Sapphire Solar Farm

Environmental Impact Statement

Volume 3 - Appendices

Appendix E
Visual Impact Assessment

Sapphire Solar Farm Visual Impact Assessment

Prepared for
Sapphire Solar Farm Pty Ltd

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Abbreviations

Abbreviation	Description
AHD	Australia Height Datum
CWP Solar	CWP Solar
DEM	Digital Elevation Model
EIA	Environmental Impact Assessment
EIS	Environmental Impact Statement
EP&A Act	Environmental Planning and Assessment Act 1979
GBD	Green Bean Design
GIS	Geographic Information System
GLVIA	Guidelines for Landscape and Visual Impact Assessment
Ha	Hectares
kV	Kilovolt
LCU	Landscape Character Unit
LGA	Local Government Area
LVIA	Landscape Visual Impact Assessment
MW	Megawatt
PCU	Power Conditioning Unit
PV array	Photovoltaic solar panels
PV	photovoltaic
SEARs	Secretary's Environmental Assessment Requirements
SSD	State Significant Development
SWF	Sapphire Wind Farm
ZVI	Zones of Visual Influence

1 Introduction

Eco Logical Pty Ltd has produced this Visual Impact Assessment on behalf of CWP Solar Pty Ltd (CWP Solar) to support the development of the proposed Sapphire Solar Farm (SSF, the 'Proposed Development'). Its purpose is to identify and outline the existing landscape character, identify the visual amenity receptors within the study area, and to assess the potential impacts resulting from the introduction of the Proposed Development, including night lighting and cumulative impacts. The assessment then considers how mitigation measures could be implemented to reduce the effect of any identified impacts.

This report provides a Visual Impact Assessment for construction and operational infrastructure associated with the proposed SSF. The Proposed Development is classified as "state significant development" (SSD) under Schedule 1 of the *State Environmental Planning Policy (State and Regional Development) 2011*, which requires the preparation of an Environmental Impact Statement (EIS) and subsequent assessment and approval under Division 4.1 of the *Environmental Planning and Assessment Act 1979* (EP&A Act).

This document aligns with the Landscape and Visual Impact Assessment (LVIA) prepared for the Sapphire Wind Farm (SWF) (GBD, 2011), within which the current project is co-located. This report, in conjunction with a separate, specialist photovoltaic glint and glare study (Pager Power, 2017), fully addresses the relevant Secretary's Environmental Assessment Requirements (SEARs) for the project, namely:

"An assessment of the likely visual impacts of the development (including any glare, reflectivity and night lighting) on surrounding residences, scenic or significant vistas, air traffic and road corridors in the public domain, including a draft landscaping plan for on-site perimeter planting, with evidence it has been developed in consultation with affected landowners."

The proponent has taken an adaptive approach to design including locating infrastructure in order to minimise environmental impacts and visual impacts. This assessment adopts a conservative approach, considering all residences within 5 km of the larger Project Area and assessing potential impacts across the entire Photovoltaic Inclusion Area and Battery Option Areas (the 'Site'), rather than considering individual components separately. Key visual components associated with the Proposed Development include:

- Installation of photovoltaic solar panels (the 'PV array') providing a combined output of approximately 180 MW; and
- On-site invertors, batteries and support buildings.

The substation, construction compound and a number of facilities are shared with the previously approved SWF which is co-located with the Proposed Development and currently under construction. Potential cumulative impacts associated with SWF and other wind and solar farms within the New England Renewable Energy Precinct are also considered.

1.1 Project overview

CWP Solar propose to develop a utility-scale photovoltaic (PV) solar farm with battery storage at Kings Plains (the Proposed Development), within the Inverell Shire Local Government Area (LGA), 30 km east of Inverell in northern NSW (Figure 1). The Proposed Development would have an electricity generation

capacity of approximately 180 megawatts (MW) at the point of connection, producing enough energy (390 GWh) to power the equivalent of 68,000 average NSW households each year.

The Proposed Development would generate electricity through the conversion of solar radiation to electricity through PV panels laid out in rows across the site on steel racks with piled supports. Other infrastructure on site will consist of transformers, invertors and batteries, electrical cabling, telecommunications equipment, amenities and storage facilities, vehicular access tracks, security fencing and gates.

Land access leases have been negotiated for the life of the Proposed Development (the proponent is seeking an initial term of 25 years, with a possible additional 25-year term). At the conclusion of the operational period, the Site will be decommissioned and returned to a suitable condition to allow the resumption of agricultural activities.

1.2 Project description

A detailed project description is presented in the EIS. This assessment has been based off the project description within the EIS.

1.3 Site description

The Proposed Development is located in a sparsely populated rural setting approximately 30 km east of Inverell in northern NSW.

The PV inclusion area comprises an area of 422.5 ha, which has been historically cleared for grazing and/or sown with improved pastures (Figure 2). There are small patches of retained native woodland scattered throughout. The PV inclusion area comprises two distinct, and visually independent areas:

- 208.1 ha in the upper reaches of Kings Plains Creek catchment, an open, low relief upland valley/meadow; and
- 214.4 ha in the upper reaches of Frazers Creek catchment, a more open landscape with regional vistas.

Battery-based storage facilities are located in the Frazers Creek catchment.

The Proposed Development is located within the New England Renewable Energy Precinct. ELA is not aware of any landscape areas within the immediate development viewshed that are subject to any Local, State or Federal statutory designations for high landscape values or scenic quality and/or scenic protection.

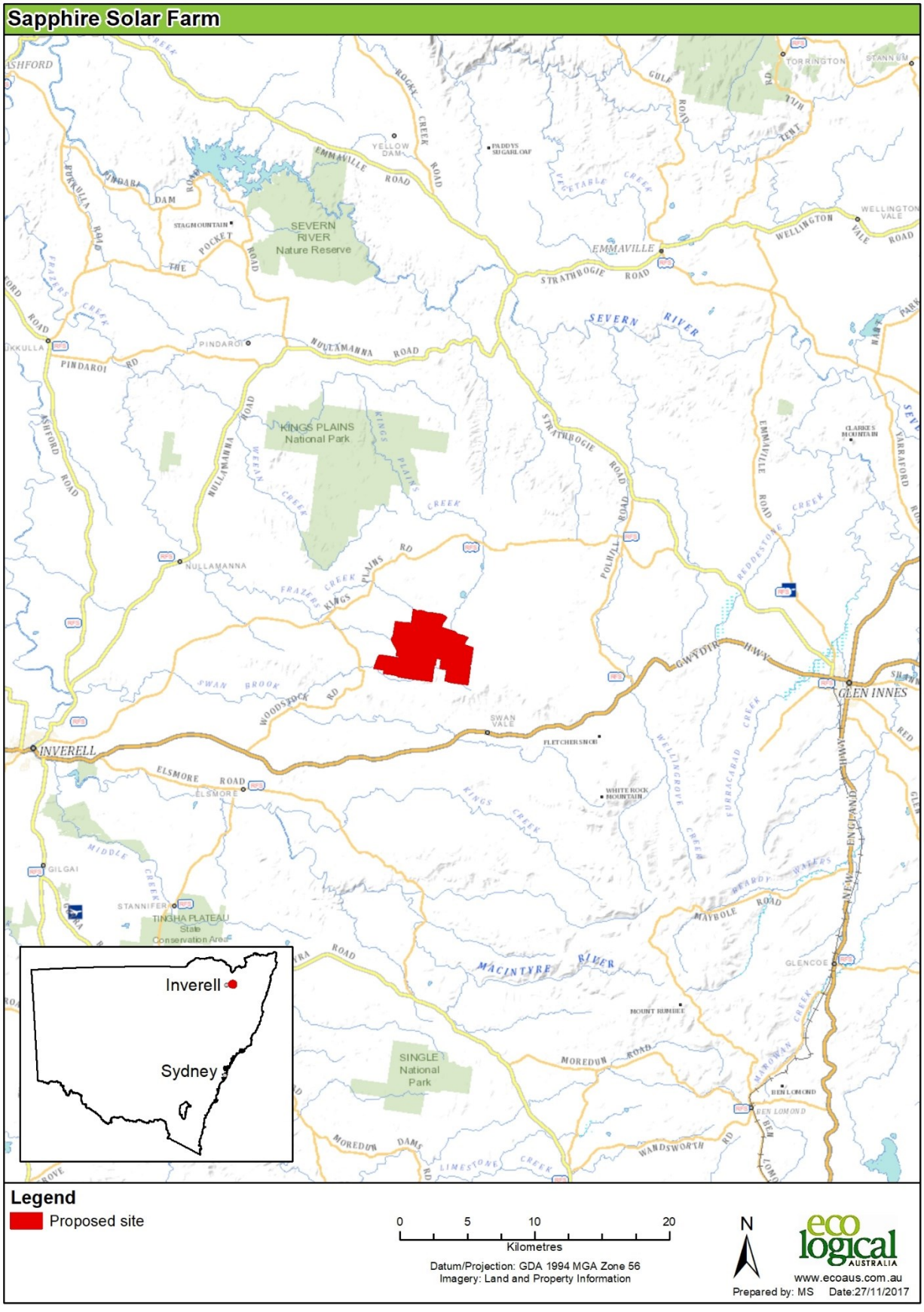

Figure 1: Location of the Proposed Development.

2 Assessment Methodology

2.1 General

This assessment has been based on the following guidelines which are considered applicable to the evaluation of Visual Impacts relating to the Proposed Development, including:

- *Environmental Impact Assessment Guide Note – Guidelines for Landscape Character and Visual Impact* (NSW Roads and Traffic Authority, 2009); and
- *Guidelines for Landscape and Visual Impact Assessment* (GLVIA) (United Kingdom, The Landscape Institute and Institute of Environmental Management and Assessment, 2013).

In response to the SEARs for this Visual Impact Assessment, the assessment methodology considers potential impacts across a range of spatial scales, from regional to the immediate field of view, from adjoining public locations as well as private residential locations (viewpoints), considering the construction, operational and decommissioning phases of the Proposed Development. Landscape character assessment is aligned to the earlier assessment of the site by Green Bean Design (GBD) for SWF.

2.2 Definition of assessment areas

The boundaries of the Proposed Development assessment areas vary depending upon which of the following impacts are being considered:

- Impacts in terms of landscape character - are more specific to the area of the landscape directly affected by, or close to, the Proposed Development; and
- Impacts to the visual amenity - considers a wider area that considers affected viewers within and beyond the Proposed Development area.

