grid reliability and network stability.

The BESS will be adjacent to the substation and will be connected to the substation (Figure 2.1).

The BESS will use lithium-ion batteries. Batteries will be stored in fully enclosed shipping or modular containers, mounted on concrete pads (Photograph 2.2 and Photograph 2.3). Subject to final design and equipment selection, each battery bank will be approximately 13 m long, 3 m wide and 3 m high, similar to a typical 40 foot shipping container (or two 20 foot shipping containers). The battery banks will be placed in rows and will be separated by a gravel surface.

The height of footings for the battery storage containers will be raised above the mapped 1 in 100 year flood event.

Photograph 2.2 Example of containerised batteries

Photograph 2.3 Example of a modular battery solution

2.3.3 Substation

Power generated on-site will be fed into the 330 kV Transgrid transmission line via the on-site substation (Figure 2.1). The substation is required to transform medium voltage (MV) to high voltage (HV), and vice versa. The substation will have a capacity of 33 kV/3,300 kV and will have a footprint of approximately 100 m wide, 160 m long and 10.3 m high. The substation will be mounted on concrete hardstand or skid and will be raised above the mapped 1 in 100-year flood event. The substation will likely consist of an indoor switch room to house MV circuit breakers, and an outdoor switch yard to house the transformer(s), gantries and associated infrastructure.

2.3.4 Supporting infrastructure

Other supporting infrastructure within the development footprint will include:

- electrical collection and conversion systems
- control room
- management hub
- operations and maintenance building

- temporary laydown areas
- fencing, security and lighting
- internal access roads, water crossings and car parking
- firefighting infrastructure.

2.4 Operations

The operational lifespan of the project may be in the order of up to 35 years, depending on the nature of solar PV technology and energy markets. Throughout operations, a workforce of three full-time equivalent (FTE) employees will be required. Key activities during operations will comprise:

- operation of the solar arrays and BESS
- maintenance of all electrical and mechanical equipment, including tracker system, low voltage/medium voltage cabling, PV modules, switchgear, BESS and communication systems
- management of vegetation, weeds and pests
- fence and access road management
- landscaping
- panel cleaning, repair and replacement
- site security.

Regular light vehicle access will be required throughout operations. Heavy vehicles may be required occasionally for replacing larger components of project infrastructure.

2.5 Decommissioning and rehabilitation

Once the project reaches the end of its investment and operational life, the project infrastructure will be decommissioned and the site returned to its pre-existing land use, or other land use in consultation with the landholder, as far as practicable.

3 Existing environment

3.1 Site description

The land on which the project will be developed is Lot 148 DP 753299, Lot 141 DP 753305 and Lot 1 DP 1064358, all of which are privately-owned. The site is in Spring Mountain, approximately 30 km east of Inverell in the Inverell local government area (LGA) of northern NSW. Access to the site will be from Sturmans Road via Spring Mountain Road. The site is zoned RU1 – Primary Production under the *Inverell Local Environmental Plan 2012* (Inverell LEP) (Figure 3.1). The site is currently used for farming (cropping and grazing) and comprises a footprint of approximately of 2,097 ha, which consists of the full extent of the three landholder lots ('project area' on Figure 2.1). There is some Crown land within the project area, largely associated with road reserves.

The development footprint is approximately 652 ha and comprises the area within the project area on which infrastructure will be located (Figure 2.1).

3.2 Surrounding land uses

Land surrounding the site is used for farming and generation of renewable energy, including the Sapphire Wind Farm (MP09_0093), Sapphire Solar Farm (SSD-8643), White Rock Wind Farm (MP10_0160), White Rock Solar Farm (SSD-7487) and Glen Innes Wind Farm (MP07_0036) (Figure 1.1).

Newstead Station Group, an item of local heritage significance listed on the Inverell LEP, is approximately 4 km west of the development footprint. Newstead Station is a pastoral property on the north side of Elsmore Road and consists of Newstead Homestead, a shearing shed, church ruins and a cemetery, originally within an open rural landscape.

No listed scenic or significant vistas within proximity of the project area have been identified.

Single National Park is approximately 16 km south of the project area and Kings Plains National Park is approximately 18 km north of the project area. Mount Topper State Forest and Tingha Plateau State Conservation Area are approximately 16 km south-west of the project area.

3.3 Electricity transmission infrastructure

Electricity transmission line infrastructure traverses the project area and includes:

- Transgrid's existing 330 kV transmission line between Armidale and Dumaresq, which passes through the project area
- a local 132 kV network that runs north of the project area between the Inverell and Glen Innes substations.

Electricity generated by the project will be injected into the grid via a new cut-into Transgrid's 330 kV transmission line.

3.4 Rural dwellings

A number of non-associated dwellings have been identified in the landscape surrounding the project area and, more specifically, the development footprint. Non-project related dwellings considered as part of this assessment are identified on Figure 6.1, as well as the figures presented in Appendix A. The closest non-associated property to the development footprint is R1, approximately 2.1 km south-west (Figure 6.1).

3.5 Settlements and townships

Inverell is the largest township in the Inverell Shire LGA and is approximately 30 km east of the project area. The site is also approximately 38 km west of Glen Innes. Other smaller towns and settlements within Inverell Shire LGA include Ashford, Yetman, Delungra, Gilgai and Tingha. The site is also approximately 38 km west of Glen Innes, which is in the Glenn Innes Severn LGA (Figure 1.1).

3.6 Traffic routes

The site will be accessed via the Gwydir Highway which connects Walgett to Grafton. The local roads providing direct access to the site (Spring Mountain Road and Sturmans Road) are terminating roads and predominantly provide access to rural properties.

3.7 Air traffic

Armidale Airport is the closest major airport to the project and is approximately 80 km south-east of the project area. Inverell and Glen Innes airports are significantly closer to the project area at approximately 26 km south-west and 26 km north-east, respectively. Based on the findings of previous assessments prepared for PV solar energy facilities, glint and glare from the project's PV panels and other project infrastructure are not expected to significantly impact aircraft arriving at or departing from Armidale, Inverell or Glen Innes airports (Section 6.4).

3.8 Night lighting

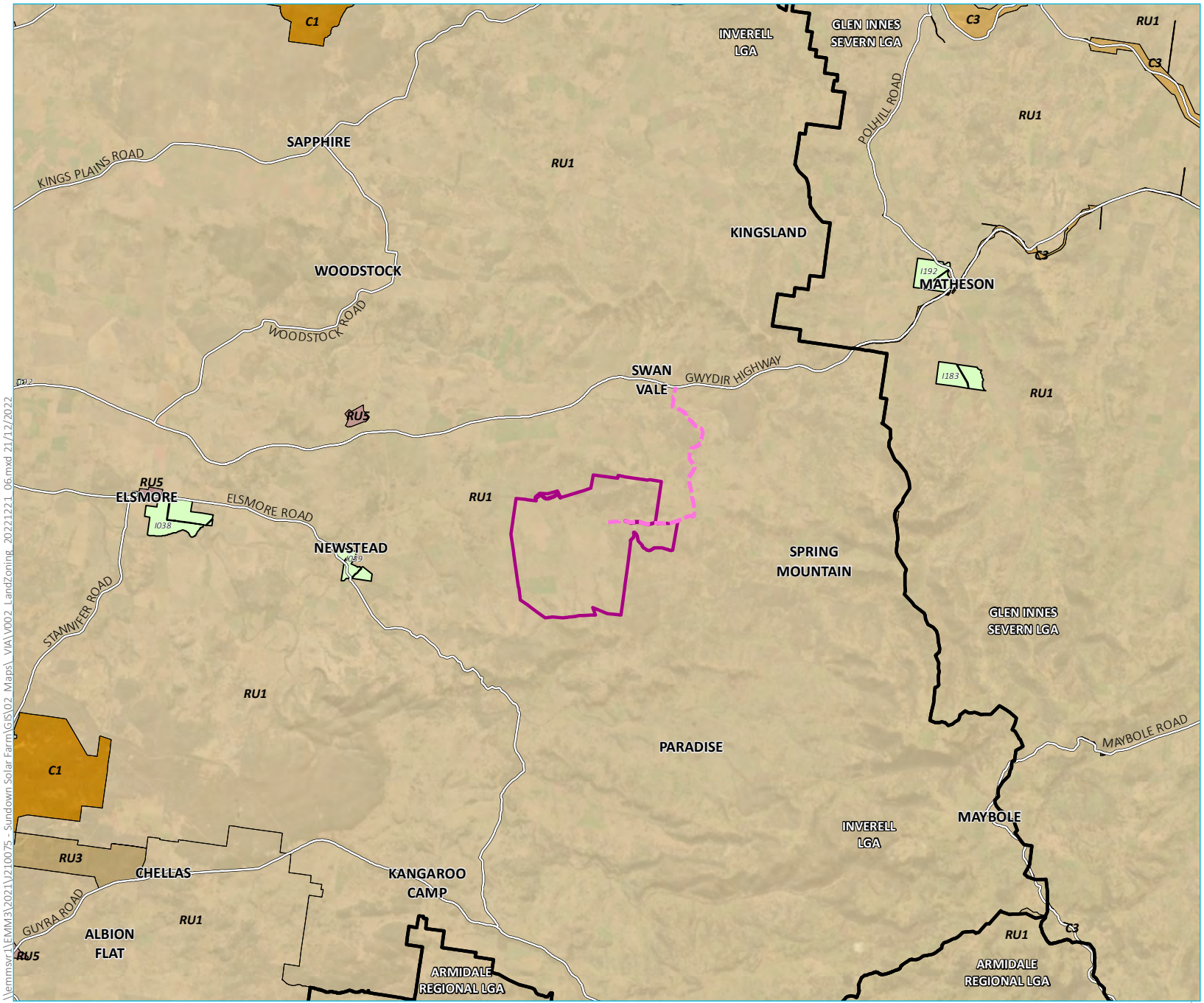
Existing sources of night lighting in the immediate vicinity of the site are minimal due to its rural setting. The main sources of lighting would be from rural residential dwellings, farm machinery and vehicles on roads.

The project will require limited permanent, fixed night lighting, most likely for the management hub buildings and the on-site substation. Temporary, localised night lighting may also be required during general maintenance activities conducted during the operation stage of the project. If required, lighting will be managed to minimise impacts on surrounding areas (Section 7.3).

3.9 Other developments

Based on a review of NSW Department of Planning and Environment's (DPE's) Major Projects register, it is understood that there are a number of other projects already constructed or likely to be constructed within close proximity of the project (Figure 1.1). These include:

- White Rock Wind Farm (MP 10_0160) – approximately 4 km east of the site at its closest point. Stage one of White Rock Wind Farm, which consists of 70 turbines is operational. Stage two is approved and will include an additional 48 turbines. Stage two construction has not yet commenced, and it is unclear when this will occur.
- White Rock Solar Farm (SSD-7487) – approximately 10 km east of the site at its closest point. Construction of the White Rock Solar Farm was completed in 2018 and this project is fully operational.
- Sapphire Wind Farm (MP09_0093) – approximately 3 km north of the site at its closest point. Construction of the Sapphire Wind Farm was completed in 2018 and this project is fully operational, with 75 turbines spread out across 22 different properties.
- Sapphire Solar Farm (SSD-8643) – approximately 15 km north of the site at its closest point. Construction of the 180 MW solar farm has not yet commenced, and it is unclear when this will occur.
- Glen Innes Wind Farm (MP07_0036) – approximately 13 km north-east of the project at its closest point. Construction of the Glen Innes Wind Farm has not commenced, and it is unclear when this will occur.



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Source: EMM (2022); Canadian Solar (2022); DPIE (2022); DFSI (2017, 2022); GA (2011)

Land use zoning

Sundown Solar Farm
Visual impact assessment
Figure 3.1

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4 Assessment requirements

4.1 Secretary's Environmental Assessment Requirements

This VIA has been prepared in accordance with the requirements of the NSW Department of Planning and Environment (DPE), which were set out in the SEARs. The individual requirements relevant to this VIA and where they have been addressed in this report are outlined in Table 4.1.

Table 4.1 Relevant SEARs

SEARs requirement	Section addressed
Visual – including a detailed assessment of the likely visual impacts and cumulative impacts of the development (including any glare, reflectivity and nightlighting) on surrounding residences, scenic or significant vistas, air traffic and road corridors in the public domain, including a draft landscaping plan for on-siteperimeter planting, with evidence it has been developed in consultation with affected landowners.	Chapter 6 A draft landscaping plan is not required.

4.2 Stakeholder engagement

As part of the project's stakeholder engagement strategy, Sundown Solar has consulted with several of the project's neighbouring landholders and, more generally, the local community.

This VIA responds to community concerns around potential visibility of project infrastructure from neighbouring residences and the local road network (Chapter 6).

4.3 Assessment guidelines

This VIA has been prepared in accordance with the relevant governmental assessment requirements, guidelines and policies, and in consultation with the relevant government agencies.

At the time of the assessment, no Commonwealth, NSW or local government planning policies, guidelines or standards directly applicable to this assessment were available. The VIA was prepared with reference to the methods outlined in:

- *Guidelines for Landscape and Visual Impact Assessment* (3rd ed.) (2013) (the GLVIA), prepared by the Landscape Institute and Institute of Environmental Management and Assessment
- *Large-Scale Solar Energy Guideline* (DPE 2022)
- *Wind Energy: Visual Assessment Bulletin AB 01 for State Significant Wind Energy Development* (2016) prepared by DPE (the VA Bulletin).

It is noted that the VA Bulletin specifically relates to assessment of visual impacts of wind farms in NSW; however, a number of the methods for describing visual sensitivity and landscape character are considered to be relevant to this assessment. The relevant elements from the VA Bulletin have been adopted for this assessment.

Representative viewpoints were selected based on the location of receptors (i.e. dwellings) and the positioning of regional and local roads and the overall visual impact at each viewpoint has been determined by combining the visual magnitude of the project and the visual sensitivity of the viewpoint. As the project is not predicted to result in significant visual impacts, mitigation strategies are not proposed to reduce or manage impacts.

Cumulative visual amenity impacts from other energy developments (proposed, approved and operating) have been considered in accordance with the *Cumulative Impact Assessment Guidelines for State Significant Projects* (DPE 2021). Cumulative visual amenity impacts of the project are discussed further in Section 6.5.

