Metz Solar Farm Visual Impact Assessment

Prepared for
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Abbreviations

Abbreviation	Description
DEM	Digital Elevation Model
EIA	Environmental Impact Assessment
EP&A Act	Environmental Planning and Assessment Act 1979
GIS	Geographic Information System
Ha	Hectares
kV	kilovolt
LGA	Local Government Area
MW	Megawatt
PV	Photovoltaic
SEARs	Secretary's Environmental Assessment Requirements
SSD	State Significant Development
ZTV	Zone of Theoretical Visibility

1 Introduction

Eco Logical Pty Ltd has produced this Visual Impact Assessment on behalf of Infinergy to support the development of an Environmental Impact Statement for the proposed Metz Solar Farm (the 'Proposed Development'). Its purpose is to identify and outline the existing landscape character and identify the visual amenity receptors within the study area and, as a consequence of the introduction of the Proposed Development, to assess the potential impacts. The assessment then considers how mitigation measures could be implemented to reduce the effect of any identified impacts.

The proponent has taken an adaptive approach to design in order to minimise environmental impacts. This visual impact assessment adopts a conservative approach, considering potential impacts across the entire Development Footprint area (the 'Site'), rather than considering individual components separately. Key visual components associated with the Proposed Development include:

- Installation of solar panels (the 'solar array') providing a combined output of approximately 100MW; and
- On-site substation and support buildings.

This report provides a Visual Impact Assessment for the construction and operational infrastructure associated with the proposed Metz solar farm. 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). The Secretary's Environmental Assessment Requirements (SEARs) outline the assessment requirements and are further discussed in Section 2.1.

1.1 Project overview

Infinergy Pacific Pty Ltd (Infinergy) propose to develop a utility-scale photovoltaic (PV) solar farm at Metz, 18 km east of Armidale, NSW (Figure 1, the Proposed Development). The Proposed Development would have an electricity generation capacity of approximately 100 Megawatts (MW), and would produce enough energy to power the equivalent of 40,000 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 an electrical substation, amenities and storage facilities, transformers and invertors, underground electrical cabling, telecommunications equipment and mast, vehicular access tracks and parking areas, security fencing and gates.

A thirty year land access lease has been negotiated for the life of the Proposed Development. 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 Site description

The Proposed Development is located in a sparsely populated rural setting approximately 4.5 km north west of the village of Hillgrove. Two independent residences are located adjacent to the southern boundary of the development which follows Waterfall Way for approximately 1.1 km.

The Development Footprint covers an area of 507 ha, the majority of which has been historically cleared for grazing and sown with improved pastures. A number of small *Pinus radiata* (Radiata Pine) plantations are located within the Site and there are patches of retained native woodland scattered throughout. The site slopes gently toward the south east, following Limerick Creek, and there are a number of farm dams within the Site boundary.