In consideration of the nature and general visibility of PV solar farms within rural settings of the New England Tablelands, the two assessment areas for the visual impact assessment are as follows (Figure 2):

- Landscape character assessment area – covers the proposed Development Area and its surrounds out to a distance of 2 km; and
- Visual amenity assessment area – focuses on an area out to 5 km from the Proposed Development Area, beyond this the visual change would be of such a low nature that impacts would be negligible. This area includes local/mid-ground or foreground views within 2 km of the Proposed Development, where any visual change and potential impacts are of most concern, along with mid-ground or subregional views.

In accordance with the principles for impact assessment, these distances are naturally conservative as they are based on the much larger proposed Development Footprint, rather than the immediate impact area associated with the PV arrays and/or other site infrastructure.

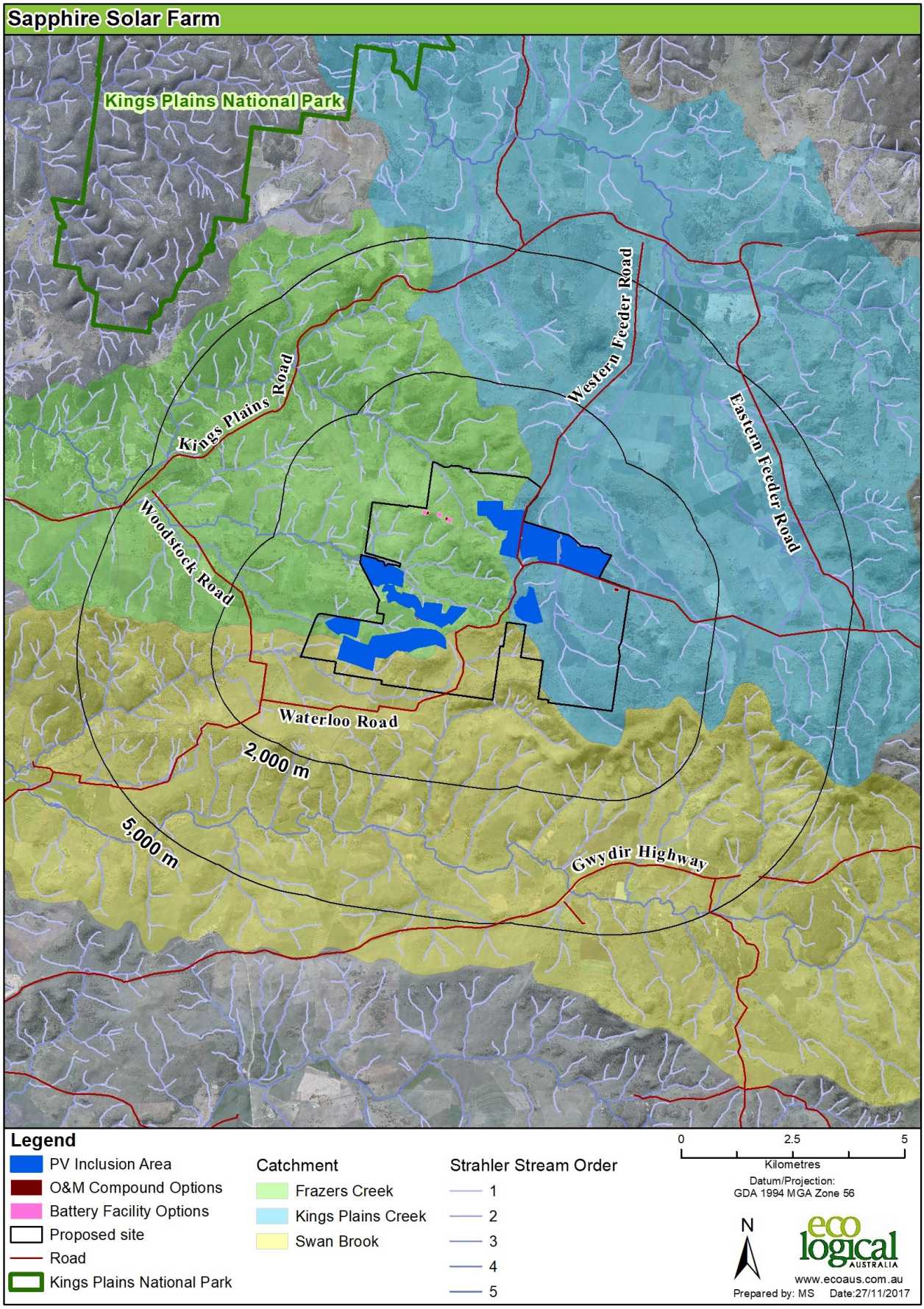

Figure 2: Study areas and wider site context.

2.3 Landscape Character – Impact Assessment Methodology

Landscape character can be defined as a distinct and recognisable pattern of elements that occur consistently across a particular landscape known discreetly as a Landscape Character Unit (LCU). It refers to the physical characteristics of landscape based on features such as location, land use, vegetation cover and landform.

The first step in undertaking a landscape character assessment is to identify the LCUs that are associated with the study area. Once identified, the following assessment method was adopted:

- Description of the existing landscape character area which defines its sensitivity to change or 'visual sensitivity';
- Description of the potential visual changes to a LCU that would result as a consequence of the proposal along with a "magnitude of change" rating;
- An assessment of impact, taking into account the relationship between visual sensitivity (the ability of a landscape character area to absorb a development) and magnitude of change;
- The identification of any mitigation measures that would reduce the visual impact identified; and then
- Results of mitigation strategies were assessed to provide a final assessment of potential residual effects of the Proposed Development, using the same criteria outlined above.

The impact to landscape character is determined by balancing the sensitivity of the receptor and the magnitude of impact as a result of the construction, operation and decommissioning of the Project. The correlation between the sensitivity of landscape character and the magnitude of change to determine the level of impact is summarised in Table 1.

Table 1: Visual impact assessment matrix

Potential level		Magnitude of change			
		Very High	High	Moderate	Low or insignificant
Visual sensitivity	Very High	Very High Impact	High Impact	High Impact	Moderate Impact
	High	High Impact	High Impact	Moderate Impact	Low Impact
	Moderate	Moderate Impact	Moderate Impact	Moderate Impact	Low Impact
	Low	Moderate Impact	Low Impact	Low Impact	Low or Insignificant Impact

2.3.1 Sensitivity Criteria

Each LCU is assessed for its sensitivity based on a review and analysis of the elements that make up its characteristic attributes. The visual sensitivity of landscape character in rural areas can largely be defined by considering aspects such as relative naturalness and uniqueness. The more disturbed or common a landscape, the less value is placed on it and consequently the less 'visually sensitive' it is to change. The visual sensitivity of a landscape character unit is evaluated according to the five-point scale presented in Table 2. The criteria used are based on guidance provided in GLVIA (2013).

Table 2: Visual sensitivity Criteria used for Landscape Character

Visual Sensitivity levels	Landscape Character
Insignificant	Contains predominantly industrial or intensive agricultural infrastructure.
Low	General widespread rural landscape with low to moderate levels of native vegetation, and no identified special landscape features or interesting topographic features.
Moderate	Rural land with high levels of native vegetation or undisturbed native woodland with attractive landscape features such as watercourses or interesting topographic features.
High	Landscapes with well-preserved natural areas, highly valued for conservation or values relating to cultural heritage.
Very High	Iconic and dramatic natural landscapes such as those protected as World Heritage Areas or National Parks. Highly valued iconic cultural landscapes may also be included.

Magnitude of Visual Change Criteria

The magnitude of visual change considers the extent to which the existing landscape features or experience of that landscape would be modified as a consequence of the visual impacts of the Proposed Development. The magnitude of change likely to occur as a result of the construction, operation and decommissioning of the Project is evaluated according to a five-point scale as outlined in Table 3.

Table 3: Magnitude of visual change definitions used for Landscape Character

Magnitude of Visual Change	Landscape Character
Insignificant	Minor scales of landscape/landform change and vegetation removal, existing urban use, intensive agriculture or industrial infrastructure may be present.
Low	Moderate level of landscape/landform change and minor vegetation removal, existing industrial or intensive agriculture use may be present.
Moderate	Moderate scale of landscape/landform change and/or vegetation removal, minor water courses possibly impacted, existing industrial or intensive agriculture on or adjoining site.
High	Large scale landscape/landform change and/or vegetation removal, minor water courses possibly affected, no existing industrial or intensive agriculture on or visible from site.
Very High	Highly significant scale landscape/landform change, possibly major vegetation and water course impacts, no existing industrial or intensive agriculture on or visible from site.

2.4 Visual Amenity – Impact Assessment Methodology

The visual amenity of an area broadly refers to how potential viewers respond to or value a particular landscape. To assess the impact of the Proposed Development on visual amenity, receptors and/or sensitive viewpoints within the potential area of impact (study area) are identified. The assessment then examines the potential impact for each identified viewpoint by balancing the visual sensitivity of the receptor and the magnitude of visual change as a result of the construction, operation and decommissioning of the Proposed Development. The correlation between visual sensitivity and the magnitude of visual change used to determine the level of impact is summarised in the visual impact assessment matrix presented in Table 1.

2.4.1 Assessment of Visual Impact

The potential visual impact of the solar farm on surrounding view locations would result primarily from a combination of the potential visibility of the PV arrays and the characteristics of the landscape between, and surrounding, the view locations and the proposed development. The potential degree of visibility and resultant visual impact would be partly determined by a combination of factors including:

- Category and type of situation from which people could view the solar farm (examples of view location categories include residents or motorists);
- Visual sensitivity of view locations surrounding the solar farm;
- Potential number of people with a view toward the proposed solar farm from any one location;
- Distance between view locations and the solar farm; and
- Duration of time people could view the solar farm from any particular static or dynamic view location.

An underpinning rationale for this visual assessment is that if people are not normally present at a particular location, such as agricultural areas, or they are screened by landform or vegetation, then there is likely to be no visual impact at that location.

If, on the other hand, a small number of people are present for a short period of time at a particular location then there is likely to be a low visual impact at that location, and conversely, if a large number of people are present then the visual impact is likely to be higher.