5 Assessment method

5.1 Overview

The assessment method used in this report is that outlined in the GLVIA and VA Bulletin, which involves information review, consultation, field observations and photography, computer-based data processing and analysis, and application of subjective professional judgement. The assessment involved seven key stages:

- Stage 1: View type and context – the existing landscape baseline is described noting its character and complexity.
- Stage 2: Visibility baseline assessment – the zone of visual influence of the project is established, where appropriate, through the use of computer-generated zones of theoretical visibility, based on topographical data, or through fieldwork analysis. This establishes the locations where views of the project may be possible. Fieldwork is undertaken to establish the types and locations of receptors within this theoretical zone.
- Stage 3: Viewpoint selection – representative public and private viewpoints of the site are selected and the project's level of exposure to them is determined.
- Stage 4: Magnitude of change – the magnitude of visual change and the changes arising from the project are assessed and the need for project modifications or other mitigation measures evaluated.
- Stage 5: Visual sensitivity – the capacity of the landscape to absorb change without a loss of quality (its visual sensitivity) is determined.
- Stage 6: Evaluation of significance – the significance of change in the landscape is a function of the magnitude of change when considered against the view type/context and the sensitivity of a receptor.
- Stage 7: Mitigation – the modified and mitigated project (if applicable) is assessed, the final visual impacts are described and illustrated and their significance documented.

Details of each of the above stages are provided below.

5.2 Stages in the assessment methodology

5.2.1 Stage 1 – View type and context

This stage involves recording and analysis of existing landscape features, characteristics, the way in which the landscape is experienced, and the value or importance of the landscape and visual resource in the site. The landscape character is determined by the number, size, type and contrast of elements present.

Typically, the key elements are topography, vegetation, water features and built elements. Other factors that are important are the consistency of these elements and whether they have developed progressively over time and become well integrated into a harmonious landscape. In addition, consideration must be given to the prevalence of change, including whether the landscape is experiencing large-scale development (such as residential growth on the urban fringe).

The context is a primary factor in the visual sensitivity of the view. Generally, sites within higher contrasting landscapes have greater ability to absorb change, whereas sites within a uniform or highly ordered landscape have higher sensitivity and less potential for absorption.

Reference has been made to the landscape characters defined in the VA Bulletin. The GLVIA also sets out guidance in relation to landscape baseline at paragraph 5.3:

> Baseline studies for assessing landscape effects require a mix of desk study and fieldwork to identify and record the character of the landscape and the elements, features and aesthetic and perceptual factors which contribute to it. They should also deal with the value attached to the landscape. The methods used should be appropriate to the context into which the development proposal will be introduced and in line with current guidance and terminology.

5.2.2 Stage 2 – Visibility baseline assessment

Baseline studies for visual effects establish the area in which the project may be visible, who will see the project infrastructure, the viewpoints that will be affected and the nature of the views at those points. Viewshed analysis using GIS has been used to simulate visibility from viewpoints and the surrounding landscape.

5.2.3 Stage 3 – Viewpoint selection

Viewpoints are selected to provide a representative sample of the likely visual landscape changes on the different users of the areas surrounding the project and their visual exposure to various project elements. Viewpoints that are considered to have potential exposure to various project elements or areas available to public access, such as roads, and private viewpoints from residential properties surrounding the project, have been identified through GIS mapping, fieldwork, stakeholder engagement and desktop analysis.

5.2.4 Stage 4 – Magnitude of change

The magnitude of change on the visual landscape is one factor in determining the significance of visual impacts of the project. In accordance with the GLVIA, this visual assessment considered the following criteria in determining the magnitude of change on a receptor:

- Whether the impact is temporary or permanent – impacts that are for a limited duration are considered less significant than those that occur for an extended period or are permanent.
- Scale of change – the loss or addition of features in the view and changes in the proportion of the view affected by the project.
- Degree of contrast – level of integration of new features with existing or remaining landscape elements, having regard to form, scale, height, colour, and texture.
- Distance of the viewer from the altered elements in the landscape – close proximity to an altered landscape will increase the significance for private residences. In the case of motorists, mid ground changes can be greater than foreground elements as they can result in longer viewing times. Glare and reflection has also been considered in regards to motorists.
- Viewing direction – whether the change is to the primary view from the receptor.
- Extent of view affected – impacts that are visible over a greater portion of a view are more significant than those where only a part of the view is impacted. Intervening topography and vegetation will also affect the magnitude of change.
- Length of viewing time – views from a residence are constant, whereas some views from roadways as experienced by motorists may be brief dependent upon speed and viewing direction.

5.2.5 Stage 5 – Visual sensitivity

Visual sensitivity is a measure of the landscape's ability to absorb development without a significant change in the character. It is a function of the view type and context. In this assessment, the major factor influencing visual sensitivity is the level of contrast between the project-related infrastructure and the rural landscape setting in which it will be set.

The physical characteristics of the landscape, including existing development features, are integral components in determining the visual sensitivity. For example, a low visual sensitivity would enable a modification or addition to be made to the landscape which would only cause minimal contrast and result in a high level of integration with the surrounding landscape. Similarly, a high visual sensitivity would mean the same modification or addition to the surrounding landscape would cause high contrast to the surrounding landscape.

Visual sensitivity has been assessed based on the viewer sensitivity level classification given in the VA Bulletin, presented in Table 5.1.

Table 5.1 Viewer sensitivity level classification

Sensitivity	Description
High	• Residential areas and rural villages (defined as land zoned R1, R2, R3, R4, R5 and RU5 in the Standard Instrument Local Environmental Plan [LEP]). • Recreation, cultural or scenic sites and viewpoints of National or State significance. • Any buildings, historic rural homesteads/residences on the State or local Government Heritage List.
Moderate	• Rural dwelling(s). • Tourist and visitor accommodation (definition in Standard Instrument LEP). • Recreation, cultural or scenic sites and viewpoints of regional significance.
Low	• Interstate and state passenger rail lines with daily daylight services. • State highways, freeways and classified main roads, classified tourist roads. • Land management roads with occasional recreation traffic. • Walking tracks of moderate local significance or infrequent recreation usage. • Other low use and low concern viewpoints and travel routes. • Navigable waterways.

Source: VA Bulletin (DPE 2016)

The VA Bulletin establishes sensitive land use designations, including key National and State sensitive land use designations, along with potentially sensitive land use zones in the local environmental plans prepared under the EP&A Act. These National and State sensitive land use designations and land use zones are identified in Table 5.2.

Table 5.2 Sensitive land use designations

National and State sensitive land use designations	LEP zones as per the NSW Standard LEP	
World Heritage areas	RU5 Village	RE2 Private Recreation
National Parks	R1 General Residential	C1 National Parks and Nature Reserves
National Reserve System reserves	R2 Low Density Residential	C2 Environmental Conservation
Coastal zone	R3 Medium Density Residential	C3 Environmental Management
Marine estate	R4 High Density Residential	C4 Environmental Living
Commonwealth Heritage List sites	R5 Large Lot Residential	W1 Natural Waterways
State Heritage Register sites	SP3 Tourist	W2 Recreational Waterways

Source: VA Bulletin (DPE 2016).

Note: LEP zones updated to align with Standard Instrument (Local Environmental Plans) Amendment (Land Use Zones) Order 2021.

The project area is not within a sensitive land use designation or within a potentially sensitive land use zone. The nearest sensitive land use zone is approximately 6 km north-west of the project area and is zoned RU5 Village under the Inverell LEP (Figure 3.1).

Schedule 5 of the Inverell LEP lists a number of heritage items within the Inverell LGA, including Newstead Station Group (I039) on Lot 8 of DP 1015844, approximately 4 km west of the development footprint (Figure 3.1). Further information on this heritage item is provided in Section 3.2 and potential visual impacts on this item have been assessed in Chapter 6.

5.2.6 Stage 6 – Evaluation of significance

The significance of a change in the landscape is a function of the magnitude of that change when considered against the view type/context and the sensitivity of a receptor. Typically, a noticeable change in the landscape in a rural or natural landscape, combined with a high visual sensitivity, would be considered to be significant, whereas a change in an already heavily modified landscape would be considered slight or moderate.

Table 5.3 illustrates how the magnitude of a change in the landscape is assessed, and its significance, rated against the sensitivity of a viewpoint.

Table 5.3 Evaluation of significance matrix

Magnitude of change	Visual sensitivity		
	High	Moderate	Low
High	Substantial	Moderate/Substantial	Moderate
Moderate	Moderate/Substantial	Moderate	Slight/Moderate
Low	Moderate	Slight/Moderate	Slight
Negligible	Slight	Slight	Negligible

Key: Red: Significant; Green: Not significant.

The primary assessment tools for determining the significance of impact of the project were the results of the viewshed analyses, site inspections and photographs of the site and surrounds. This enabled an assessment of potential visual impact, taking into consideration the nature of the landscape, topography, the distance between the viewpoint and the proposed infrastructure, as well as the type of view experienced.

5.2.7 Stage 7 – Mitigation

The final step in the assessment process was to determine additional measures that could be incorporated into the design of the project to ameliorate, or, where possible, eliminate the visual impact of the project.

Mitigation measures can be in several forms including:

- designing project infrastructure to reduce the contrast with the surrounding environment
- use of visual buffers and screening by planting vegetation (where required)
- designing infrastructure to screen operations and lighting.

Mitigation measures that have been incorporated into the design of the project are discussed in Chapter 7 of this report.

6 Impact assessment

6.1 Assessed viewpoints

As part of the preparation of this VIA, a number of site inspections have been undertaken by representatives from EMM and Sundown Solar. The purpose of these site inspections has been to ground-truth the representative viewpoints identified during the initial desktop analysis (where possible). During these inspections, photographs from accessible viewpoints were captured and a selection of these photographs is provided in Section 6.3.

The representative viewpoints were selected based on the following criteria:

- proximity to the project area
- the location of receptors (i.e. dwellings)
- the positioning of regional and local roads and potential impacts on passing motorists
- local topography.

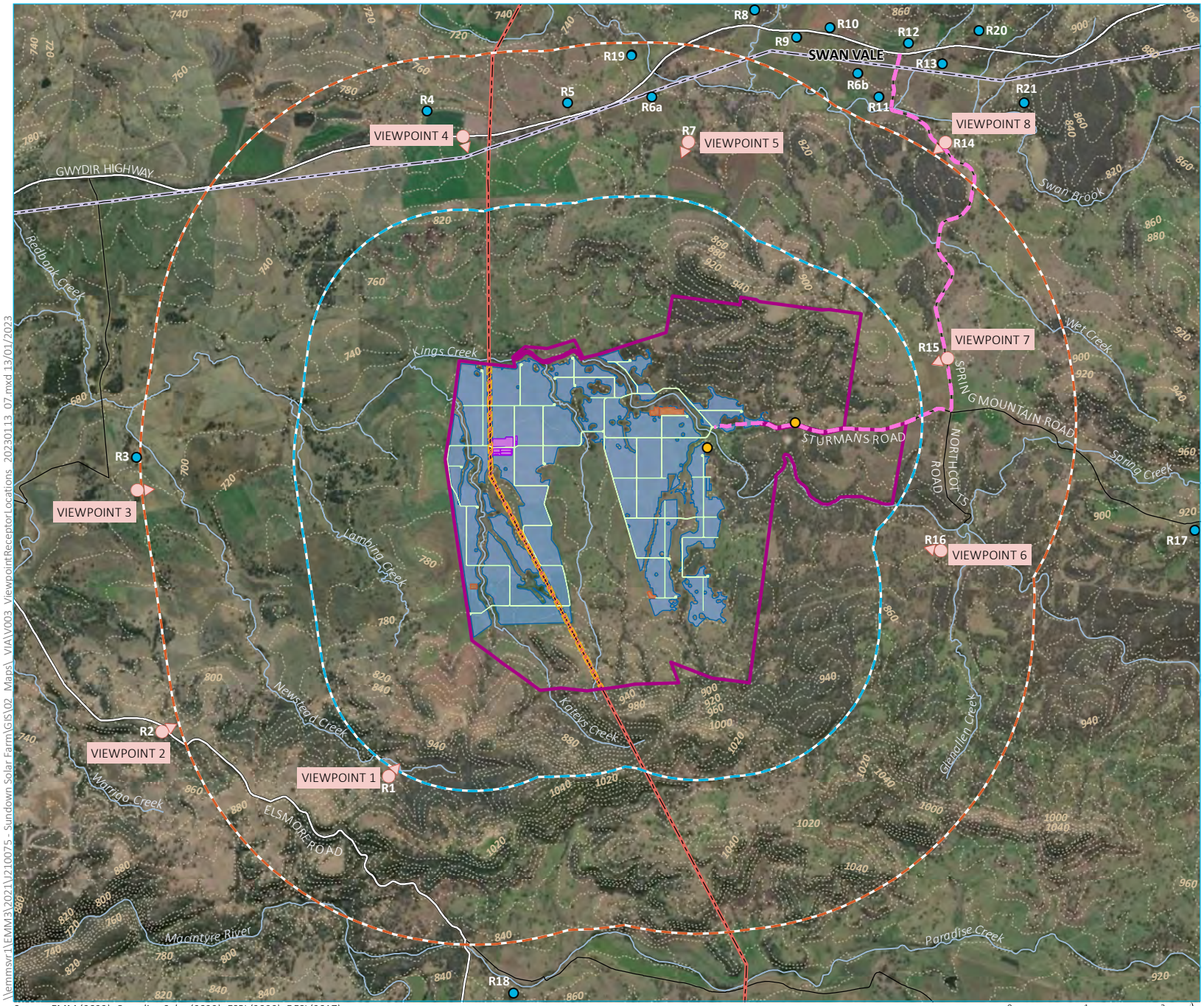
The locations of the receptors considered as part of this assessment are provided on Figure 6.1. As part of the preparation of this VIA, a total of 11 non-associated dwellings (residential properties) have been identified within approximately 4 km of the development footprint.

The locations of the eight viewpoints considered as part of this assessment are also shown on Figure 6.1. The figure also includes contours, which demonstrate the undulating nature of the landscape surrounding the project area.

The rationale for the selection of each of the viewpoints analysed as part of this report is summarised in Table 6.1.