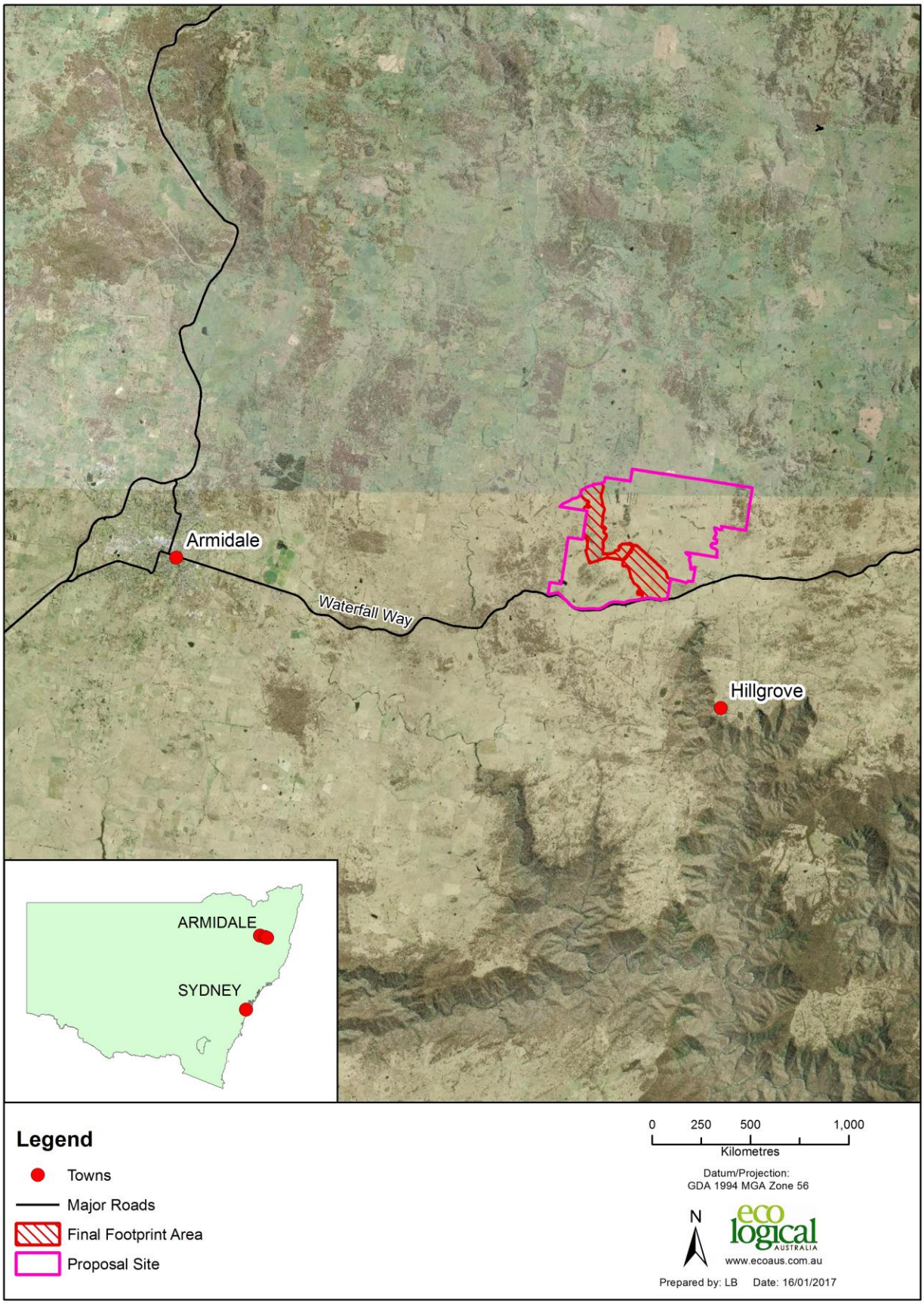

Figure 1: Location of the Proposed Development.

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).

The methodology used to assess the Visual Impacts of the proposed Clarks Gully Underground Mine, at Hillgrove Station near the intersection of Old Hillgrove Road and Waterfall Way, some 375 m south east of the proposed Site has been adopted for this assessment (Envisage Consulting Pty Ltd, 2015). This provides a standardised assessment methodology for development in the area.

The SEARs set out the assessment requirements for the Visual Impact Assessment, as follows:

"An assessment of the likely visual impacts of the development (including 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 to demonstrate it has been developed in consultation with affected landholders".

In response, 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 post decommissioning phases of the Proposed Development.

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 - takes into account a much wider area that considers affected viewers within and beyond the Proposed Development area.

Thus, the two identified assessment areas for the visual impact assessment are defined as follows (Figure 2):

- Landscape character assessment area – covers the Proposed Development area and its surrounds out to a distance of 2 km. Due to the undulating nature of the landscape, the single character type that defines the area and its widespread nature (discussed below), landscape character impacts beyond this distance would be limited; and
- Visual amenity assessment area – focuses on an area out to 5 km from the Site, 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 1 km of the Proposed Development, where any visual change and potential impacts are of most concern, along with mid-ground or subregional views.