Although this rationale can be applied at a broad scale, this assessment also considers, and has determined, the potential visual impact for individual view locations that would have a higher degree of sensitivity to the solar farm development, including the potential impact on individual residential dwellings situated in the surrounding landscape. The determination of a visual impact is also subject to a number of other factors which are considered in more detail in this LVIA.

Whilst this assessment addresses a number of static elements associated with the Sapphire Solar farm, the assessment acknowledges the potential visual impact associated with solar panel glint. Potential glint and glare are assessed in a separate specialist report (Pager Power, 2017).

2.4.2 Viewpoint Selection

A desktop assessment of sensitive receptors within the study area identified a selection of public and private viewpoints that together would represent the overall visual amenity impacts of the Proposed Development. Topographic maps and aerial photographs were also used to identify the locations and categories of potential view locations that could be verified during the fieldwork component of the assessment. The desktop study also outlined the visual character of the surrounding landscape including features such as landform, elevation, landcover and the distribution of settlements.

The desktop assessment included the generation of maps showing Zones of Visual Influence (ZVI) of the Proposed Development which illustrate areas of potential visibility across the study area. ZVI's are generated using Geographic Information System (GIS) software and a Digital Elevation Model (DEM). A desktop study was carried out to identify an indicative viewshed for the Sapphire Solar farm. This was carried out by reference to 1:25,000 scale topographic maps as well as aerial photographs and satellite images of the project area and surrounding landscape. A preliminary ZVI diagram was also produced prior to the commencement of fieldwork in order to inform the likely extent and nature of areas within the nominated 5 km viewshed of the proposed solar farm.

It should be noted that ZVI's do not take into account the screening effects of local features such as subtle variations in landform, vegetation cover or existing development features. In addition, the following assumptions were made when generating the ZVI's:

- The solar array was assumed to cover the entire PV inclusion area (in reality the final design will confine the solar array to a smaller area);
- All panels were assumed to be installed at the maximum height of 3 m above the natural surface area (however, this is likely to be lower);
- The height of the battery installations is assumed to be 3 m; and
- The height of the supporting buildings is assumed to be 5 m.

Therefore, based on the limitations of ZVI modelling and the conservative assumptions underlying the model, it is considered that the ZVI represent a 'worst-case' scenario, but provides a good starting point for assessing the operational impacts of the Proposed Development.

2.4.3 Viewpoint assessment methodology

Potential viewpoints were identified based on a site inspection and reference to prior works associated with the SWF (GBD, 2011). For the sake of clarity and comparability, this report adopts the same naming conventions as used for the visual impact assessment of SWF.

The site inspection involved:

- Assessments to determine and confirm the potential extent of visibility of the SSF and ancillary structures;
- Determination and confirmation of the various view location categories and locations from which the Sapphire Solar farm and ancillary structures could potentially be visible; and
- Preparation of a record for each view location inspected and assessed.

A viewpoint analysis was prepared for all potentially impacted residences. Similar to the preparation of ZVI maps, this modelling approach uses DEM data to consider what can be seen from each assessed residence (the viewpoint). Furthermore, this approach is far more amenable to an assessment of vegetation screening, as the proximity of vegetation near to the viewpoint can significantly influence the visibility of the proposed development. Existing vegetation mapping (OEH, 2015) was incorporated into the viewpoint analysis. Viewpoint analyses for all assessed residences are provided in Appendix A.

Once all potential viewpoints were identified, the following assessment approach for each viewpoint was adopted:

- An assessment of the visual sensitivity;
- A description of the likely visual change and an assessment of the magnitude of visual change;

- An overall assessment of the potential impact;
- The identification of any mitigation measures that would reduce the visual impact identified;
- An assessment of mitigation strategies to provide a final assessment of potential residual effects of the Proposed Development, using the same criteria outlined above.

Finally, a composite viewpoint heatmap was produced for the Site. This map provides information about what parts of the project area are most visible and what parts are less visible. Such mapping, provides confirmation of relative visibility at a regional scale, and provides visual guidance for opportunities to modify concept designs to further mitigate potential impacts.

Visual Sensitivity Criteria

The sensitivity in relation to visual amenity is dependent on a combination of the location, context and the importance of the viewer. The sensitivity level attributed to Visual Amenity is determined by considering the distance of a sensitive receptor from the development, the potential for views, and whether it is a public or private viewpoint. Residential viewpoints are considered more sensitive than public viewpoints. The sensitivity of visual amenity receptors are evaluated according to the five point scale provided in Table 4 and based on guidance provided in GLVIA (2013).

Table 4: Visual sensitivity criteria used for Visual Amenity

Visual Sensitivity levels	Visual Amenity
Insignificant	Residential viewpoints within 5 km with no, or very limited potential views; or Public viewpoints within 2 km with limited potential views and a low number of viewers.
Low	Residential viewpoints over 2 km away with the potential for some views; or Public viewpoints over 3 km viewed by a high number of viewers; or Public viewpoints within 1 km viewed by a low number of viewers, or by transient viewers (such as road users).
Moderate	Residential viewpoints within 1-2 km with potential for some views of the project; or Public viewpoints between 1-3 km viewed by a high number of viewers; or Public viewpoints within 1 km viewed by moderate number of viewers with potential extensive views of the Proposed Development; or by transient viewers (such as road users).
High	Residential viewpoints less than 1 km away with some views of the Proposed Development. Public viewpoints within 1 km viewed by a high number of viewers with views of the Proposed Development.
Very High	Residential viewpoints within 1 km with extensive or intrusive views of the Proposed Development; or Public viewpoints within 1 km, viewed by a high number of viewers with extensive views of the Proposed Development.

Magnitude of Change Criteria

The magnitude of visual change for visual amenity considers the degree of change, particularly with respect to changes from characteristically 'rural' views to those which contain infrastructure. The magnitude of visual change for each viewpoint is evaluated according to the five-point scale provided in Table 5.

Table 5: Magnitude of visual change definitions used for Visual Amenity

Magnitude of Visual Change	Visual Amenity
Insignificant	Minor scale of change, not significantly different in scale or type to existing views and/or landscape character.
Low	Low to moderate scale change, not significantly different in scale or type to existing views and/or landscape character.
Moderate	Moderate visual change to views as a result of landscape change and construction of infrastructure where it was previously a rural landscape.
High	High visual change to views as a result of landscape change and construction of infrastructure where it was previously a rural landscape
Very High	Significant visual change to views as a result of substantial landscape change within close proximity.

3 Context of Existing Environment

3.1 General context of the location

The Proposed Development would be located in the north of New South Wales within the New England Tablelands Renewable Energy Precinct, around 18 km west of Glen Innes and 28 km east of Inverell. The general location of the Sapphire Solar farm is illustrated in Figure 1. The landscape is undulating and of rural nature, mainly supporting agricultural enterprises, as well as sapphire mining.

Access to the development site is via unpaved local roads; Waterloo Road and Western Feeder Road. The proposed development generally lies around the intersection of Waterloo Road and Western Feeder Road, north of the Gwydir Highway between Glen Innes and Inverell. The historic “Kings Plains Castle” is located approximately 8 km to the north. The nearest national park is Kings Plains National Park, located 10 km north-west of the proposed development.

Glen Innes, a rural town located at the intersection of the New England and Gwydir Highways. Gazetted around 1852, has an estimated population of 6155 people as of the 2016 Census, residing either side of the New England Highway which passes through the centre of the town or located within the general rural district of Glen Innes. Glen Innes contains several historic and diverse built structures, which are still largely connected by the original fabric of urban development that was established following European settlement in the area. The Main North Railway once passed through Glen Innes; however, the line north of Armidale was abandoned and closed in the 1980's.

The western extent of the Sapphire Solar Farm would be located approximately 28km from Inverell, a rural town situated on the Macintyre River on the western slopes of the Northern Tablelands. With a population estimated around 11,660 people as of the 2016 Census, the Inverell district supports a diverse agricultural industry and mining for gem stones.

The Glen Innes Severn Council covers around 548,700 ha covering large tracts of the New England Tablelands, and the Inverell Shire Council area covers approximately 860,600 ha of the New England Tablelands. The footprint of the Sapphire solar farm project would therefore occupy a very small proportion of both Councils administered areas.

Views toward the Sapphire Solar Farm arrays from surrounding urban areas, including the Glen Innes and Inverell townships, would be completely screened by rising landform and vegetation. Accordingly, the development would have no impact on the immediate visual qualities of either Glen Innes or Inverell.

There are a number of National Parks within the New England Tableland region. The more significant include the Kings Plains, Gibraltar Range, Guy Fawkes River and Washpool National Parks. Through the influence of distance, landcover and topography, the Sapphire wind farm would not be visible from camping or recreational areas within any of these regional National Parks.

The closest National Park (Kings Plains National Park) is around 10 km from the closest Sapphire Solar farm array. Covering an area of just over 8,000 ha the park includes walking tracks to take in Ironbark woodlands, creeks, pools and waterfalls. Camping facilities are provided within the park; however, the distribution of dense vegetation and tree cover throughout the park tends to limit the opportunity for views toward the Sapphire Solar farm.

3.2 Landform, Geology & Soils

Landform within the Site consists of undulating hills with relatively low to medium gradients. The Site is located within an undulating landscape, where elevation ranges between 810 – 1000 m above sea level Australian Height Datum (AHD). The landscape grades gently from hillsides with granite outcroppings, to alluvial basins with moderately fertile soils. The valleys are broad and there are no cliffs, escarpments, or gorges within the Site, though some hillsides are relatively steep.

The Site lies within a geological domain that comprises a large area of tertiary basalts. The key geological unit that underlies the Site is an unnamed unit of Tertiary Basalt Flows. A small area of Texas Beds is present, in addition to areas comprising Quaternary alluvial, residual or colluvial deposits of sand, silt, clay and gravel (Geological Survey of New South Wales, 2009; ELA, 2011). These soil landscapes have an erodibility potential ranging from moderate to high. The site is dominated by Vertosols, Ferrosols and Dermosols.

3.3 Vegetation

Land within the Site and wider landholding has been historically cleared for grazing purposes and most has been sown with improved pastures. There are patches of retained native woodland scattered throughout. There are three plant community types (PCTs) that occur within the development site which are represented by three biometric vegetation types as described:

- PCT510 (BR272): Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion
- PCT921: (BR153): Manna Gum - Rough-barked Apple - Yellow Box grassy woodland/open forest of the New England Tableland Bioregion and NSW North Coast Bioregion
- PCT1383 (BR240): White Box grassy woodland of the Nandewar Bioregion and Brigalow Belt South Bioregion

3.4 Hydrology

The hydrology of the Site is typified by ephemeral first order drainage lines. Several drainage lines intersect each other upstream of the development site to form Kings Plains Creek which is classed as a third order stream (Strahler, 1952) as it passes through the eastern Development Site. Similarly, the PV inclusion area intersects only first and second order drainage lines within the Frazers Creek catchment.