Table 6.1 Assessed viewpoints, receptors and rationale for selection

Assessment location	Viewpoint type(s)	Representative receptors	Rationale for selection
Viewpoint 1	Dwelling	R1	Views are representative of a receptor (i.e. dwelling) on Cooks Road, R1. At its closest point, the development footprint is approximately 2.1 km from R1.
Viewpoint 2	Dwelling	R2	Views are representative of a receptor (i.e. dwelling) on Elsmore Road, R2. At its closest point, the development footprint is approximately 4.2 km from R2.
Viewpoint 3	Dwelling Local heritage item	R3	Views are representative of a receptor (i.e. dwelling) with access from Gwydir Highway and Newstead South Road, R3. At its closest point, the development footprint is approximately 4 km from R3. A review of aerial imagery indicates there is more than one dwelling at this property. R3 was selected as the focus of Viewpoint 3 as it was considered to have the highest likelihood of a line of sight to the project area (based on distance, elevation and vegetation). Views are also representative of Newstead Station Group, an item of local heritage significance listed on the Inverell LEP, approximately 4 km west of the development footprint.
Viewpoint 4	Motorists	-	Views are representative of those experienced by motorists travelling along Gwydir Highway.
Viewpoint 5	Dwelling	R7	Views are representative of a receptor (i.e. dwelling) on Inverness Road, R7. At its closest point, the development footprint is approximately 2.8 km from R7.
Viewpoint 6	Dwelling	R16	Views are representative of a receptor (i.e. dwelling) on Northcotts Road, R16. At its closest point, the development footprint is approximately 2.8 km from R16.
Viewpoint 7	Dwelling	R15	Views are representative of a receptor (i.e. dwelling) on Spring Mountain Road, R15. At its closest point, the development footprint is approximately 2.5 km from R15.
Viewpoint 8	Dwelling	R14	Views are representative of a receptor (i.e. dwelling) on Spring Mountain Road, R14. At its closest point, the development footprint is approximately 4.2 km from R14.



KEY

- Proposed Sundown Solar Farm (Project area)
- Development footprint buffer (2 km)
- Development footprint buffer (4 km)
- Viewpoint location
- Associated property
- Non-associated property
- Major road
- Minor road
- Named watercourse
- Topographic contour (20 m)

Existing overhead transmission line

- Armidale to Dumaresq (330 kV)
- Glen Innes to Inverell (132 kV)

Development footprint

- Access road
- 330 kV OHL easment (60 m)
- Internal access road
- BESS/switchroom/substation
- Construction and laydown
- Potential PV area

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Source: EMM (2023); Canadian Solar (2022); ESRI (2023); DFSI (2017)

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GDA2020 MGA Zone 56

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Location of viewpoints and receptors

Sundown Solar Farm
Visual impact assessment
Figure 6.1

EMM creating opportunities

6.2 Construction impacts

A description of the site establishment and construction activities associated with the project is provided in Section 2.2.

Civil works will be required to prepare the development footprint, including fencing installation, construction of internal access tracks, and minor earth works.

As noted in Section 2.2.2, upon completion of the site establishment, construction will typically be as follows:

- driving piles into the ground to support the PV panel mounting structure
- assembling tracker frames and PV panels on top of the piles
- installing underground cabling between the PV panels, inverters and on-site substation
- preparing foundations for inverter blocks, switchyard and management hub structures
- installing combiner boxes, inverters, on-site substation, switchgear and BESS
- constructing the management hub
- constructing internal access tracks.

The most significant visual impacts during the construction stage of the project will be experienced by receptors with views of the development footprint; however, the viewshed analysis has illustrated that the visibility of the development footprint from surrounding receptors is heavily shielded by undulating topography within the project area and surrounds (Appendix A).

During construction, the landscape within the development footprint will undergo a number of physical changes, namely through the installation of project infrastructure, including PV panels, inverters and transformer units, an on-site substation and BESS. This infrastructure will add new features to the visual landscape within the development footprint.

Motorists travelling along the Gwydir Highway may experience distant views of the development footprint during construction; however, it is assumed the focus of these motorists will be in line with their direction of travel along the Gwydir Highway.

Due to their temporary nature (i.e. approximately 21 months), the site establishment works and construction activities are considered unlikely to have any significant visual impacts on passing motorists or nearby receptors. Accordingly, no mitigation measures are warranted during the construction stage of the project.

6.3 Operation impacts

An assessment of the selected viewpoints in accordance with the methodology outlined in Chapter 5 of this report is presented in the following sections.

To determine potential visibility of project infrastructure, a viewshed analysis was completed. The results of the viewshed analysis are presented in Appendix A. The figures identify the likely changes to the viewshed experienced at each viewpoint as a result of the installation of the project infrastructure within the development footprint.

The viewshed analysis has been generated using a digital elevation model (DEM) which covers the development footprint, the eight selected viewpoints and their immediate surrounds. The DEM was built using publicly available ELVIS spatial data from the Foundation Spatial Data Framework. This data was captured in 2011. The DEM is representative of the bare earth surface and only considers the topography of the landscape.

A digital surface model (DSM) has not been developed due to the negligible potential for views of the development footprint (as indicated by the results of the baseline viewshed analysis in Figure 6.2).

To assist with the interpretation of the results presented in the figures within Appendix A, the reader should consider the total area identified as 'visible project infrastructure – bare earth surface' as representative of the worst-case scenario for each viewpoint (i.e. the maximum visible extent of project infrastructure from the selected viewpoint).

The viewshed analysis presented in the figures in Appendix A only considers the height of the dominant project infrastructure, i.e. the PV panels. As part of the viewshed analysis, the height of the PV panels was conservatively assumed to be 4.4 m. This is representative of the height of the PV panels at their maximum tilt angle (i.e. 4 m) and allows site-specific clearance of up to 40 cm, should it be required to avoid flooding risk or to improve access for sheep to graze underneath the PV panels.

Other project infrastructure including inverters, the on-site substation, BESS and management hub facilities have not been considered as part of the viewshed analysis. The exact location of this infrastructure within the development footprint is more difficult to specify at this stage of the project's development and will be determined during the detailed design stage of the project. For example, the location of the inverters will be dependent on the model chosen. The proposed footprints for the on-site substation and BESS have been positioned within the development footprint with a view to minimise or avoid visual amenity impacts on nearby residences wherever possible.

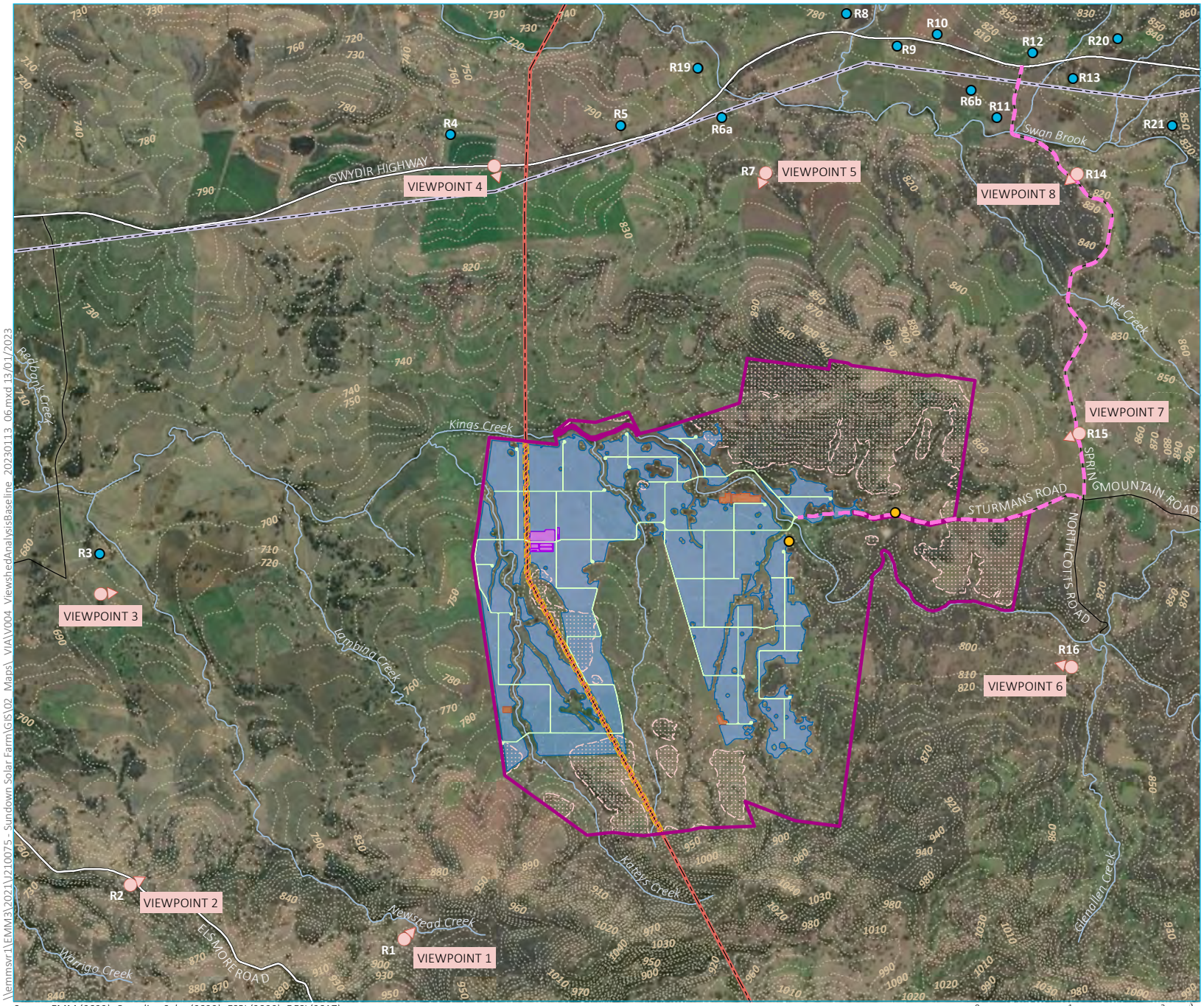
One of the criteria considered during the selection of the on-site substation and BESS footprints identified on Figure 2.1 has been proximity to rural dwellings. As noted above, this infrastructure has not been considered as part of the viewshed analysis. However, based on field investigations and a review of aerial imagery, it is anticipated that views of this infrastructure will be screened from all of the selected viewpoints. This is primarily due to undulation in the landscape combined with distance to the potential footprints.

As discussed in Section 2.3.2, as part of the BESS, batteries will be stored in fully enclosed shipping or modular containers. Regardless of the housing selected during the detailed design stage of the project, this infrastructure will be designed to integrate with existing elements in the landscape wherever possible, having regard to form, height, and colour.

As noted in Section 3.3, existing electricity transmission line infrastructure traverses the project area, namely Transgrid's existing 330 kV transmission line. Local supply lines enter the eastern portion of the project area. Due to the presence of existing overhead wiring within the landscape, the project's potential electricity transmission infrastructure has not been considered as part of the viewshed analysis.

When considering the bare earth surface (i.e. topography) within the development footprint and surrounds, the results of the viewshed analysis indicate that project infrastructure will be visible from one of the eight viewpoints assessed as part of this VIA. As identified by the 10 m contours presented on Figure 6.2, the landform pattern within and surrounding the development footprint can be described as undulating with the terrain rising to the south, north and east of the development footprint. At the majority of selected viewpoints, undulation within the topography limits the extent to which the visual landscape is affected by project infrastructure.

Based on aerial imagery and ground truthing, a large number of the rural residential dwellings surrounding the development footprint feature extensive vegetation screens on their boundaries. These screens would mitigate dust, visual and noise impacts from existing agriculture-related activities on land adjacent to these dwellings.



KEY

- Proposed Sundown Solar Farm (Project area)
- Viewpoint location
- Visible areas within the project area
- Associated property
- Non-associated property
- Major road
- Minor road
- Named watercourse
- Topographic contour (10 m)

Existing overhead transmission line

- Armidale to Dumaresq (330 kV)
- Glen Innes to Inverell (132 kV)

Development footprint

- Access road
- 330 kV OHL easment (60 m)
- Internal access road
- BESS/switchroom/substation
- Construction and laydown
- Potential PV area

Source: EMM (2022); Canadian Solar (2022); ESRI (2022); DFSI (2017)

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Viewshed analysis - baseline

Sundown Solar Farm
Visual impact assessment
Figure 6.2

EMM
creating opportunities

A key observation made during the site inspections conducted as part of the preparation of this assessment was that the presence of stands of both scattered and more dense vegetation between the development footprint and a number of rural dwellings, means that regardless of topography, views to the development footprint would still be at least partially obstructed from most locations. Potential views of project infrastructure within the development footprint from Gwydir Highway (over a distance of up to 3 km) will also be highly obstructed by undulation in the landscape, remnant vegetation and roadside vegetation.

Project infrastructure may also be visible from the Newstead Station Group (I039) on Lot 8 of DP 1015844, approximately 4 km west of the development footprint; however, based on the results of the viewshed analysis for Viewpoint 3, undulation in the landscape, distance to the development footprint and remnant and planted vegetation in the landscape will limit views of project infrastructure from this locally listed heritage item.

Impacts to the setting and cultural landscape will occur as a result of the project. The nature of the project and extent of the development footprint will change some views and vistas and affect the setting of the landscape in some areas. However, it should be noted that the potentially impacted areas identified as part this assessment are not visible from public spaces and are on land owned by the project landholders.