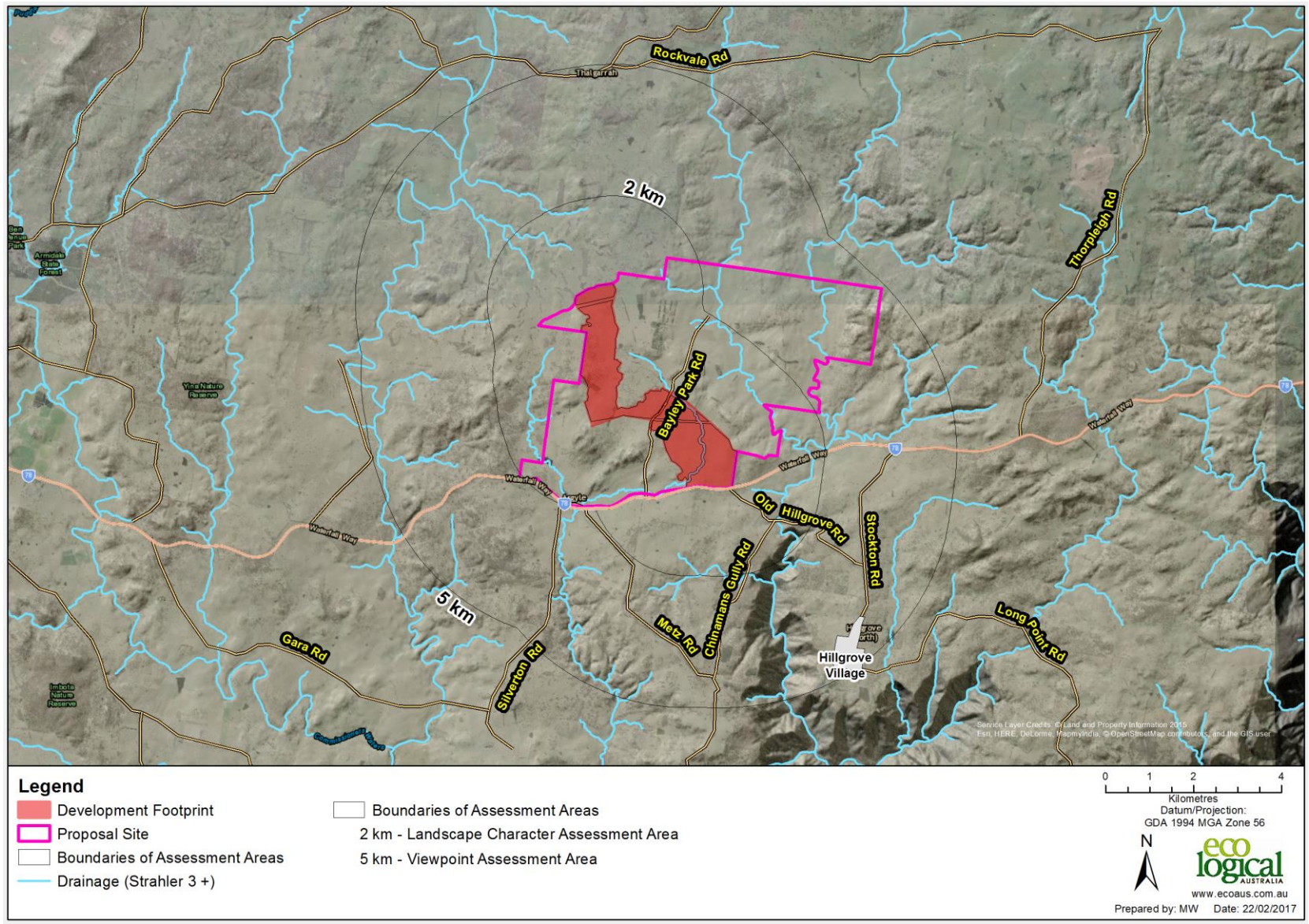

Figure 2: Study areas and wider site context.

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, landuse, 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 '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 are 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 Proposed Development. 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 (adopted from Envisage, 2015)

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

Landscape Character Areas are assessed for their 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 or 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) with reference to the criteria used to assess the proposed Clarks Gully Mine adjacent to the site (Envisage, 2015).

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 a 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.

**Criteria adapted from the Clarks Gully EIA (Envisage 2015).*

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 Proposed Development 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.