Riparian areas associated with the site have been historically cleared, reducing visual amenity and landscape sensitivity. Furthermore, historic and recent sapphire mining has impacted stream form and riparian structures.

3.5 Landuse

The primary landuse within the region is mixed agriculture including sheep, goat and cattle grazing, as well as cropping. Improvement of pastures is a common practice within the region, and the majority of the Site has been visibly cultivated within the 6 months prior to assessment.

A number of sapphire mining leases exist within close proximity to the Site, including recent mining activity within parts of the Kings Plains Creek catchment.

3.6 Major Roads

South of the site the Gwydir Highway (B76) passes through scenic countryside with open vistas in places, as well as sections of densely vegetated native forest. The Gwydir Highway provides a major regional

route linking the Pacific Highway at Grafton with Bourke in far western NSW. Accordingly, the Gwydir Highway provides an important east-west link to a number of regional centres including, Grafton, Glen Innes, Inverell, Warialda, Moree, Collarenebri, Walgett, Brewarrina and Bourke.

Although daily traffic numbers in the vicinity of the Proposed Development site are estimated at 1,469 vehicles per day (TTM, 2017a), SSF is not generally not visible from the Gwydir Highway.

3.7 Minor Roads

Within the broader 5 km study area there are a number of minor roads, these include Waterloo Road, the Eastern and the Western Feeder Road, Woodstock Road and Kings Plains Road. Within the 5 km study area, all roads are unpaved, local roads that provide property access. Kings Plain National Parks is accessed via Kings Plains Road. However, public access and use of minor roads within the study area is extremely low.

3.8 Residences and Villages

Four residences are located on the project area itself, each owned by a participating host landholder. The remainder of residences within the study area comprise scattered rural residences. The nearest village is Wellingrove, located approximately 15 km north east of the proposed project area. The Wellingrove district had a population of 96 at the 2016 census.

3.9 Landscape Character

The landscape character of the Site and the wider study area is classified into two LCUs;

- (LCU1) Kings Plain Creek Valley dominated by a wide opened valley with undulating to rolling hills. The LCU is rural, with 20 dwellings scattered across the wider landscape. Due to historic clearing for agriculture, vegetation cover is generally low except along ridgetops, within road reserves, in isolated patches in paddocks and gullies and within gardens surrounding homesteads.
  In reference to Table 2, the sensitivity of LCU1 is assessed as **Low**, for it is of a type that is widespread and common in the local area and does not have any notable landscape features or attributes that set it apart. A representative image of LCU1 is shown in Figure 5.

- LCU2 is the Frazers Creek Valley part of the study area (which also includes Horse Gully, Mary Anne Creek and Apple Tree Gully) which lies to the west of Waterloo Road. This LCU is more open than the Kings Plains Creek Valley with open, sub-regional vistas and more dramatic hills and ranges including White Hill, Kings Hill and Swan Peak. This area has been more extensively cleared and incorporates considerable areas of cropping and improved pasture, as well as active sapphire mining leases. Woody native vegetation persists on hill tops and in areas of lower soil fertility.
  In reference to Table 2, the sensitivity of LCU2 is also assessed as **Low**. A representative image of LCU1 is shown in Figure 6.

Figure 3: Typical views of LCU1, showing rolling rural landscape and cleared vegetation from Eastern Feeder Road across Kings Plain Creek valley.

Figure 4: Typical views of LCU2 viewed from Waterloo Road looking north east.

3.10 General Visibility

The Proposed Development site has a relatively confined area of visibility due to topography and areas of remaining woody vegetation. Solar farms generally seek out relatively flat areas associated with valley floors and foothills. The site is generally most visible from elevated areas to the North East and to the west of the development area. Views from these locations are generally buffered by distance and vegetation screening.

The Proposed Development site has approximately 3 km of direct road frontage to Waterloo Road and the Western Feeder Road. Topography and vegetation in adjoining public areas naturally obscures potential views of the development site. Distant views and glimpses of the site are possible from Waterloo Road, Western Feeder Road, Eastern Feeder Road, Woodstock Road and Kings Plains Road. All roads within the study area are unpaved and, outside of construction periods, subject only to low volumes of local traffic.

4 Visual Impact Assessment

4.1 Landscape character impact assessment

The landscape impact assessment considers the direct and indirect impacts of the Proposed Development on LCUs associated with the Site. In this case, due to the contained nature of landscape in which the Proposed Development is located, this assessment considers potential impacts on two landscape character units (LCU1 and LCU2) identified within the 2 km study area (Section 4.9).

An assessment, taking into account the relationship between 'visual sensitivity' (the ability of a landscape character area to absorb a development) and the 'magnitude of visual change' is used to determine the potential impact of the Proposed Development on each LCU.

4.1.1 Landscape Character Unit 1 (LCU1)

The visual sensitivity of LCU1 has been assessed as **low** (as described in Section 4.9), for although it is an attractive rural landscape, it is of a type and scale that is widespread in the local area and which does not display particular defining qualities of note. LCU1 is not covered by a designated landscape classification such as a State Forest, National Park or a World Heritage Area.

The magnitude of visual change to LCU1 during the construction and operation of the Proposed Development is considered to be **moderate**, as the introduction of a commercial-scale solar farm involves a moderate scale land form change and vegetation clearing in an landscape already impacted by intensive agriculture and mining (Table 3).

It should be noted, that due to the location of the Proposed Development, within an undulating landscape, it is never possible to view the solar farm in its entirety. In addition, the magnitude of visual change decreases with distance from the site, as shielding from the topography of the landscape and vegetation interact to reduce views of the Proposed Development, such that, it is no longer the defining feature.

Based on these findings, and with reference to Table 1, the overall impact on the landscape character within LCU1 is assessed as **low**.

Following decommissioning, all above-ground infrastructure would be removed and the site would be returned to agricultural production. Thereafter, the magnitude of visual change is considered to be **insignificant** due to the very minor residual changes to landform and vegetation that would remain (such as access tracks, and site drainage).

4.1.2 Landscape Character Unit 2 (LCU2)

The visual sensitivity of LCU2 is assessed as **low** (section 4.9), although it comprises sweeping views and interesting topography it is highly disturbed, has been extensively cleared of native vegetation and subject to a range of heterogeneous land uses including cropping, grazing and sapphire mining. LCU2 is not covered by a designated landscape classification such as a State Forest, National Park or a World Heritage Area.

For the same reasons as for LCU1, the magnitude of visual change to LCU2 during the construction and operation is considered to be **moderate** (Table 3). Similarly, there will also be relatively minor changes to vegetation cover and landform as a consequence of the development although the site chosen for the PV arrays has a history of cropping and soil conservation activities including the construction of contour banks. The overall impact on the landscape character within LCU2 is assessed as **low** (Table 1).

Following decommissioning, all above-ground infrastructure would be removed and the site would be returned to agricultural production, resulting in an **insignificant** visual change due to residual changes to landform.

4.2 Visual Amenity Impact Assessment: Viewshed Analysis

4.2.1 Viewshed analysis

ZVI mapping has been generated to understand the potential extent of the visibility of the Proposed Development within the study area (5 km). The ZVI for the PV Inclusion Area, Battery Facility Option and Compound Option Areas are presented in Figure 7.

The ZVI clearly illustrates that, despite the relatively large scale of the Proposed Development, theoretical visibility is limited by the undulating topography that characterises the landscape within which it sits. The landscape's ability to contain the visual influence of the development is a key factor in the selection of the site. Within the study area, the main extent of visibility is to the north east and west of the proposed development.

ZVI analysis indicates that development within the Kings Plain Creek catchment is predominantly visually independent from development within the Frazers Creek catchment, and *vice versa*. Accordingly, impacted viewpoints associated with Kings Plains Creek catchment are to the north and east, while visual impacts associated with Frazers Creek catchment occur to the west of the site.