6.3.1 Viewpoint 1 – dwelling on Cooks Road

Table 6.2 Viewpoint 1 – dwelling on Cooks Road

Viewpoint details	This viewpoint is a dwelling accessible from Cooks Road, R1, approximately 2.1 km south-west of the development footprint. The closest project infrastructure will be approximately 2.1 km north-east of R1. This viewpoint was not accessible during site inspections undertaken as part of this assessment.
View type and context	Immediate views from this location are likely to be dominated by partially cleared agricultural land. More distant views are likely to be dominated by dense strands of remnant vegetation to the north, east and south and more sparsely vegetated land to the west along the driveway entrance. Other features in the landscape at this location include agricultural infrastructure and minor creek lines. A review of aerial imagery indicates that there is vegetation present around R1 that would act to screen views of project infrastructure within the development footprint.
Visibility baseline assessment	The results of the viewshed analysis (Figure A.1) indicate that project infrastructure within the development footprint will not be visible from this location. This is due to undulation in the landscape between this location and the development footprint. This is supported by the contours on Figure A.1.
Magnitude of change	Negligible – it is unlikely that this dwelling will experience views of the project infrastructure due to undulation in the landscape between this location and the development footprint.
Visual sensitivity	Moderate – due to the presence of a rural dwelling.
Evaluation of significance	Slight – there would not be a significant impact from this viewpoint.
Additional mitigation	No additional mitigation measures are warranted based on the evaluation of significance.

6.3.2 Viewpoint 2 – dwelling on Elsmore Road

Table 6.3 Viewpoint 2 – dwelling on Elsmore Road

Viewpoint details	This viewpoint is a dwelling accessible from Elsmore Road, R2, approximately 4.2 km south-west of the project area. The closest project infrastructure will be approximately 4.2 km north-east of R2. Photograph 6.1 was taken from Elsmore Road in front of R2 looking north-east towards the development footprint.
View type and context	Immediate views from this location are dominated by partially cleared agricultural land. More distant views are dominated by strands of remnant vegetation to the north, east, south and west. Other features in the landscape at this location include overhead power lines, agricultural infrastructure, farm dams, minor creek lines and Elsmore Road. A review of aerial imagery indicates that there is vegetation present around R2 that would act to screen views of project infrastructure within the development footprint.
Visibility baseline assessment	The results of the viewshed analysis (Figure A.2) indicate that project infrastructure within the development footprint will not be visible from this location. This is due to undulation in the landscape between this location and the development footprint. This is supported by the contours on Figure A.2 and Photograph 6.1.
Magnitude of change	Negligible – it is unlikely that this dwelling will experience views of the project infrastructure due to undulation in the landscape between this location and the development footprint.
Visual sensitivity	Moderate – due to the presence of a rural dwelling.
Evaluation of significance	Slight – there would not be a significant impact from this viewpoint.
Additional mitigation	No additional mitigation measures are warranted based on the evaluation of significance.

Photograph 6.1 **Viewpoint 2 – View from Elsmore Road looking north-east towards development footprint**

6.3.3 Viewpoint 3 – dwelling on Gwydir Highway

Table 6.4 Viewpoint 3 – dwelling on Gwydir Highway

Viewpoint details	This viewpoint is representative of a dwelling accessible from Gwydir Highway (to the north) and Newstead South Road (to the west), R3, approximately 4 km west of the development footprint. The closest project infrastructure will be approximately 4 km east of R3. This viewpoint is also considered representative of potential views from Newstead Station Group, an item of local heritage significance listed on the Inverell LEP, approximately 4 km west of the development footprint (Section 3.2). This viewpoint was not accessible during site inspections undertaken as part of this assessment. A review of aerial imagery indicates there is more than one dwelling at this property. Viewpoint 3 is considered to have the highest likelihood of a line of sight to the project area (based on distance, elevation and vegetation).
View type and context	Immediate views from this location are likely to be dominated by cleared agricultural land. More distant views are likely to be dominated by strands of remnant vegetation to the north, east, south and west. Other features in the landscape at this location include agricultural infrastructure and minor creek lines. A review of aerial imagery indicates that there is vegetation present around R3 that would act to partially screen views of project infrastructure within the development footprint.
Visibility baseline assessment	The results of the viewshed analysis (Figure A.3) indicate that project infrastructure within the development footprint will be visible from this location. The distance between R3 and the closest visible part of the development footprint is anticipated to be approximately 4 km. As discussed in Section 6.3, a DSM has not been developed as part of this assessment due to the negligible potential for views of the development footprint (as indicated by the results of the viewshed analysis in Figure 6.2). However, it is clear from aerial imagery that shielding features in the landscape (namely remnant vegetation) have the potential to significantly screen the extent of project infrastructure visible from this viewpoint.
Magnitude of change	Low – the distance to the development footprint from this location and significant amount of remnant vegetation in the landscape between this viewpoint and the development footprint will limit the scale of change and degree of contrast for views from this location and its surrounds (including other dwellings and Newstead Station Group). Cumulative visual impacts from the project and other renewable energy developments are considered possible from this viewpoint; however, due to the significant distance between this viewpoint and other renewable energy developments and the limited extent of project infrastructure predicted to be visible, the magnitude of change is still considered low.
Visual sensitivity[1]	Moderate – due to the presence of a rural dwelling.
Evaluation of significance	Slight/moderate – there would not be a significant impact from this viewpoint. Visual impacts from this viewpoint will continue throughout the life of the project.
Additional mitigation	No additional mitigation measures are warranted based on the evaluation of significance.

Note: 1. If the focus of this viewpoint were Newstead Station Group, the visual sensitivity would be nominated as 'high' due to the presence of a local heritage item listed on Schedule 5 of the Inverell LEP; however, as R3 and the other dwellings are closer to the development footprint and considered more likely to experience views of project infrastructure, the visual sensitivity has been rated based on the presence of rural dwellings only.

6.3.4 Viewpoint 4 – motorists on Gwydir Highway

Table 6.5 Viewpoint 4 – motorists on Gwydir Highway

Viewpoint details	This viewpoint, shown in Photograph 6.2, is on the northern side of Gwydir Highway looking south towards the development footprint. Photograph 6.2 was taken from the northern road shoulder approximately 3 km from the development footprint at its closest point.
View type and context	Views from this location represent a typical rural setting with a wide expanse of relatively cleared agricultural land. Transgrid's 330 kV transmission line, low rolling hills and scattered remnant vegetation is visible in the distance.
Visibility baseline assessment	The results of the viewshed analysis (Figure A.4) indicate that project infrastructure within the development footprint will not be visible from this location. This is due to undulation in the landscape between this location and the development footprint. This is supported by the contours on Figure A.4 and Photograph 6.2.
Magnitude of change	Negligible – it is unlikely that motorists will experience views of project infrastructure due to undulation in the landscape between this location and the development footprint. In addition, project infrastructure will not be the primary view from this viewpoint, as it is assumed the focus of motorists will be in line with their direction of travel along the Gwydir Highway.
Visual sensitivity	Low – due to its agricultural landscape character, absence of sensitive land use designations and status as a state highway.
Evaluation of significance	Negligible – there would not be a significant impact from this viewpoint.
Additional mitigation	No additional mitigation measures are warranted based on the evaluation of significance.

Photograph 6.2 Viewpoint 4 – View from Gwydir Highway looking south towards development footprint

6.3.5 Viewpoint 5 – dwelling on Inverness Road

Table 6.6 Viewpoint 5 – dwelling on Inverness Road

Viewpoint details	This viewpoint is a dwelling accessible from Inverness Road, R7, approximately 2.8 km north of the development footprint. The closest project infrastructure will be approximately 2.8 km south of R7. This viewpoint was not accessible during site inspections undertaken as part of this assessment. Photograph 6.3 was taken from Inverness Road prior to the entrance to R7 looking east away from the development footprint.
View type and context	Immediate views from this location are likely to be dominated by partially cleared agricultural land. More distant views are likely dominated by strands of remnant vegetation becoming increasingly dense in the distance. Other features in the landscape that were observed along Inverness Road include overhead power lines and agricultural infrastructure. Wind turbines are visible in the distance. A review of aerial imagery indicates that there is vegetation present around R7 that would act to screen views of project infrastructure within the development footprint.
Visibility baseline assessment	The results of the viewshed analysis (Figure A.5) indicate that project infrastructure within the development footprint will not be visible from this location. This is due to undulation in the landscape between this location and the development footprint. This is supported by the contours on Figure A.5.
Magnitude of change	Negligible – it is unlikely that this dwelling will experience views of the project infrastructure due to undulation in the landscape between this location and the development footprint. Whilst the viewshed analysis (Figure A.5) indicates that a small parcel of land within the project area will be visible from R7, no changes to this portion of the site are proposed as part of the project and therefore no change in views experienced from this dwelling are anticipated.
Visual sensitivity	Moderate – due to the presence of a rural dwelling.
Evaluation of significance	Slight – there would not be a significant impact from this viewpoint.
Additional mitigation	No additional mitigation measures are warranted based on the evaluation of significance.

Photograph 6.3 Viewpoint 5 – Entrance to R7 looking east away from development footprint

6.3.6 Viewpoint 6 – dwelling on Northcotts Road

Table 6.7 Viewpoint 6 – dwelling on Northcotts Road

Viewpoint details	This viewpoint is a dwelling accessible from Northcotts Road, R16, approximately 2.8 km east of the development footprint. The closest project infrastructure will be approximately 2.8 km west of R16. This viewpoint was not accessible during site inspections undertaken as part of this assessment.
View type and context	Immediate views from this location are likely to be dominated by partially cleared agricultural land. More distant views are likely to be dominated by dense strands of remnant vegetation to the north, east, south and west. Other features in the landscape at this location include agricultural infrastructure and farm dams. A review of aerial imagery indicates that there is vegetation present around R16 that would act to screen views of project infrastructure within the development footprint.
Visibility baseline assessment	The results of the viewshed analysis (Figure A.6) indicate that project infrastructure within the development footprint will not be visible from this location. This is due to undulation in the landscape between this location and the development footprint. This is supported by the contours on Figure A.6.
Magnitude of change	Negligible – it is unlikely that this dwelling will experience views of the project infrastructure due to undulation in the landscape between this location and the development footprint. Whilst the viewshed analysis (Figure A.6) indicates that land within the project area will be visible from R16, no changes to these portions of the site are proposed as part of the project and therefore no change in views experienced from this dwelling are anticipated.
Visual sensitivity	Moderate – due to the presence of a rural dwelling.
Evaluation of significance	Slight – there would not be a significant impact from this viewpoint.
Additional mitigation	No additional mitigation measures are warranted based on the evaluation of significance.

6.3.7 Viewpoint 7 – dwelling on Spring Mountain Road

Table 6.8 Viewpoint 7 – dwelling on Spring Mountain Road

Viewpoint details	This viewpoint is a dwelling accessible from Spring Mountain Road, R15, approximately 2.5 km east of the development footprint. The closest project infrastructure will be approximately 2.5 km west of R15. This viewpoint was not accessible during site inspections undertaken as part of this assessment.
View type and context	Immediate views from this location are likely to be dominated by partially cleared agricultural land. More distant views are likely to be dominated by dense strands of remnant vegetation to the north, south and west and more scattered vegetation to the east. Other features in the landscape at this location include agricultural infrastructure, overhead power lines and farm dams. A review of aerial imagery indicates that there is vegetation present around R15 that would act to screen views of project infrastructure within the development footprint.
Visibility baseline assessment	The results of the viewshed analysis (Figure A.7) indicate that project infrastructure within the development footprint will not be visible from this location. This is due to undulation in the landscape between this location and the development footprint. This is supported by the contours on Figure A.7.
Magnitude of change	Negligible – it is unlikely that this dwelling will experience views of the project infrastructure due to undulation in the landscape between this location and the development footprint. Whilst the viewshed analysis (Figure A.7) indicates that a small parcel of land within the project area will be visible from R15, no changes to this portion of the site are proposed as part of the project and therefore no change in views experienced from this dwelling are anticipated.
Visual sensitivity	Moderate – due to the presence of a rural dwelling.
Evaluation of significance	Slight – there would not be a significant impact from this viewpoint.
Additional mitigation	No additional mitigation measures are warranted based on the evaluation of significance.

6.3.8 Viewpoint 8 – dwelling on Spring Mountain Road

Table 6.9 Viewpoint 8 – dwelling on Spring Mountain Road

Viewpoint details	This viewpoint is a dwelling accessible from Spring Mountain Road, R14, approximately 4.2 km north-east of the development footprint. The closest project infrastructure will be approximately 4.2 km south-west of R14. This viewpoint was not accessible during site inspections undertaken as part of this assessment.
View type and context	Immediate views from this location are likely to be dominated by partially cleared agricultural land. More distant views are likely to be dominated by dense strands of remnant vegetation to the south and west and more scattered vegetation to the north and east. Other features in the landscape at this location include agricultural infrastructure, overhead power lines, minor creek lines and farm dams. A review of aerial imagery indicates that there is vegetation present around R14 that would act to screen views of project infrastructure within the development footprint.
Visibility baseline assessment	The results of the viewshed analysis (Figure A.8) indicate that project infrastructure within the development footprint will not be visible from this location. This is due to undulation in the landscape between this location and the development footprint. This is supported by the contours on Figure A.8.
Magnitude of change	Negligible – it is unlikely that this dwelling will experience views of the project infrastructure due to undulation in the landscape between this location and the development footprint. Whilst the viewshed analysis (Figure A.8) indicates that a small parcel of land within the project area will be visible from R14, no changes to this portion of the site are proposed as part of the project and therefore no change in views experienced from this dwelling are anticipated.
Visual sensitivity	Moderate – due to the presence of a rural dwelling.
Evaluation of significance	Slight – there would not be a significant impact from this viewpoint.
Additional mitigation	No additional mitigation measures are warranted based on the evaluation of significance.

6.4 Reflectivity and glare

Reference materials from the NSW Government's Department of Industry Division of Resources and Energy (2016), Solar Trade Association (2016) and the Federal Aviation Administration of the United States (2010) indicate that, in general, as little as 2% of the light received is reflected by PV panels. As noted by both the Federal Aviation Administration of the United States (FAA 2010) and Spaven Consulting (2011), this degree of reflectivity is less than the reflectivity produced by a wide variety of different surfaces, including surfaces within the immediate vicinity of the development footprint, such as bare soil and vegetation, and is similar to the reflectivity of smooth bodies of water. Further, the NSW Department of Planning (2010) acknowledged in a discussion paper on solar energy technology that potential for glare associated with non-concentrating PV solar systems is relatively limited and PV panels will not generally create noticeable glare when compared with an existing roof or building surface.

The potential impacts of reflectivity on receptors, primarily dwellings within proximity of the development footprint and motorists travelling along the local and regional road network are glint and glare. Glint refers to shorter period and more intense levels of exposure, while glare refers to sustained or continuous periods of exposure to excessive brightness, but at a reduced level of intensity (Morelli 2014). The amount of glint and glare produced by a PV panel is variable and is dependent on the angle of the PV panel, with lower angles producing less glint and glare (Morelli 2014).

As described in Section 2.3.1, the project's PV panels will likely be constructed in a single axis tracking configuration. This configuration will allow the PV panels to rotate from east to west during the day tracking the sun's movement. Consequently, the degree of glint and glare experienced by receptors will be variable depending on the time of day and viewing location. For example, receptors west of the development footprint will only have potential to be impacted by glint and glare during the afternoon tracking period. However, as noted above, as little as 2% of the light received is reflected by PV panels, which is less than the reflectivity produced by a wide variety of surfaces in the existing environment surrounding and within the development footprint.

Reflection in the form of glint and glare will only be possible when direct sunlight occurs, therefore, in those instances where glint and glare from the PV panels may occur, receptors will also likely experience direct sunlight, which will be a significantly brighter and more intense source of light than reflection from the PV panels within the development footprint. Nonetheless, glint and glare may result from the project and may have an impact on receptors and motorists travelling along the local and regional road network.

As discussed in Section 6.3, undulation within the landscape, favourable topography and existing remnant vegetation in the landscape will reduce both the duration and location from which reflection from the PV panels may be visible. As shown in the baseline viewshed analysis in Figure 6.2, there is negligible potential for views of the development footprint from the surrounding landscape.

In addition to the PV panels, other project infrastructure may also result in glint and glare depending on the angle of the sun and viewing location. For example, glint and glare may occur as a result of the mounting frameworks to support the PV panels, perimeter security fencing, BESS housing, management hub infrastructure, inverters and transformer units. This infrastructure will be more sparsely dispersed within the development footprint and is unlikely to create noticeable glint or glare when compared with existing structures within the development footprint and project area (e.g. agricultural sheds and wire fencing).

As part of the preliminary design process, the substation and BESS footprints within the development footprint have been positioned as far from the closest receptors as possible.

Spaven Consulting (2011) prepared a report to assess the potential impact of PV solar energy facilities located in off-airfield situations. Within this report, the potential for glare to pilots caused by sunlight reflected by PV was identified as the only significant aviation issue likely to be raised by PV solar energy facilities (Spaven Consulting 2011).

As noted within this report, PV solar energy facilities positioned away from airports and airfields are unlikely to present problems to pilots, with the only potential hazards likely to be encountered during the critical phases of flight, namely approach and landing (Spaven Consulting 2011). The report also concluded that there was no evidence at the time of publication of glare from any existing PV solar energy facilities affecting pilots and no cases of accidents in which glare caused by a PV solar energy facility was cited as a factor (Spaven Consulting 2011).

As noted in Section 3.7, Armidale Airport is the closest major airport to the development footprint and is approximately 80 km south-east of the development footprint. Due to the distance between Armidale Airport and the development footprint, it is unlikely that aircraft using this facility will pass directly over the development footprint during the critical phases of flight as identified in the report produced by Spaven Consulting (2011).

Inverell and Glen Innes airports are significantly closer to the development footprint at approximately 26 km south-west and 26 km north-east, respectively. Due to the distance between these airports and the development footprint, it is unlikely that aircraft using this facility will pass directly over the development footprint during the critical phases of flight as identified in the report produced by Spaven Consulting (2011).

A scoping exercise was conducted by Solar Trade Association (2016) to help inform debates around development proposals for non-domestic PV solar developments in Scotland. The exercise identified a variety of examples of airports successfully operating with large installations of PV panels on airport-related infrastructure, adjacent to airport runways and/or under direct flight paths (Solar Trade Association 2016). PV panels are currently in use at the Giebelstadt Power Plant in Germany, which features 120,000 PV panels with a total capacity of 28 MW. This project is adjacent to an airport currently used for general aviation purposes. Within the United States, four separate arrays of PV panels envelop the Denver International Airport, with a combined capacity of approximately 10 MW. In Japan, Osaka's Kansai International Airport has had an 11.6 MW solar farm installed adjacent to the runway since 2014.

Within Australia, Adelaide Airport's Terminal One roof supports 760 PV panels with a capacity of 114 kW and Darwin Airport features a 4 MW solar farm, which includes 15,000 PV panels over 6 ha. In addition, the Ballarat Solar Park, which has an installed capacity of 300 kW, is positioned adjacent to the boundary of the Ballarat Airport.

The potential for low angled reflected sunlight to cause a distraction to drivers travelling along the local and regional road network has been considered. Due to the low level of reflectivity of PV panels, as well as the possibility of other features becoming more common in modern PV panel designs, such as anti-reflective coatings, the PV panels are not expected to cause a distraction to motorists travelling along the local and regional road network.

Where undulation in the landscape, favourable topography, screening in the form of existing remnant vegetation and/or landscaping completely removes or disrupts views towards the development footprint, potential impacts from glint or glare will be limited.

Based on the findings of previous assessments prepared for PV solar energy facilities, glint and glare from the project's PV panels and other project infrastructure are not expected to significantly impact the following:

- receptors within the vicinity of the development footprint
- people engaged in agricultural activities in the surrounding landscape
- motorists travelling along the local and regional road network (including Gwydir Highway)
- motorists travelling along a number of minor, unsealed rural property access roads and farm tracks
- aircraft arriving at or departing from Armidale, Inverell or Glen Innes airports.

6.5 Cumulative impacts

As discussed in Section 3.9, the closest developments to the project are the White Rock wind and solar farm and the Sapphire wind and solar farm, which, at their closest point, are approximately 4 km east and 3 km north of the project, respectively (Figure 6.3). The construction of the project will expand the overall area within the Inverell Shire LGA that is occupied by renewable energy generation infrastructure.

Once constructed, the PV panels will be the prominent visual feature of the project and the White Rock Solar Farm and Sapphire Solar Farm throughout their respective operational stages. A cumulative visual impact may result from the project being constructed in conjunction with these other developments; however, it is anticipated that views of project infrastructure from each of these projects from a single location will be limited as a result of:

- the distance between the projects (Figure 6.3)
- variable elevation and undulation within the landscape surrounding the projects

- the presence of significant transport infrastructure within the landscape, namely Gwydir Highway
- the presence of remnant vegetation and vegetation screens within the landscape surrounding the projects.

Due to the distance between the development footprint for the project and the Glen Innes Wind Farm (Figure 1.1), an assessment of potential cumulative visual impacts is not warranted.

6.5.1 Cumulative impacts during construction

During construction, the landscape within the development footprint will undergo a number of physical changes, namely through the installation of project infrastructure, which will add new features to the visual landscape.

Views of the project and other renewable energy generation projects during construction may be possible for motorists travelling along the Gwydir Highway; however, based on separation distances, it is anticipated that these views will be of only one project at any given time.

Views of project infrastructure within the development footprint from the Gwydir Highway have been considered as part of this VIA (Section 6.3.4). At its closest point, the development footprint is approximately 2.9 km from the Gwydir Highway. The distance to the development footprint will limit the scale of change and degree of contrast for views from this location. Further, it is assumed the focus of these motorists will be in line with their direction of travel along this major road corridor.

Based on the results of the viewshed analysis, concurrent views of the project and other renewable energy generation projects during construction from neighbouring residences are considered unlikely. Further, a review of aerial imagery indicates that there is vegetation present around a number of dwellings, which would act to further screen concurrent views of multiple projects.

Due to their temporary nature, the site establishment works and construction activities for the project are considered unlikely to have any significant visual impacts on dwellings.

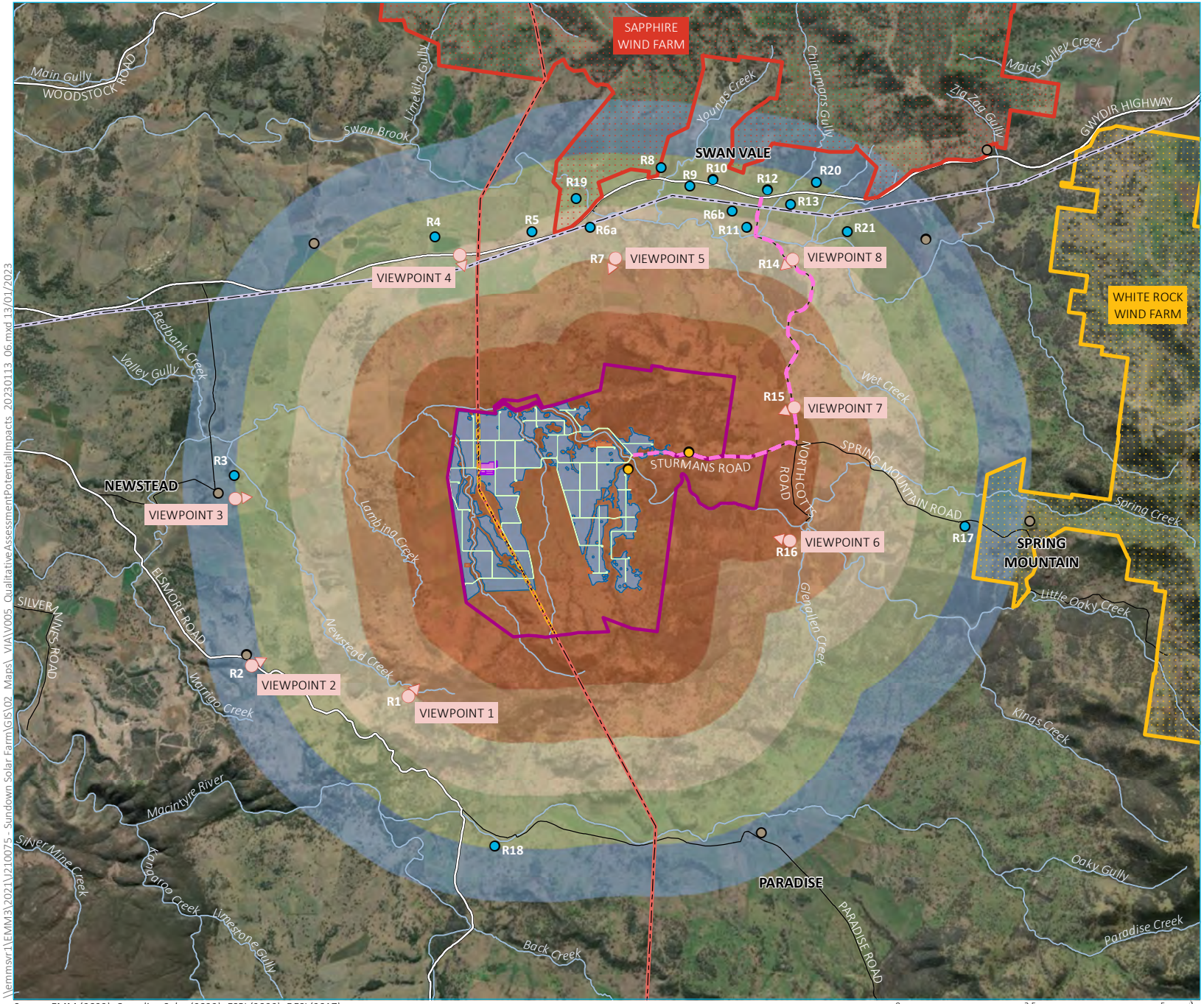
6.5.2 Cumulative impacts during operation

Project infrastructure from multiple renewable energy generation projects may be visible to motorists travelling along the Gwydir Highway; however, based on separation distances, it is anticipated that these views will be of only one project at any given time, with the exception of shared views of turbines from both the White Rock Wind Farm and Sapphire Wind Farm.

Due to the low level of reflectivity of PV panels, the project is not expected to cause a distraction to motorists travelling along the Gwydir Highway.

The following factors will limit potential for cumulative visual impacts to occur:

- spatial separation between the development footprint for the project and neighbouring renewable energy generation projects (both operational and proposed)
- variable elevation and undulation within the landscape between these projects
- the presence of significant stands of remnant vegetation in the landscape between these projects.



KEY

- Proposed Sundown Solar Farm (Project area)
- Sapphire Wind and Solar Farm
- White Rock Wind and Solar Farm
- Viewpoint location
- Associated property
- Non-associated property
- Non-associated property (>4 km from Project area)
- Major road
- Minor road
- Named watercourse

Existing overhead transmission line

- Armidale to Dumaresq (330 kV)
- Glen Innes to Inverell (132 kV)

Development footprint

- Access road
- 330 kV OHL easment (60 m)
- Internal access road
- BESS/switchroom/substation
- Construction and laydown
- Potential PV area

Project area buffer

- 1 km
- 2 km
- 3 km
- 4 km
- 5 km

Source: EMM (2022); Canadian Solar (2022); ESRI (2022); DFSI (2017)

0 2.5 5 km

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Qualitative assessment of potential cumulative impacts

Sundown Solar Farm
Visual impact assessment
Figure 6.3

EMM creating opportunities

6.6 Summary of visual assessment

A summary of the results of the analysis of visual impacts for each of the eight viewpoints is provided in Table 6.10.

Due to the low level of reflectivity of the PV panels, they are not expected to cause a distraction to motorists travelling along the local and regional road network. Further, glint and glare are not expected to significantly impact the closest receptors.

Visual impacts from Viewpoint 3 (Newstead Station Group, an item of local heritage significance listed on the Inverell LEP) have also been considered as part of this VIA. It is anticipated that existing remnant vegetation, distance and undulation in the landscape will reduce the visibility of project infrastructure from this location. The project will not result in a significant visual impact on Newstead Station Group.