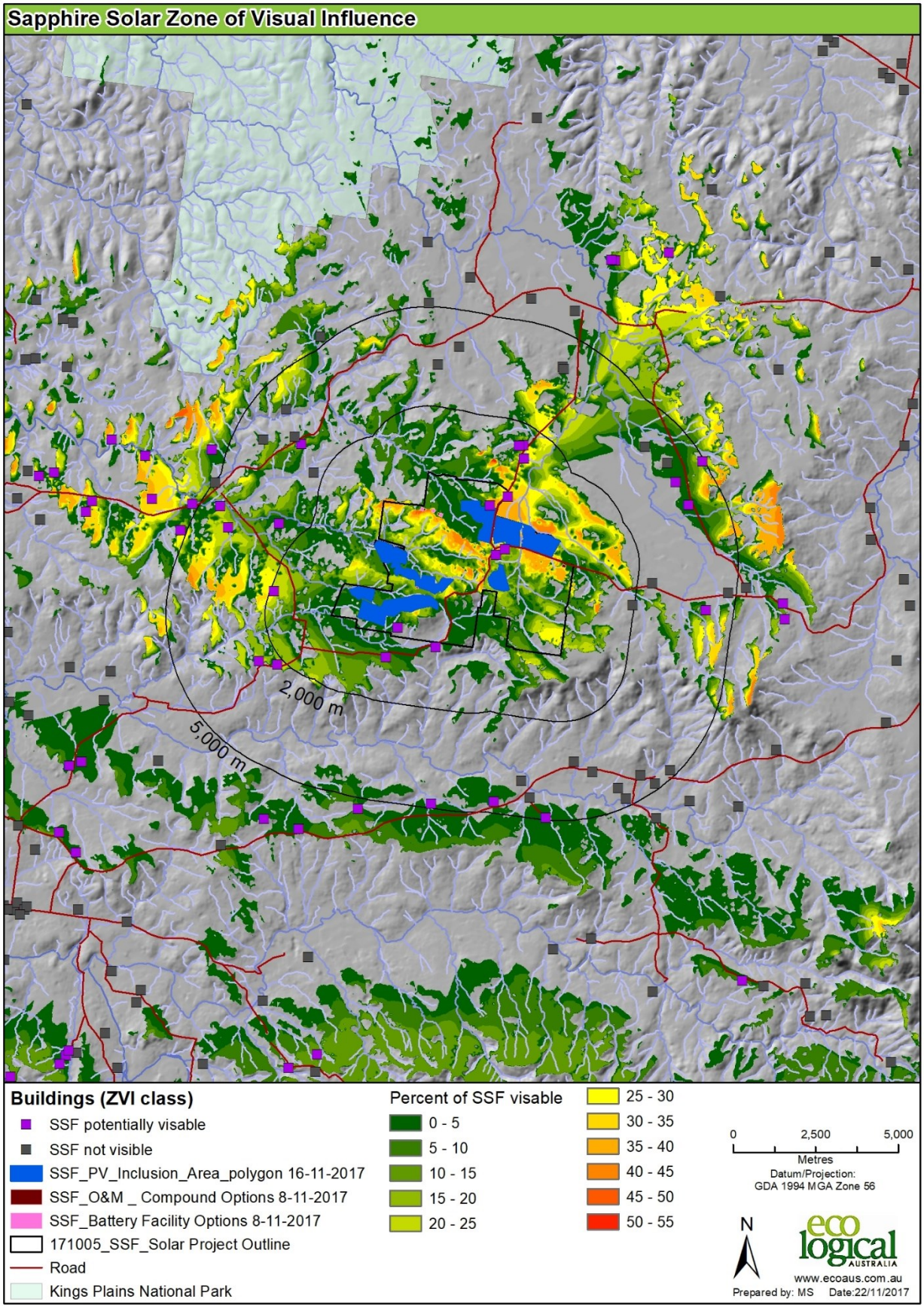

Figure 5: ZVI model indicating Development Footprint visibility at a sub-regional level.

4.3 Visual Amenity Impact Assessment: Viewpoints

Residential Viewpoints

Desktop spatial assessment identified 47 residences and/or potential dwellings within 5 km of the project area footprint. ZVI analysis indicates that the proposed development is potentially visible from 24 of these locations (Figure 8).

Four (associated) residences were located within the project area itself, each owned by a host landholder. A further two residences outside of the project area were also owned by host landholders and one property is owned by Sapphire Wind Farm. While visual amenity at associated residences may be impacted by the development, impacts to associated residences, and other residences owned by the host, are not considered further.

ZVI analysis indicates that the proposed solar farm is visible to six non-associated residences located within 2 km from the project area, and a further 11 non-associated residences located between 2 and 5 km. During field investigations, it was confirmed that due to the mitigating effect of distance, combined with topography and vegetation, visual impacts beyond 5 km are considered to be negligible, and are not considered further.

Public Viewpoints

Public viewpoints within 5 km of the project area are restricted to public roads. During field investigations it was confirmed that the project would be potentially visible from the following roads:

- Waterloo Road;
- Western Feeder Road;
- Woodstock Road;
- Eastern Feeder Road;
- Kings Plains Road; and
- Gwydir Highway.

While it may be possible to catch glimpses of the solar array from other roads beyond 5 km from the project area, such glimpses are considered to be insignificant.

Table 6 below, describes the viewpoints selected for assessment, the potential visibility of the Proposed Development from each viewpoint and the assessed visual sensitivity.

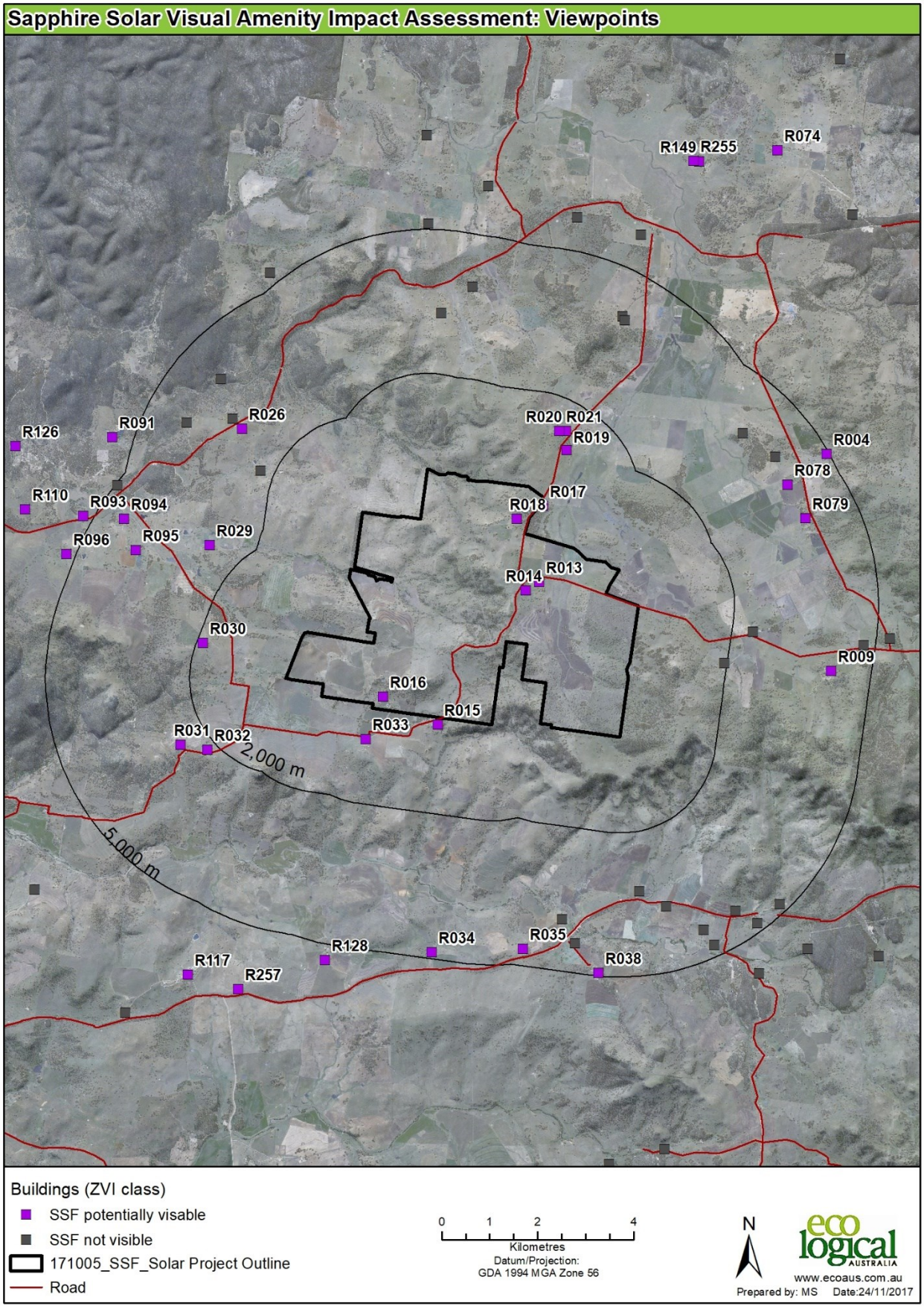

Figure 6: Key Public and Private Viewpoints selected for visual amenity impact assessment.

Table 6: Overview of viewpoints selected for assessment

Viewpoint	Distance from Project Area	Viewpoint description and potential visibility of the Proposed Development	Viewpoint sensitivity assessment
R017	75 m	• Inhabited residence in Kings Plains Creek catchment. • Potential views to the South East through to South West of PV array areas located north of Waterloo Road and West of the Western Feeder Road, as well as the operations and maintenance compound. • Views of up to 36% of total PV array area.	This residence is the closest non-associated residence and has the most significant potential views of the proposed development. However, this is completely screened by existing woody vegetation located on the residences property. Distance to PV inclusion area – 490 m Viewpoint sensitivity – **Insignificant**
R015	154 m	• Inhabited residence located to the South East of the Frazers Creek catchment PV array. • Negligible views of less than 1% of PV array area.	Despite close proximity to the project area, this residence is roughly 1 km from the nearest solar arrays and potential views are shielded by topography and vegetation. Distance to PV inclusion area – 1,140 m Viewpoint sensitivity – **Insignificant**
R019	1,073 m	• Inhabited residence in Kings Plains Creek catchment. • Potential views to the South of PV array areas located within Kings Plains Creek catchment, as well as the operations and maintenance compound. • Views of up to 25% of total PV array area.	Existing vegetation partially screens potential view, almost eliminating visibility of PV arrays west of the Western Feeder Road and significantly reducing visibility of arrays north of Waterloo Road. Distance to PV inclusion area – 1,730 m Viewpoint sensitivity – **Moderate**
R21	1,316 m	• Non-Inhabited residence in Kings Plains Creek catchment. • Potential views to the South of PV array areas of located north of Waterloo Road as well as the operations and maintenance compound. • Views of up to 2% of total PV array area.	Existing vegetation screening is effective, eliminating potential views of the PV array. Views of the operations and maintenance compound are likely screened by R019. Distance to PV inclusion area – 2,020 m Viewpoint sensitivity – **Insignificant**

Viewpoint	Distance from Project Area	Viewpoint description and potential visibility of the Proposed Development	Viewpoint sensitivity assessment
R020	1,394 m	• Inhabited residence in Kings Plains Creek catchment. • Potential views to the South of PV array areas located within Kings Plains Creek catchment, as well as the operations and maintenance compound. • Views of up to 6% of total PV array area.	Existing vegetation screening is effective, eliminating potential views of the PV array and the operations and maintenance compound. Distance to PV inclusion area – 2,080 m Viewpoint sensitivity – **Insignificant**
R030	1,873 m	• Non-inhabited residence located to the West of the Frazers Creek catchment PV array. • Dispersed views of southern Frazers Creek PV array area and potentially Battery Facilities. • Views of up to 27% of PV array area.	Due to topography and limited vegetation between R030 and the PV array, existing vegetation has limited effect in screening views of the PV array and Battery Facilities within the Frazers Creek catchment area. Distant glimpses of the north western extent of Kings Plains Creek solar array area may also be possible. Distance to PV inclusion area – 2,650 m Viewpoint sensitivity – **Low**
R032	2,207 m	• Inhabited residence located to the South West of the Frazers Creek catchment PV array. • Dispersed views of southern Frazers Creek PV array area and potentially Battery Facilities. • Views of up to 21% of PV array area.	Existing residential plantings between R032 and the PV array provides effective screening of the PV array and Battery Facilities within the Frazers Creek catchment area. Distance to PV inclusion area – 2,850 m Viewpoint sensitivity – **Insignificant**
R031	2,592 m	• Derelict residence located to the South West of the Frazers Creek catchment PV array. • Dispersed views of southern Frazers Creek PV array area and potentially Battery Facilities. • Views of up to 21% of PV array area.	Similar to R032, however derelict nature of residence negates potential impact. Distance to PV inclusion area – 3,300 m Viewpoint sensitivity – **Insignificant**

Viewpoint	Distance from Project Area	Viewpoint description and potential visibility of the Proposed Development	Viewpoint sensitivity assessment
R029	2,685 m	• Inhabited residence located to the North West of the Frazers Creek catchment PV array. • Negligible views of less than 1% of PV array area and potential Battery facilities.	The effects of topography and existing vegetation negate potential impacts from this viewpoint. Distance to PV inclusion area – 2,990 m Viewpoint sensitivity – **Insignificant**
R095	3,894 m	• Unknown tenancy • Located west of Frazer Creek catchment PV array • Potential distant views of Frazers Creek and western-most extent of Kings Plains PV array • Potential views of up to 21% of PV array area.	Existing vegetation has limited effect in screening views from R095, with potential but distant views of PV arrays in both the Frazers Creek and Kings Plains Creek catchment areas. Distance to PV inclusion area – 4,470 m Viewpoint sensitivity – **Insignificant**
R078	3,930 m	• Inhabited residence in Kings Plains Creek catchment. • Negligible views to South West of less than 1% of total PV array area.	Existing vegetation completely mitigates potential views. Distance to PV inclusion area – 3,930 m Viewpoint sensitivity – **insignificant**
R009	4,168 m	• Inhabited residence in Kings Plains Creek catchment. • Potential views to the West of PV array areas located East and West of the Western Feeder Road as well as operations and maintenance compound on Waterloo Road. • Views of up to 12% of total PV array area.	Potential views mitigated by distance, however distant glimpses remain. Distance to PV inclusion area – 4,890 m Viewpoint sensitivity – **Insignificant**
R094	4,431 m	• Derelict residence located to the West of the Frazers Creek catchment PV array. • Distant views of southern Frazers Creek PV array area. • Potential views of 23% of PV array area.	Existing vegetation completely mitigates potential views. Distance to PV inclusion area – 4,830 m Viewpoint sensitivity – **insignificant**

Viewpoint	Distance from Project Area	Viewpoint description and potential visibility of the Proposed Development	Viewpoint sensitivity assessment
R035	4,649 m	• Located South East of the Frazers Creek catchment PV array • Distant glimpses may be possible of the Frazer Creek catchment PV array. • Potential views of up to 2% of PV array area.	Potential views mitigated by distance, however distant glimpses remain. Distance to PV inclusion area – 6,320 m Viewpoint sensitivity – **Insignificant**
R034	4,867 m	• Located South of the Frazers Creek catchment PV array • Negligible glimpses may be possible of the Frazer Creek catchment PV array. • Potential views of less than 1% of PV array area.	Potential views completely mitigated by distance and vegetation. Distance to PV inclusion area – 5,580 m Viewpoint sensitivity – **Insignificant**
R038	4,936 m	• Located South East of the Frazers Creek catchment PV array • Distant glimpses may be possible of the Frazer Creek catchment PV array. • Potential views of up to 3% of PV array area.	Potential views mitigated by distance, however distant glimpses remain. Distance to PV inclusion area – 6,700 m Viewpoint sensitivity – **Insignificant**
R004	4,950 m	• Inhabited residence in Kings Plains Creek catchment. • Potential views to the South West of PV array areas located West of the Western Feeder Road and the South of Waterloo Road, as well as the construction compound on Waterloo Road. • Views of up to 17% of total PV array area.	Potential views mitigated by distance, however distant glimpses remain. Distance to PV inclusion area – 4,950 m Viewpoint sensitivity – **Insignificant**
A1 – Gwydir Highway	5,600 m	• Distant glimpses may be possible from higher points of Gwydir Highway to southern most extent of Frazer Creek catchment arrays.	• Number of viewers – High • Road length within 5 km with potential views – 100 m • Period of view – Short term • Viewpoint sensitivity – **Insignificant**
A2 – Kings Plains Road	3,700 m	• Distant glimpses may be possible from higher points of Kings Plains Road to western most extent of Frazers Creek catchment arrays.	• Number of viewers – Low • Road length within 5 km with potential views – 2656 m • Period of view – Short term

Viewpoint	Distance from Project Area	Viewpoint description and potential visibility of the Proposed Development	Viewpoint sensitivity assessment
			• Viewpoint sensitivity - **Insignificant**
A6 – Waterloo Road	0 m	• Passes immediately between PV array areas in Kings Plains Creek catchment. • Passes Operations and Maintenance compound. • Proximate views of PV array in Frazers Creek catchment.	• Number of viewers – Low • Road length within 5 km with potential views – 11,400 m • Period of view – Short term • Viewpoint sensitivity - **Low**
A7 – Woodstock Road	1,600 m	• Proximate views of PV array in Frazers Creek catchment.	• Number of viewers – Low • Road length within 5 km with potential views – 6,634 m • Period of view – Short term • Viewpoint sensitivity – **Insignificant**
A8 – Western Feeder	0 m	• Passes immediately between PV array areas in Kings Plains Creek catchment.	• Number of viewers – Low • Road length within 5 km with potential views – 5,115 m • Period of view – Short term • Viewpoint sensitivity - **Low**
A9 – Eastern Feeder Road	4,100 m	• Distant glimpses may be possible from higher points of Eastern Feeder Road to Kings Plains Creek catchment arrays.	• Number of viewers – Low • Road length within 5 km with potential views – 4, 567 m • Period of view – Short term • Viewpoint sensitivity - **Insignificant**

The observer point analysis heatmap (Figure 7) indicates that the PV inclusion area is well located with generally low levels of visibility to residences located within 5 km of the project area. Similarly, the proposed Battery and Compound Facilities are located in areas of low visibility. The impact of existing vegetation (OEH, 2015) has been considered in the heatmap (Figure 9) and further modelling could be undertaken to guide the establishment of any vegetation screens required. Visibility from public roads, where required, may be mitigated with strategic plantings and/or the retention and enhancement of existing roadside vegetation within the road corridor.

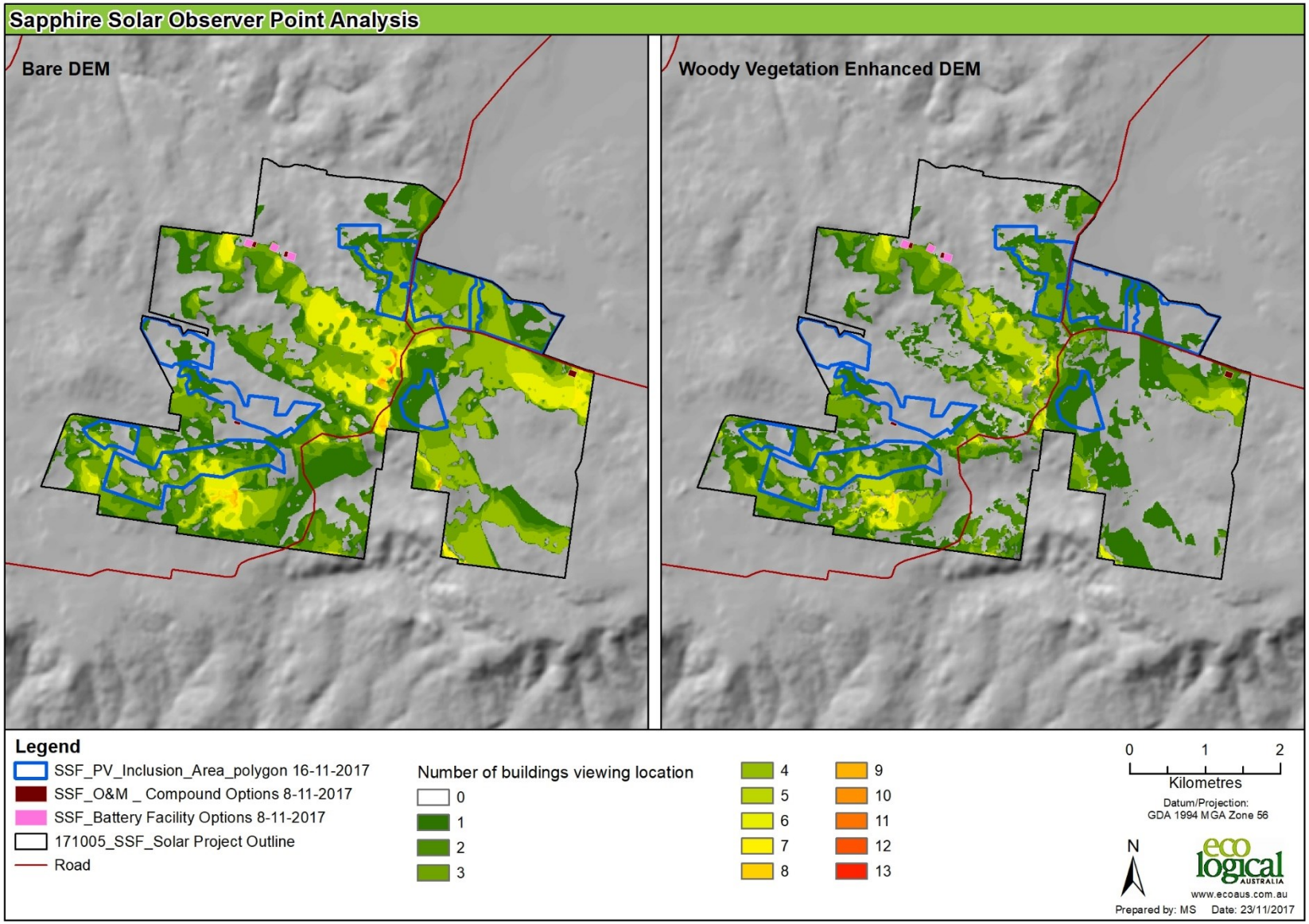

Figure 7. Observer point analysis heatmap (with and without vegetation) for residences within 5 km of the proposed development.