Table 6.10 Summary of results of visual impacts at each viewpoint

Viewpoint	Distance to development footprint	Representative receptors	Residential or public	Project infrastructure visible based on viewshed analysis	Magnitude of change	Visual sensitivity	Evaluation of significance	Significant impact	Additional mitigation proposed	Potential cumulative impact
Viewpoint 1	2.1 km	R1	Residential	No	Negligible	Moderate	Slight	No	No	No
Viewpoint 2	4.2 km	R2	Residential	No	Negligible	Moderate	Slight	No	No	No
Viewpoint 3	4.1 km	R3	Residential	Yes	Low	Moderate	Slight/moderate	No	No	Yes
Viewpoint 4	3 km	-	Public	No	Negligible	Low	Negligible	No	No	No
Viewpoint 5	2.8 km	R7	Residential	No	Negligible	Moderate	Slight	No	No	No
Viewpoint 6	2.8 km	R16	Residential	No	Negligible	Moderate	Slight	No	No	No
Viewpoint 7	2.5 km	R15	Residential	No	Negligible	Moderate	Slight	No	No	No
Viewpoint 8	4.2 km	R14	Residential	No	Negligible	Moderate	Slight	No	No	No

7 Management of impacts

Development of the project design has included and will continue to include general measures to reduce the degree of contrast between project infrastructure and the surrounding rural landscape, having regard to the form, scale, height, colour and texture of materials incorporated as part of the project.

7.1 Landscaping

Views of project infrastructure are only predicted from Viewpoint 3 at a distance of 4 km. However, it is clear from aerial imagery that shielding features in the landscape (namely remnant vegetation) have the potential to significantly screen the extent of project infrastructure visible from this viewpoint.

Based on the calculated magnitude of change and evaluations of significance assigned to each of the eight viewpoints, no landscaping is warranted.

7.2 Colour of materials

Where possible, suitable colours will be chosen for project infrastructure to minimise visual impacts, including in particular the management hub buildings/facilities and the BESS housing. These buildings and materials will be designed to blend in with the local rural/farming landscape and with consideration to the colours of existing farm sheds and agricultural infrastructure in the area surrounding the site.

7.3 Night lighting

During operation, as noted in Section 3.8, the project will require limited permanent, fixed night lighting, most likely for the management hub buildings and substation. As construction works will be limited to standard construction hours, there will no night lighting required during construction.

Lighting will be managed to minimise impacts on surrounding areas. All external lighting will be installed as low intensity lighting (except where required for safety or emergency purposes) and will comply with Australian Standard AS/NZS 4282:2019 – *Control of the Obtrusive Effects of Outdoor Lighting*. In addition, all external lighting will not shine above the horizontal.

8 Conclusion

A visual assessment has been conducted from a number of representative viewpoints surrounding the development footprint. The representative viewpoints were selected based on the following criteria:

- proximity to the development footprint
- the location of receptors (i.e. dwellings)
- the positioning of regional and local roads and potential impacts on passing motorists
- the location of items of local heritage significance listed within the Inverell LEP
- local topography
- presence of remnant vegetation with potential to provide screening.

The representative viewpoints have been assessed to demonstrate the potential visual impacts of the project. Due to existing mature vegetation, variable elevation and undulation in the landscape, and the height of the dominant project infrastructure, namely the PV panels, infrastructure within the development footprint will be shielded from view at the majority of viewpoints considered as part of this assessment.

The visual assessment determined that, of the viewpoints assessed, infrastructure may be visible from one of the eight viewpoints. Based on variable elevation and undulation in the landscape and the presence of vegetation, combined with the height of the PV panels, the impact assessment predicts:

- a negligible visual impact for Viewpoint 4
- a slight visual impact for Viewpoints 1, 2, 5, 6, 7 and 8
- a slight/moderate visual impact for Viewpoint 3.

Due to the methodology adopted as part of this assessment, a slight visual impact has been assigned to six viewpoints that are not predicted to be exposed to any views of project infrastructure. This is due to the visual sensitivity of the viewpoints. However, it is reiterated that the viewshed analysis results indicate no views of project infrastructure are anticipated from these viewpoints and associated dwellings.

Based on the calculated magnitude of change and evaluations of significance assigned to each of the eight viewpoints, no landscaping is warranted.

Visual impacts from Newstead Station Group, an item of local heritage significance listed on the Inverell LEP, have also been considered as part of this VIA. It is anticipated that distance between this item and the development footprint, topography and existing remnant vegetation will mitigate the visibility of project infrastructure from this location. The project will not result in a significant visual impact on Newstead Station Group (Viewpoint 3).

Motorists travelling along the Gwydir Highway may experience transitory and distant views of project infrastructure within the development footprint. As it is assumed that the focus of these motorists will be in line with their direction of travel along this road corridor and motorists will be travelling at the prescribed speed limit of 100 km/hr, any potential views are considered insignificant.

The construction of the project will expand the overall area within the Inverell LGA that is occupied by solar infrastructure. Based on the height of the dominant project infrastructure, namely the PV panels, variable elevation and undulation in the landscape, the presence of vegetation and separation distances between the development footprint and the footprints for other wind and solar developments in the area, it is anticipated that there is limited potential for combined views of the project and other renewable energy developments.

This VIA concludes that the project will not have any significant adverse visual impacts on the locality.

References

Federal Aviation Administration 2010, *Technical Guidance for Evaluating Selected Solar Technologies on Airports*.

Landscape Institute and Institute of Environmental Management and Assessment 2013, *Guidelines for Landscape and Visual Impact Assessment* (GLVIA) (3rd ed.).

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NSW Department of Planning and Environment 2016, *Wind Energy: Visual Assessment Bulletin AB 01 For State Significant Wind Energy Development*.

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Solar Trade Association 2016, *Impact of Solar PV on Aviation and Airports*.

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Appendix A
Viewshed analysis figures

EMM
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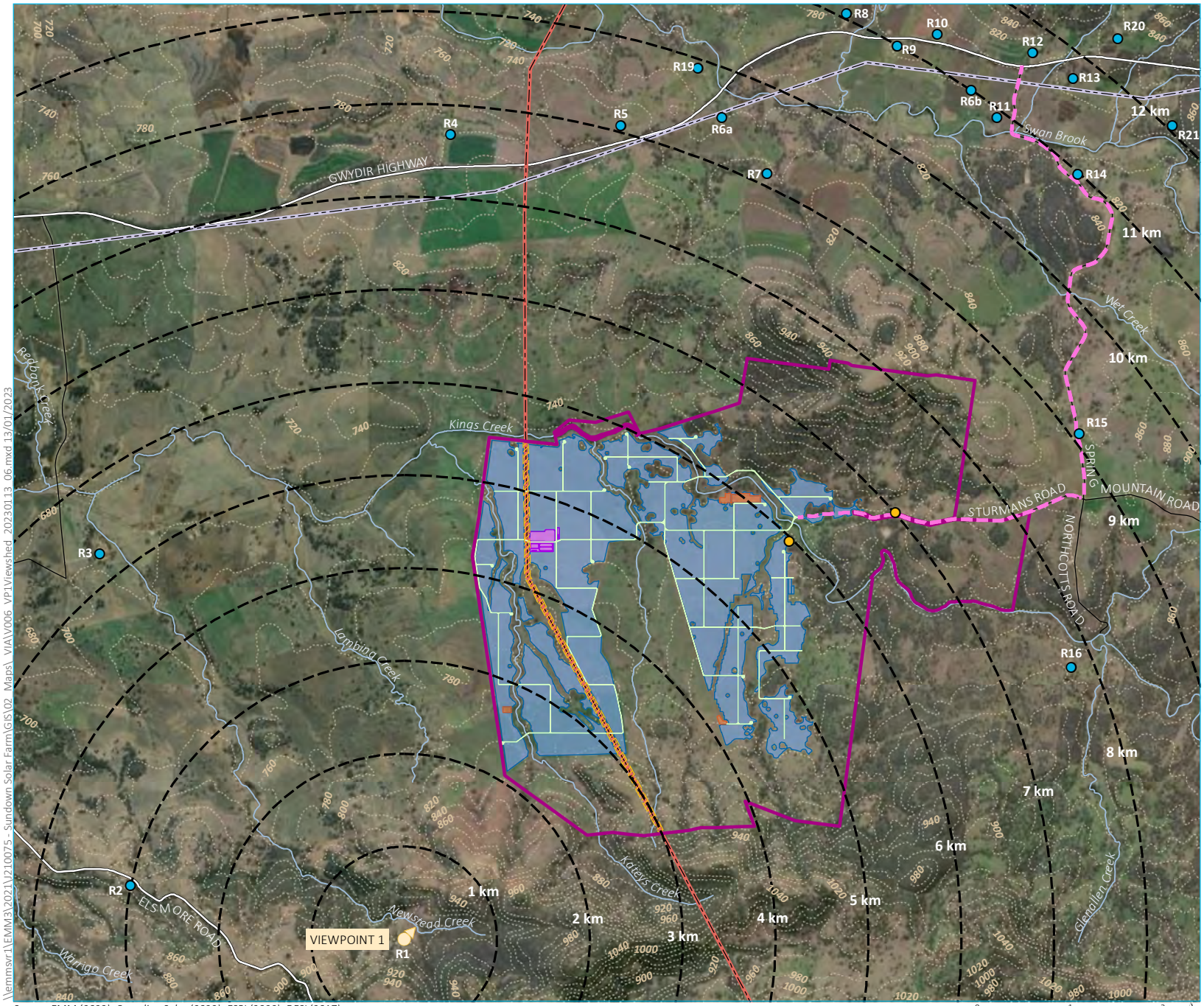

KEY

- Proposed Sundown Solar Farm (Project area)
- Associated property
- Non-associated property
- Major road
- Minor road
- Named watercourse
- Topographic contour (20 m)

Existing overhead transmission line

- Armidale to Dumaresq (330 kV)
- Glen Innes to Inverell (132 kV)

Development footprint

- Access road
- 330 kV OHL easment (60 m)
- Internal access road
- BESS/switchroom/substation
- Construction and laydown
- Potential PV area

Viewshed analysis

- Viewpoint 1
- Viewpoint buffer

NOTE: No views of project infrastructure predicted based on viewshed analysis

Source: EMM (2023); Canadian Solar (2022); ESRI (2023); DFSI (2017)

0 1 2 km

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Viewshed analysis - Viewpoint 1

Sundown Solar Farm
Visual impact assessment
Figure A.1

EMM
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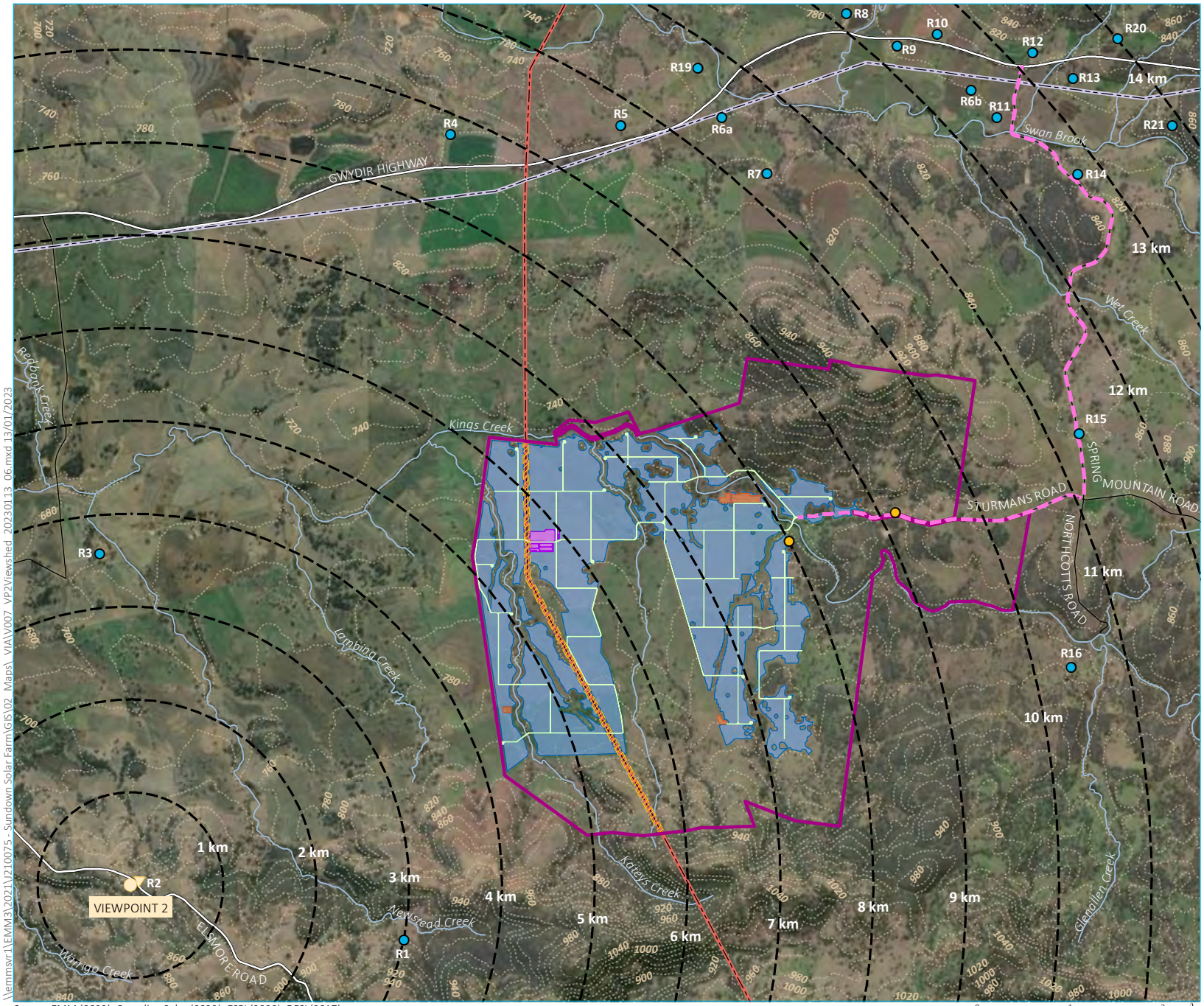

KEY

- Proposed Sundown Solar Farm (Project area)
- Associated property
- Non-associated property
- Major road
- Minor road
- Named watercourse
- Topographic contour (20 m)

Existing overhead transmission line

- Armidale to Dumaresq (330 kV)
- Glen Innes to Inverell (132 kV)

Development footprint

- Access road
- 330 kV OHL easment (60 m)
- Internal access road
- BESS/switchroom/substation
- Construction and laydown
- Potential PV area

Viewshed analysis

- Viewpoint 2
- Viewpoint buffer

NOTE: No views of project infrastructure predicted based on viewshed analysis

Source: EMM (2023); Canadian Solar (2022); ESRI (2023); DFSI (2017)