4.4 Impact Assessment for each Viewpoint

Table 7 summarises the predicted visual amenity impacts at key public and private viewpoints and recommended mitigation strategies.

Table 7: Summary of impacts to visual amenity and recommended mitigation strategies

Viewpoint	Approximate distance	Visual sensitivity	Magnitude of visual change	Visual Amenity impact	Recommended Mitigation
R017	75 m	Insignificant	Insignificant	Insignificant	Nil
R015	154 m	Insignificant	Insignificant	Insignificant	Nil
R019	1,073 m	Moderate	Low	Low	Consider viewpoint vegetation screening
R21	1,316 m	Insignificant	Insignificant	Insignificant	Nil
R020	1,394 m	Insignificant	Insignificant	Insignificant	Nil
R030	1,873 m	Low	Low	Low	Consider viewpoint vegetation screening
R032	2,207 m	Insignificant	Insignificant	Insignificant	Nil
R031	2,592 m	Insignificant	Insignificant	Insignificant	Nil
R029	2,685 m	Insignificant	Insignificant	Insignificant	Nil
R095	3,894 m	Insignificant	Insignificant	Insignificant	Nil
R078	3,931 m	Insignificant	Insignificant	Insignificant	Nil
R009	4168 m	Insignificant	Insignificant	Insignificant	Nil
R094	4,431 m	Insignificant	Insignificant	Insignificant	Nil
R035	4,649 m	Insignificant	Insignificant	Insignificant	Nil
R034	4,867 m	Insignificant	Insignificant	Insignificant	Nil
R038	4,936 m	Insignificant	Insignificant	Insignificant	Nil
R004	4,950 m	Insignificant	Insignificant	Insignificant	Nil
A1 – Gwydir Highway	5,600 m	Insignificant	Insignificant	Insignificant	Nil
A2 – Kings Plains Road	3,700 m	Insignificant	Insignificant	Insignificant	Nil
A6 – Waterloo Road	0 m	Low	Moderate	Low	Assess visibility post construction in consultation with Inverell Shire Council
A7 – Woodstock Road	1,600 m	Insignificant	Insignificant	Insignificant	Nil

Viewpoint	Approximate distance	Visual sensitivity	Magnitude of visual change	Visual Amenity impact	Recommended Mitigation
A8 – Western Feeder	0 m	Low	Moderate	Low	Nil
A9 – Eastern Feeder Road	4,100 m	Insignificant	Insignificant	Insignificant	Nil

4.5 Other considerations

4.5.1 Night lighting

There is no requirement to light the solar farm at night. The only facilities with provisions for night lighting will be associated with the operations and maintenance compound. Lighting at this location will be predominantly on-demand only. Observer point analysis indicates that the compound is visible from a small number of potential sensitive receivers (Appendix A). As such, it is recommended that night lighting be developed to minimise light spill and that vegetative screenings be established as an additional mitigation, if required.

4.5.2 Glint, glare and reflections

When the sun is reflected off a smooth surface, it can result in a glint (a quick reflection) or glare (longer reflection). In both cases, the intensity of light will depend upon the reflectiveness of the surface from which the sun is being reflected.

Solar farms are not considered to be reflective, since PV panels are designed to absorb as much sunlight as possible and convert it into electricity. Solar panels feature low-iron glass that is designed to minimise reflection and maximise the transmission of light through the glass. Low-iron glass reflects between 4% and 7% of light (Spaven Consulting, 2011). As part of the Capital Solar Farm visual impact assessment, it was estimated that reflectivity of a PV solar panel is similar to, though slightly lower than levels of reflectivity of grasslands, crops and forested areas associated with rural landscapes (NGH, 2010).

Detailed assessment of potential glint, glare and reflections is provided in Pager Power (2017).

4.5.3 Air traffic

The nearest public airports are Glen Innes Airport, located approximately 25 km east of the development site and Inverell located approximately 30 km west. However, there are a number of private rural landing strips on properties within the surrounding district. Commercial north-south flightpaths are spread across northern NSW, including within the vicinity and the Proposed Development site.

Generally speaking, concerns regarding glare from solar farms has focussed on solar facilities on, or adjacent to airfields. Spaven Consulting (2011) concluded that off-airfield ("*en route*") facilities are unlikely to present glare problems to pilots, for the following reasons:

- glare is likely to present a hazard only during critical phases of flight, especially approach and landing, the *en route* phase is not normally a critical phase;
- glare occurs almost exclusively at low angles of elevation, aircraft in the *en route* phase of flight will be at higher angles of elevation;

- pilots in the *en route* phase are already subjected to glare from a number of existing sources such as large assemblies of parked cars, major glasshouse facilities and large bodies of water, etc; and
- the pilot view from most cockpits, is severely limited in the downward direction by the aircraft structure, thus blocking the line of sight to any source of glare on the ground.

The presence of the Proposed Development is anticipated to have an insignificant visual impact on local airfields traffic. PV panels are no more reflective than areas of vegetation such as forests, crops or grasslands and far less reflective than standing water such as water in dams, rivers and lakes, all features which pilots regularly fly over or adjacent to (NGH, 2010).

Further evidence of the limited risks posed by reflections from PV panels is the increasing installation of large solar arrays within airports in order to take advantage of large open areas and high local day-time electricity demand. Australian examples include Adelaide Airport, Alice Springs Airport, Newman (WA) Airport and Ballarat Airport (Solar Choice, 2013).

Detailed assessment of potential impacts to air traffic is provided in Pager Power (2017).

4.5.4 Road traffic

As discussed above, reflectivity of solar panels is generally similar, or lower, than surrounding landscape features so would not have a visual impact on road uses. Potential glint and glare impacts to road traffic shall be further minimised through:

- Selection of muted and non-reflective construction materials; and
- Installation of security fencing and where considered appropriate in consultation with Council, screening vegetation between road users and infrastructure.

Detailed assessment of potential glint and glare impacts to road traffic is provided in Pager Power, 2017.

4.5.5 Decommissioning

At the conclusion of the operational phase of the project, all above ground infrastructure associated with the solar farm shall be removed from site and the site rehabilitated to a condition to allow the resumption of agricultural activities. As such, all visual impacts post decommissioning are considered to be insignificant.

4.6 Cumulative visual impacts

A cumulative landscape or visual impact could result from the proposed development being constructed in conjunction with other existing or proposed development, and may be either associated with, or separate to it.

The SSF is co-located with the Sapphire Wind Farm and is located within the New England Renewable Energy Precinct (Figure 8). Other renewable energy projects within the New England Renewable Energy Precinct include:

- Sapphire Wind Farm – under construction
- Glen Innes Wind Farm – approved
- White Rock Wind Farm – operational
- White Rock Solar Farm – under construction
- Sundown Solar Farm – SEARs under preparation

Cumulative impact assessment undertaken by GBD (2011) indicates that, in the absence of local mitigating factors (i.e. vegetation), following full development of these projects wind

turbines will be visible from almost all locations assessed as part the current visual impact assessment.

Wind turbines possess a very different visual presence to PV solar arrays, tending to rise above the existing landscape and to be visible over a far greater distance, whereas solar farms tend to integrate into the landscape and to be visible only within the local setting. Furthermore, wind turbines are typically located on elevated ridgelines, whereas PV arrays require flat areas generally associated with open valleys.

It is anticipated that these disparities in visual characteristics and setting will help to mitigate the potential for cumulative impacts involving SSF and nearby wind turbine generators. This impact may be further mitigated through the adoption of mitigation strategies identified in Section 7.

There are currently three commercial scale PV solar farms, in differing stages of development, proposed for the New England Renewable Energy Precinct. Both Sundown Solar Farm and White Rock Solar Farm are approximately 10 km from the proposed PV array areas identified for Sapphire Solar Farm (Figure 8).

Based on topography and separation distances it is anticipated that there is limited potential for significant views of SSF and any other solar farm development. ZVI analyses prepared as part of the Preliminary Environmental Assessment to support an application for SEARs for Sundown Solar indicate that this development will not be visible from any of the residences or public roads within 5 km of Sapphire Solar Farm.

Travellers on the Gwydir Highway may catch glimpses of several solar farms as they travel between Inverell and Glen Inness, however, these views will be of only one solar farm at any given time and of short duration. Such visual impacts to amenity will be insignificant.