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Viewshed analysis - Viewpoint 2

Sundown Solar Farm
Visual impact assessment
Figure A.2

EMM
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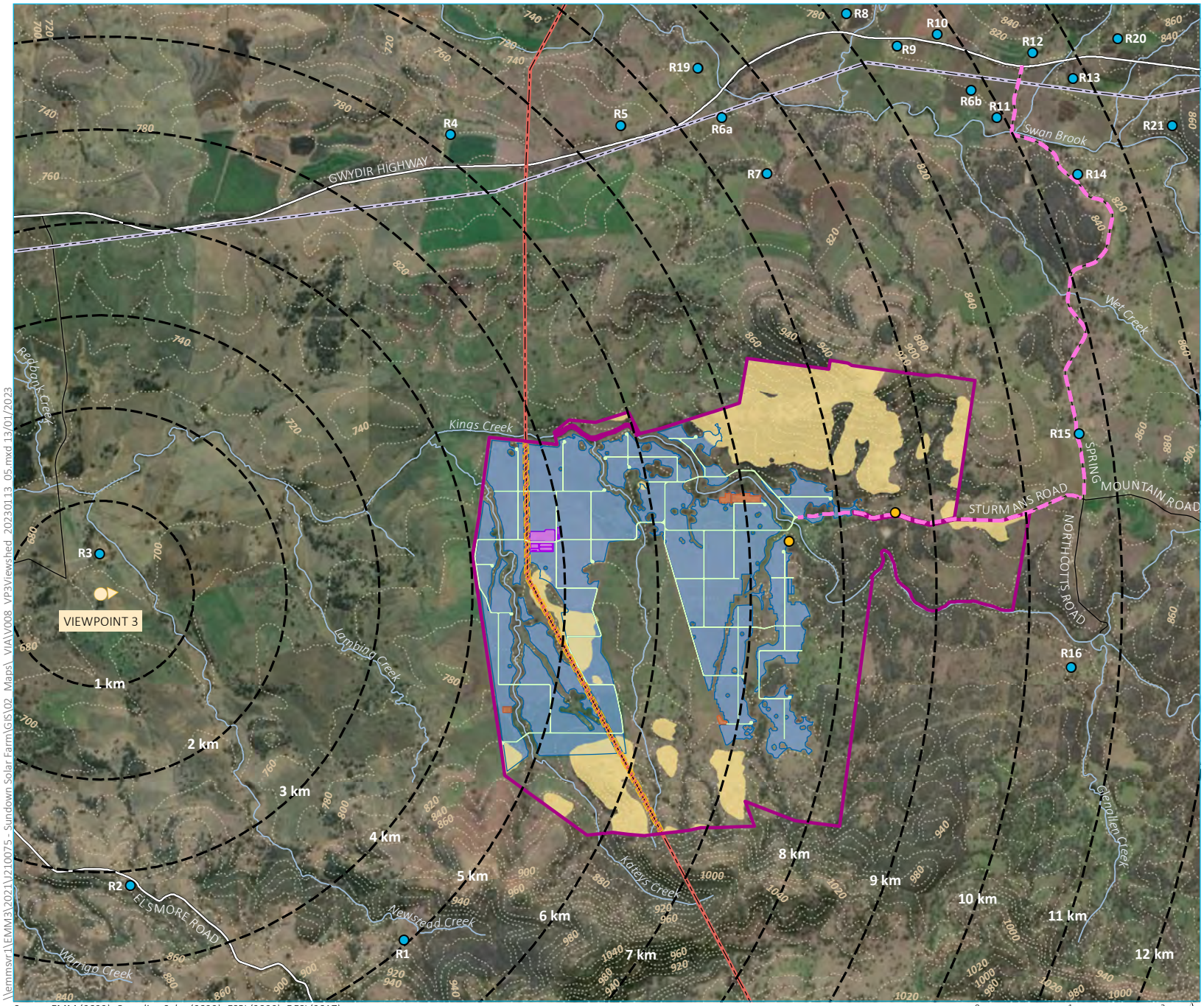

KEY

- Proposed Sundown Solar Farm (Project area)
- Associated property
- Non-associated property
- Major road
- Minor road
- Named watercourse
- Topographic contour (20 m)

Existing overhead transmission line

- Armidale to Dumaresq (330 kV)
- Glen Innes to Inverell (132 kV)

Development footprint

- Access road
- 330 kV OHL easment (60 m)
- Internal access road
- BESS/switchroom/substation
- Construction and laydown
- Potential PV area

Viewshed analysis

- Viewpoint 3
- Viewpoint buffer
- Visible project infrastructure (assumed 4.4 m height) - bare earth surface

Source: EMM (2022); Canadian Solar (2022); ESRI (2022); DFSI (2017)

0 1 2 km

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Viewshed analysis - Viewpoint 3

Sundown Solar Farm
Visual impact assessment
Figure A.3

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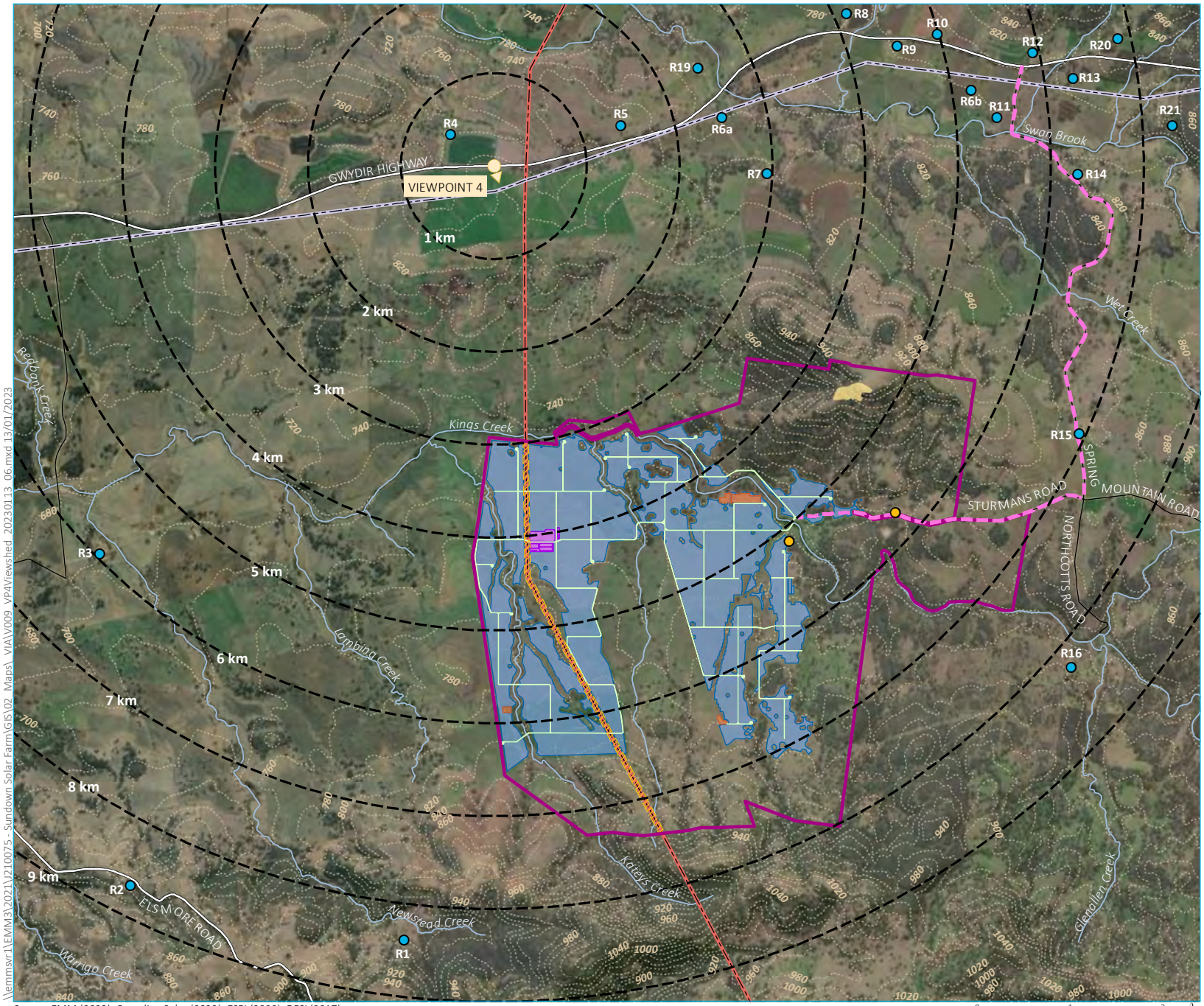

KEY

- Proposed Sundown Solar Farm (Project area)
- Associated property
- Non-associated property
- Major road
- Minor road
- Named watercourse
- Topographic contour (20 m)

Existing overhead transmission line

- Armidale to Dumaresq (330 kV)
- Glen Innes to Inverell (132 kV)

Development footprint

- Access road
- 330 kV OHL easment (60 m)
- Internal access road
- BESS/switchroom/substation
- Construction and laydown
- Potential PV area

Viewshed analysis

- Viewpoint 4
- Viewpoint buffer
- Visible project infrastructure (assumed 4.4 m height) - bare earth surface

NOTE: No views of project infrastructure predicted based on viewshed analysis

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Source: EMM (2023); Canadian Solar (2022); ESRI (2023); DFSI (2017)

0 1 2 km

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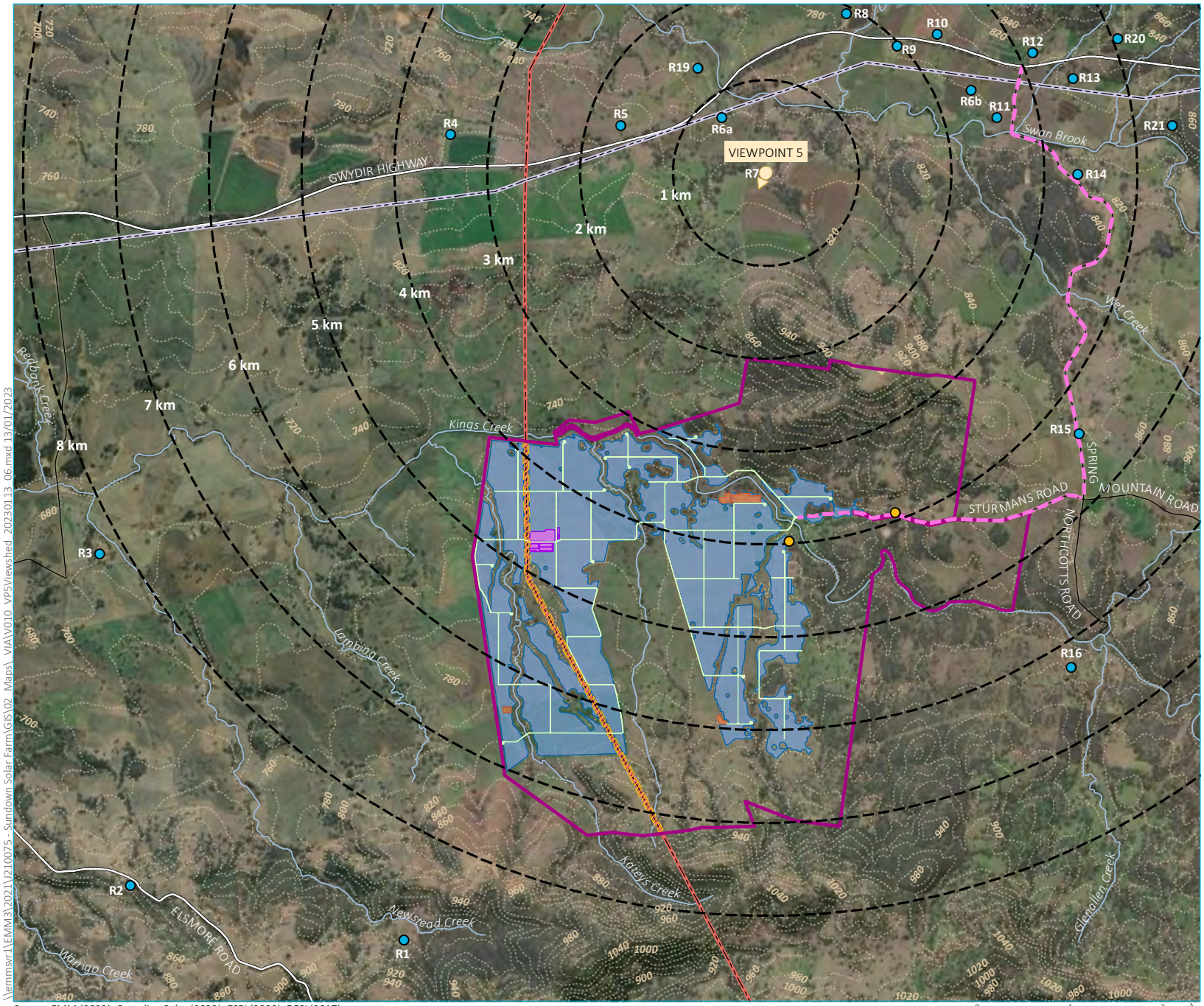
Viewshed analysis - Viewpoint 4

Sundown Solar Farm
Visual impact assessment
Figure A.4

EMM creating opportunities



KEY

- Proposed Sundown Solar Farm (Project area)
- Associated property
- Non-associated property
- Major road
- Minor road
- Named watercourse
- Topographic contour (20 m)

Existing overhead transmission line

- Armidale to Dumaresq (330 kV)
- Glen Innes to Inverell (132 kV)

Development footprint

- Access road
- 330 kV OHL easment (60 m)
- Internal access road
- BESS/switchroom/substation
- Construction and laydown
- Potential PV area

Viewshed analysis

- Viewpoint 5
- Viewpoint buffer
- Visible project infrastructure (assumed 4.4 m height) - bare earth surface

NOTE: No views of project infrastructure predicted based on viewshed analysis

Source: EMM (2023); Canadian Solar (2022); ESRI (2023); DFSI (2017)

0 1 2 km

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Viewshed analysis - Viewpoint 5

Sundown Solar Farm
Visual impact assessment
Figure A.5

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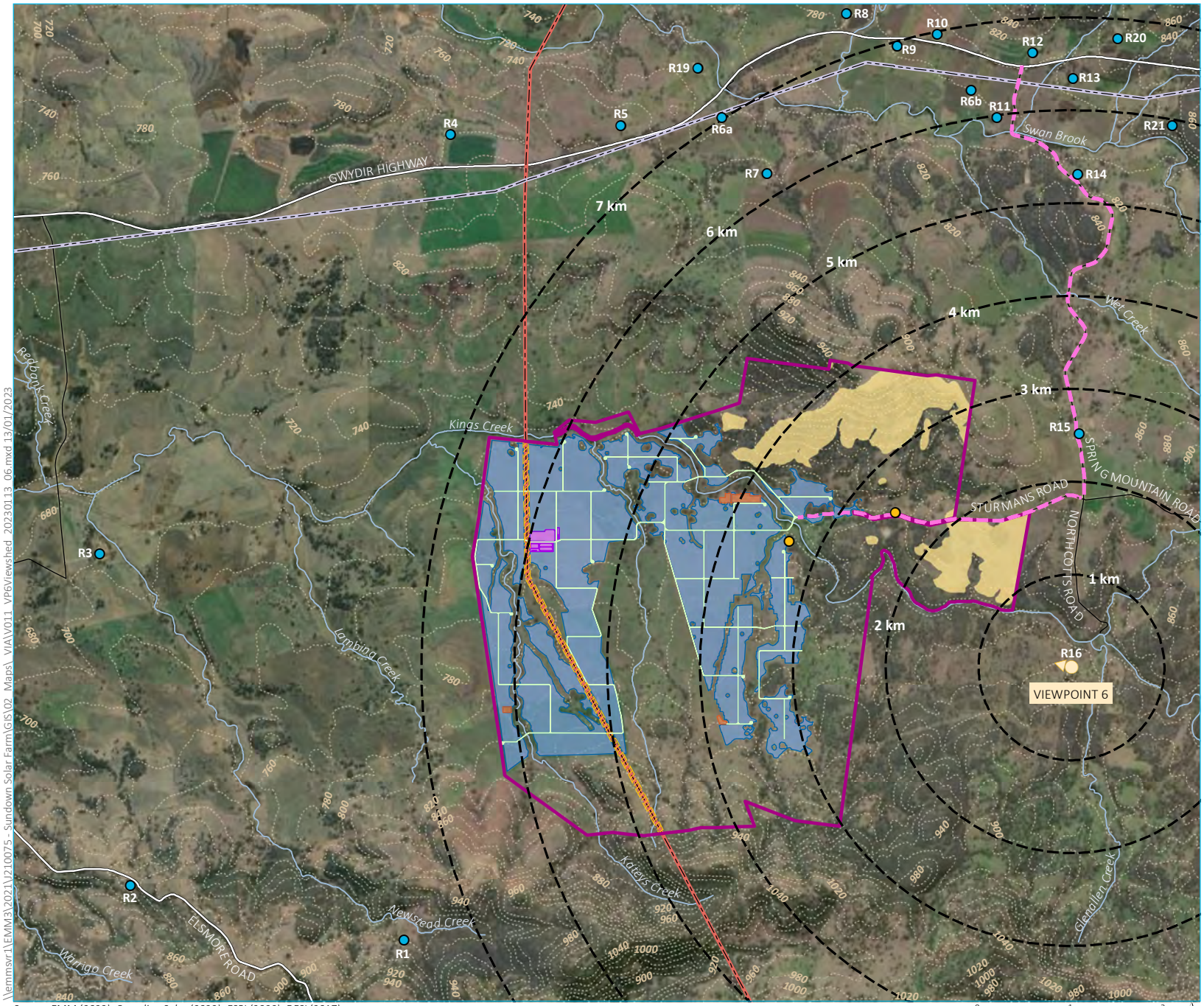

KEY

- Proposed Sundown Solar Farm (Project area)
- Associated property
- Non-associated property
- Major road
- Minor road
- Named watercourse
- Topographic contour (20 m)

Existing overhead transmission line

- Armidale to Dumaresq (330 kV)
- Glen Innes to Inverell (132 kV)

Development footprint

- Access road
- 330 kV OHL easment (60 m)
- Internal access road
- BESS/switchroom/substation
- Construction and laydown
- Potential PV area

Viewshed analysis

- Viewpoint 6
- Viewpoint buffer
- Visible project infrastructure (assumed 4.4 m height) - bare earth surface

NOTE: No views of project infrastructure predicted based on viewshed analysis

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Source: EMM (2023); Canadian Solar (2022); ESRI (2023); DFSI (2017)

0 1 2 km

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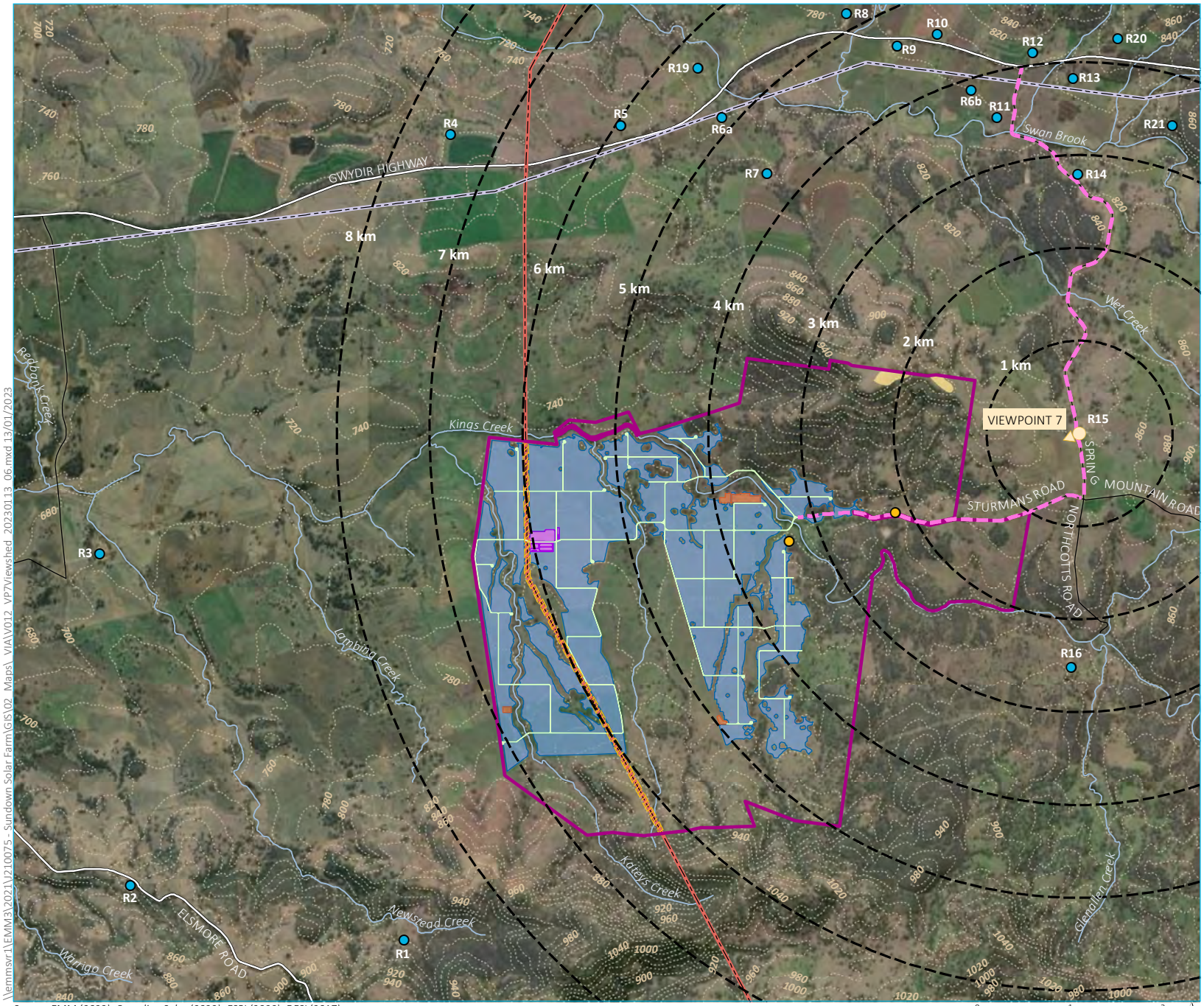
Viewshed analysis - Viewpoint 6

Sundown Solar Farm
Visual impact assessment
Figure A.6

EMM creating opportunities



KEY

- Proposed Sundown Solar Farm (Project area)
- Associated property
- Non-associated property
- Major road
- Minor road
- Named watercourse
- Topographic contour (20 m)

Existing overhead transmission line

- Armidale to Dumaresq (330 kV)
- Glen Innes to Inverell (132 kV)

Development footprint

- Access road
- 330 kV OHL easment (60 m)
- Internal access road
- BESS/switchroom/substation
- Construction and laydown
- Potential PV area

Viewshed analysis

- Viewpoint 7
- Viewpoint buffer
- Visible project infrastructure (assumed 4.4 m height) - bare earth surface

NOTE: No views of project infrastructure predicted based on viewshed analysis

Source: EMM (2023); Canadian Solar (2022); ESRI (2023); DFSI (2017)

0 1 2 km

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Viewshed analysis - Viewpoint 7

Sundown Solar Farm
Visual impact assessment
Figure A.7

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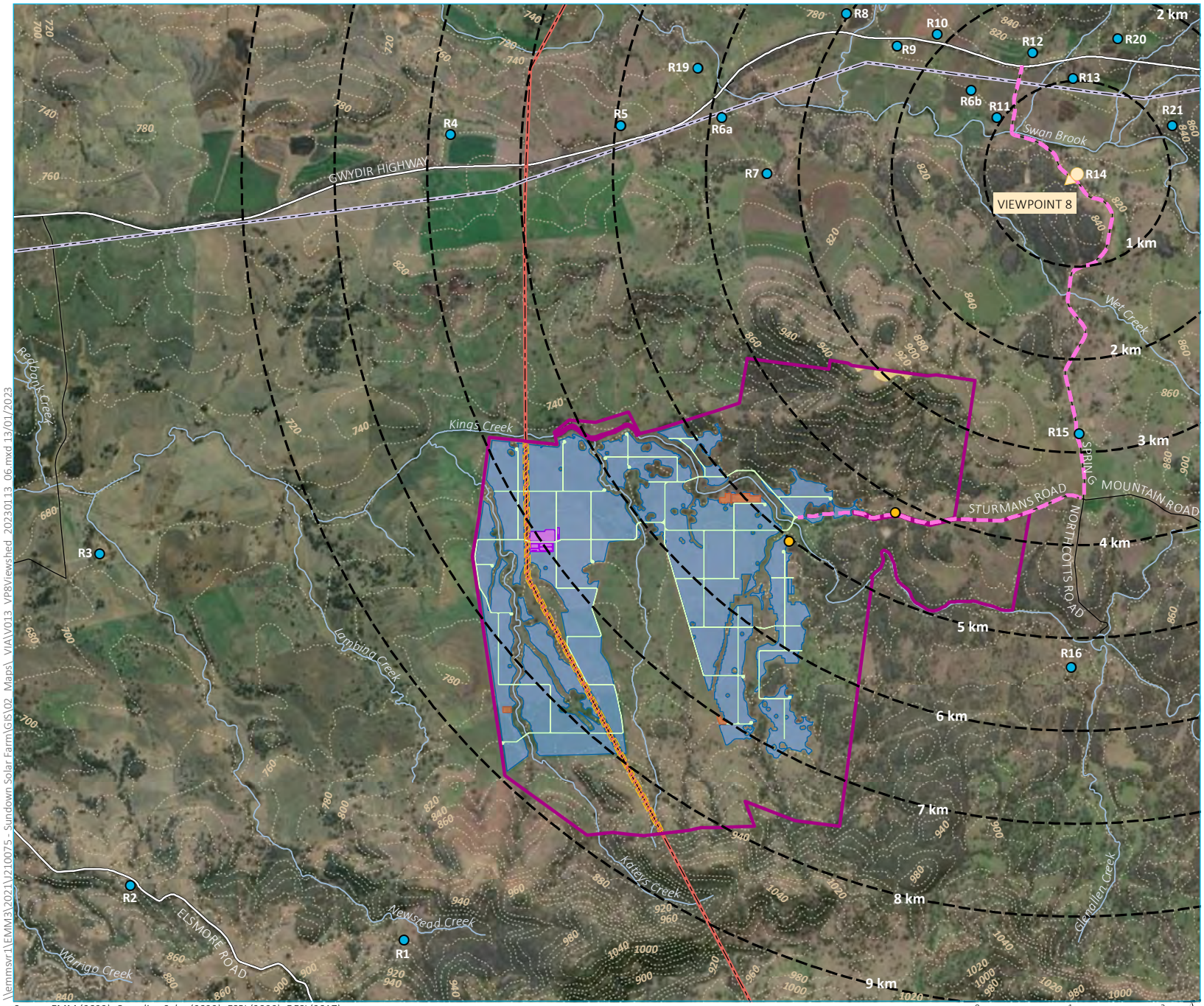

KEY

- Proposed Sundown Solar Farm (Project area)
- Associated property
- Non-associated property
- Major road
- Minor road
- Named watercourse
- Topographic contour (20 m)

Existing overhead transmission line

- Armidale to Dumaresq (330 kV)
- Glen Innes to Inverell (132 kV)

Development footprint

- Access road
- 330 kV OHL easment (60 m)
- Internal access road
- BESS/switchroom/substation
- Construction and laydown
- Potential PV area

Viewshed analysis

- Viewpoint 8
- Viewpoint buffer
- Visible project infrastructure (assumed 4.4 m height) - bare earth surface

NOTE: No views of project infrastructure predicted based on viewshed analysis

Source: EMM (2023); Canadian Solar (2022); ESRI (2023); DFSI (2017)

0 1 2 km

GDA2020 MGA Zone 56

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Viewshed analysis - Viewpoint 8

Sundown Solar Farm
Visual impact assessment
Figure A.8

EMM
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