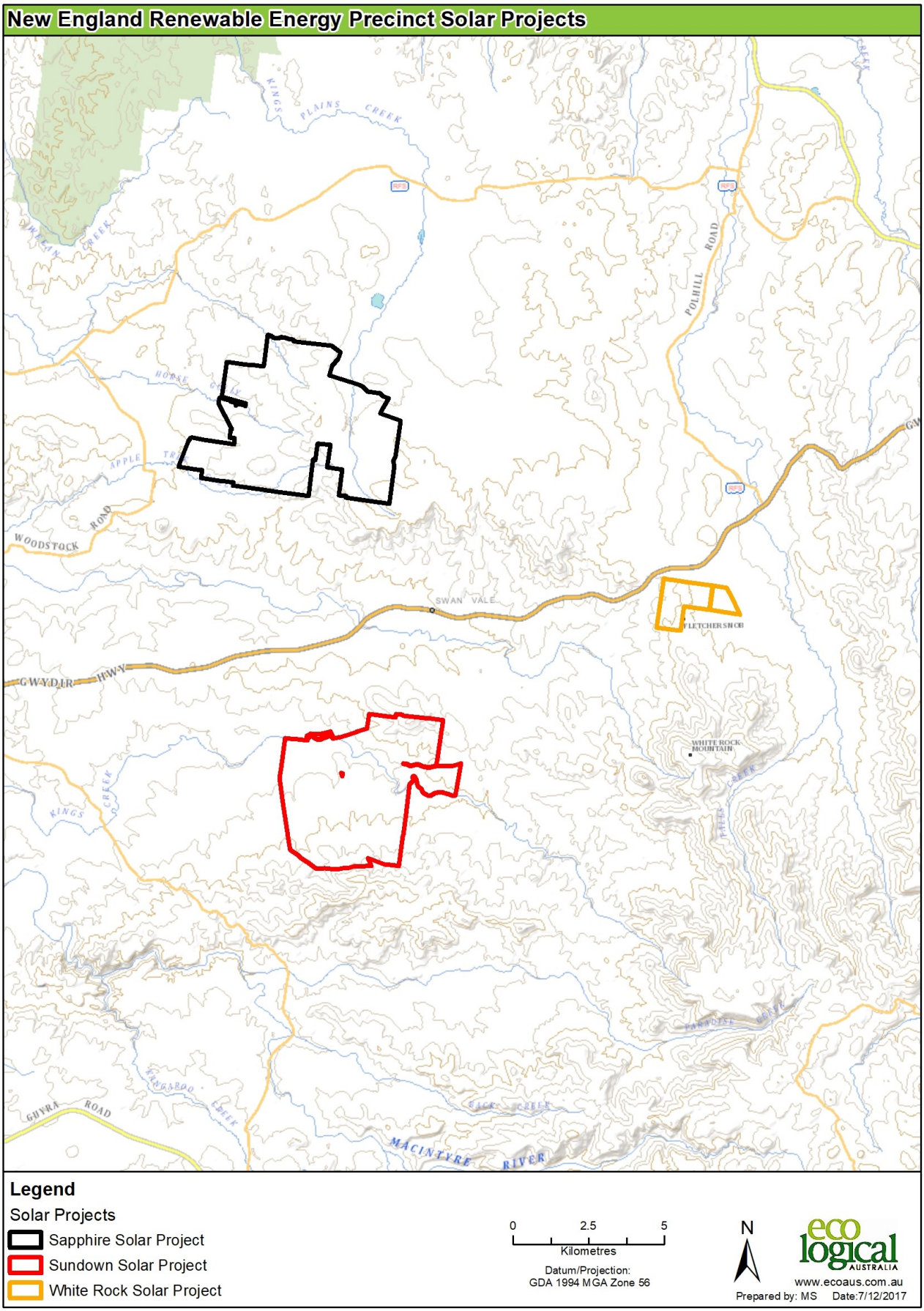

Figure 8: Renewable Energy developments in New England Tablelands Renewable Energy Precinct.

5 Mitigation Measures

5.1 Proposed Mitigation Measures

The following mitigation measures will be implemented over the life of the project:

- Minimise vegetation clearing and earthworks, and rehabilitate bare earth progressively;
- Post-construction, consult with Inverell Shire Council regarding the benefits associated with vegetation buffer to help screen views from Waterloo Road;
- Continue to consult with landholders at R019 and R030 to identify, where possible, the location of mutually agreeable vegetation screening both pre and post construction.
- In consultation with Inverell Shire Council, promote management of road corridor vegetation to allow natural regeneration of native plant species;
- Use muted, low contrast colours for infrastructure, so that they blend into the landscape as far as possible;
- Select infrastructure to minimise potential for reflectivity and glare;
- As designed, maintain locations of proposed battery facilities away from visual receptors and apply visual screening if necessary; and
- Minimise night lighting.

5.2 Draft Landscaping Plan

A draft landscaping plan has been developed in response to the findings of this assessment (Figure 9). The proposed planting area comprises a vegetation buffer along the frontage with Waterloo Road. Baseline traffic volumes along this road are very low, with the majority comprising local residents, whom have been consulted extensively regarding the proposed solar farm. As such, it is proposed that the potential benefits of such a visual screening be determined post-construction and in consultation with Inverell Shire Council in respect to visual impacts associated with Waterloo Road.

Additional observer point vegetation screening shall be developed, if requested, in consultation with impacted landholdings, R019 and R030.

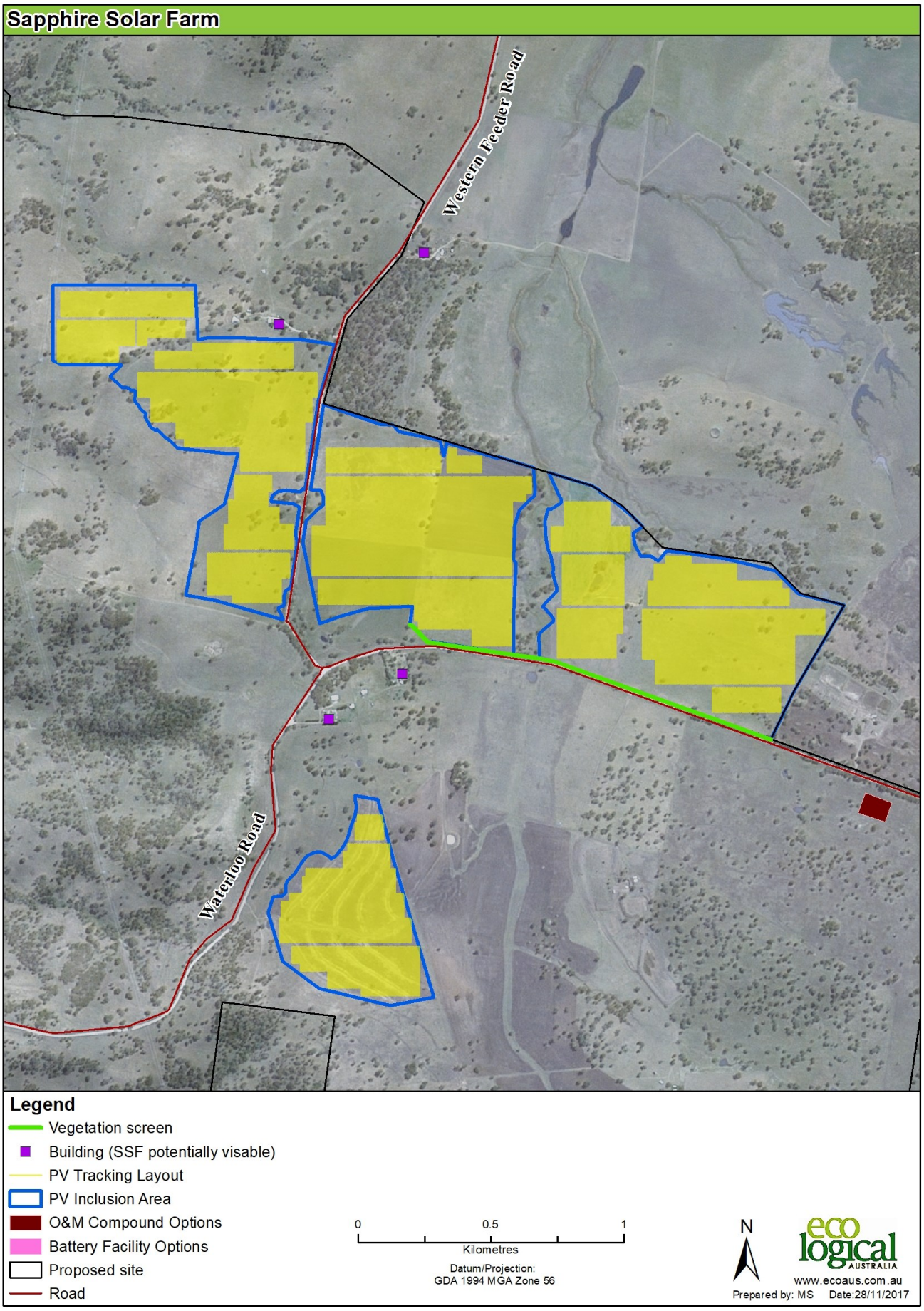

Figure 9: Draft landscaping plan for Waterloo Road

Predicted residual impacts following the introduction of mitigation measures discussed above are outlined in Table **8** below.

Table 8**: Summary of residual effects**

LCU/Viewpoint	Visual Amenity impact	Anticipated residual effect following mitigation
LCU1	Low	**Low**
LCU2	Low	**Low**
R019	Low	**Insignificant** - viewpoint vegetation screenings would effectively mitigate visual impacts
R030	Low	**Low** - viewpoint vegetation screening to reduce, but not eliminate, visual impacts
A6 – Waterloo Road	Low	**Low** - a southern boundary vegetation screen would significantly reduce visual impacts
A8 – Western Feeder	Low	**Low**

6 Conclusion

The Proposed Development requires the installation of solar panels within a potential Development Footprint area of approximately 459 ha, which is currently land used for agricultural purposes.

Solar farms do not generally result in excessive visual impacts due to their low-lying nature. Accordingly, the overall potential for impacts as a consequence of the introduction of the Proposed Development is low due to the interacting influences of:

- Design principles that move infrastructure away from public and private viewpoints;
- A location within valleys, surrounded by undulating hills;
- Screening from exiting vegetation;
- A sparsely populated setting; and
- The use of visual screening techniques as a mitigation strategy.

The objective of the visual impact assessment is to determine how the Proposed Development would impact landscape character and visual amenity at the site and within the surrounding landscape. The parameters which influence visual impacts associated with the Proposed Development include:

- The visible extent of the Proposed Development;
- The visual appearance of the solar panels and associated infrastructure;
- The sensitivity of the viewing location; and
- The sensitivity of the viewer (residential, public, permanent or transient).

The landscape at the proposed site and in the surrounding area is characterised as an undulating to rolling rural landscape. Due to historic clearing for agriculture, vegetation cover is generally low except along ridgetops, in isolated patches in gullies and along waterways and roads.

Broadly, the Proposed Development, by its very nature, would introduce a new element into a largely rural landscape. With regard to landscape character, the Proposed Development would not greatly change the underlying characteristics of the local or wider landscape, as the landscape is of a type and scale that is widespread in the local area.

Despite its large scale, the vast majority of the Proposed Development would not be visible from public or private viewpoints outside the development Site. This is largely due to the undulating topography that characterises the landscape within which it sits. Topography, vegetation cover and the absence of sensitive receptors effectively limit visual impacts.

Within the study area (5 km), the main extent of visibility are the areas immediately adjacent to the Proposed Development out to approximately 500 m, after this visibility drops away significantly. The main visual impacts occur where Waterloo Road and Western Feeder Road border the Proposed Development. Visual impacts at viewpoints beyond 2 km were assessed as low and if visible, the Proposed Development is likely to appear as a grey line or band in the background of broader landscape views.

The proponent has developed a mitigation strategy aimed at minimising potential visual impacts of the Proposed Development. This includes ongoing consultation regarding visual screening options aimed at minimising visibility from impacted landholdings and public roads.

In conclusion, the Proposed Development will generally have a low visual impact on the landscape character of the local area. The greatest visual amenity impacts would be apparent within the immediate vicinity of the development. However, these impacts can be mitigated using vegetation screening to be developed in consultation with affected landholders and Inverell Shire Council, as such, the overall visual impact of the Sapphire Solar Farm will be low.

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