**Criteria adapted from the Clarks Gully EIA (Envisage 2015).*

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 to determine the level of impact is summarised in the visual impact assessment matrix presented in Table 1.

2.4.1 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. The desktop assessment included the generation of maps showing Zones of Theoretical Visibility (ZTV) of the Proposed Development which illustrate areas of potential visibility across the study area. ZTV's are generated using GIS software and landform data (Digital Elevation Data (DEM)). It should be noted that ZTV'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 ZTV's:

- The solar array was assumed to cover the entire Site 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); and
- The height of the substation and all supporting buildings is assumed to be 8m (the maximum height).

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

2.4.2 Viewpoint assessment methodology

Once the representative 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; and then
- An assessment of mitigation strategies to provide a final assessment of potential residual effects of the Proposed Development, using the same criteria outlined above.

In addition to this, ZTVs (as described above) were also generated at the most affected viewpoints to determine which parts of the Proposed Development would be visible from these viewpoints, A site visit then identified any intervening variations in landform or vegetation that would screen or obscure those views.

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. The criteria used are based on guidance provided in GLVIA (2013) with

reference to the criteria used to assess the proposed Clarks Gully Mine adjacent to the site (Envisage, 2015).

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.

Criteria adapted from the Clarks Gully EIA (Envisage, 2015).

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. The criteria used are based on the based on guidance provided in GLVIA (2013) with reference to the criteria used to assess the proposed Clarks Gully Mine adjacent to the site (Envisage, 2015).

Table 5: Magnitude of visual change definitions used for Landscape Character and 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.

Magnitude of Visual Change	Visual Amenity
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.

**Criteria adapted from the Clarks Gully EIA (Envisage, 2015).*

3 Project Description

The Proposed development would comprise of approximately 400,000 individual solar panels with a combined generation capacity of aproximately100 MW.

The solar panels would be fitted to either or a combination of:

- Fixed tilt frames which would be orientated so the panels face upwards at approximately 25 to 30^0 in a north, north west or north easterly direction; or
- A single-axis tracking system which would track the sun from east to west as it moves throughout the day.

The solar array will be supported by approximately 50,000 piles which would be mechanically driven or screwed into the ground. Figure 3 and Figure 4 illustrate an operational fixed array solar farm and an operational tracking solar farm respectively. The solar array would be wired in 'blocks' that would be connected to inverters (the approximate size of a shipping container, Figure 3) located throughout the Proposed Development. Blocks would not necessarily appear as discrete entities but would appear as a series of continuous rows.

Other visible elements of the Proposed Development would include:

- Onsite access tracks;
- Substation (connects the Proposed Development to the national electricity grid);
- Onsite above ground cabling and electrical connections;
- Support buildings alongside the substation including communications equipment and tower;
- Perimeter fence (approximately 2.5 m high);
- Vegetation buffers for screening;
- Temporary construction compound; and
- Firebreaks.

The final location of the elements listed above will be determined during a detailed post consent design process. An indicative layout for the Proposed Development is provided in Figure 5.

The rows of solar panels (the 'solar array') at a maximum height of 3 m would be the most visible component of the Proposed Development. The inverters, while visible throughout the development would be located, as far as possible away from the southern edge of the array to minimise visibility from outside the solar farm. The substation and support buildings (up to 8 m high) have also been carefully located to take advantage of the Sites topography, vegetation and distance to sensitive receptors to ensure visibility is minimised.

As the final design will not be determined until post consent, the Development Footprint (as defined by the red line boundary illustrated in Figure 5) will be used as the assessment area. By adopting this approach, the assessment assumes that the whole area would be utilised by the Proposed Development. While this is unlikely as the indicative layout provided in Figure 5 illustrates, it represents a worst case scenario in line with Environmental Impact Assessment (EIA) principles and reduces the likelihood of needing to seek modification approvals for minor layout changes.

Figure 3: Fully assembled fixed array solar farm (image supplied by Infinergy UK).

Figure 4: Fully assembled tracking array solar farm showing inverter housing (image courtesy Nextracker Australia, actual system may differ).

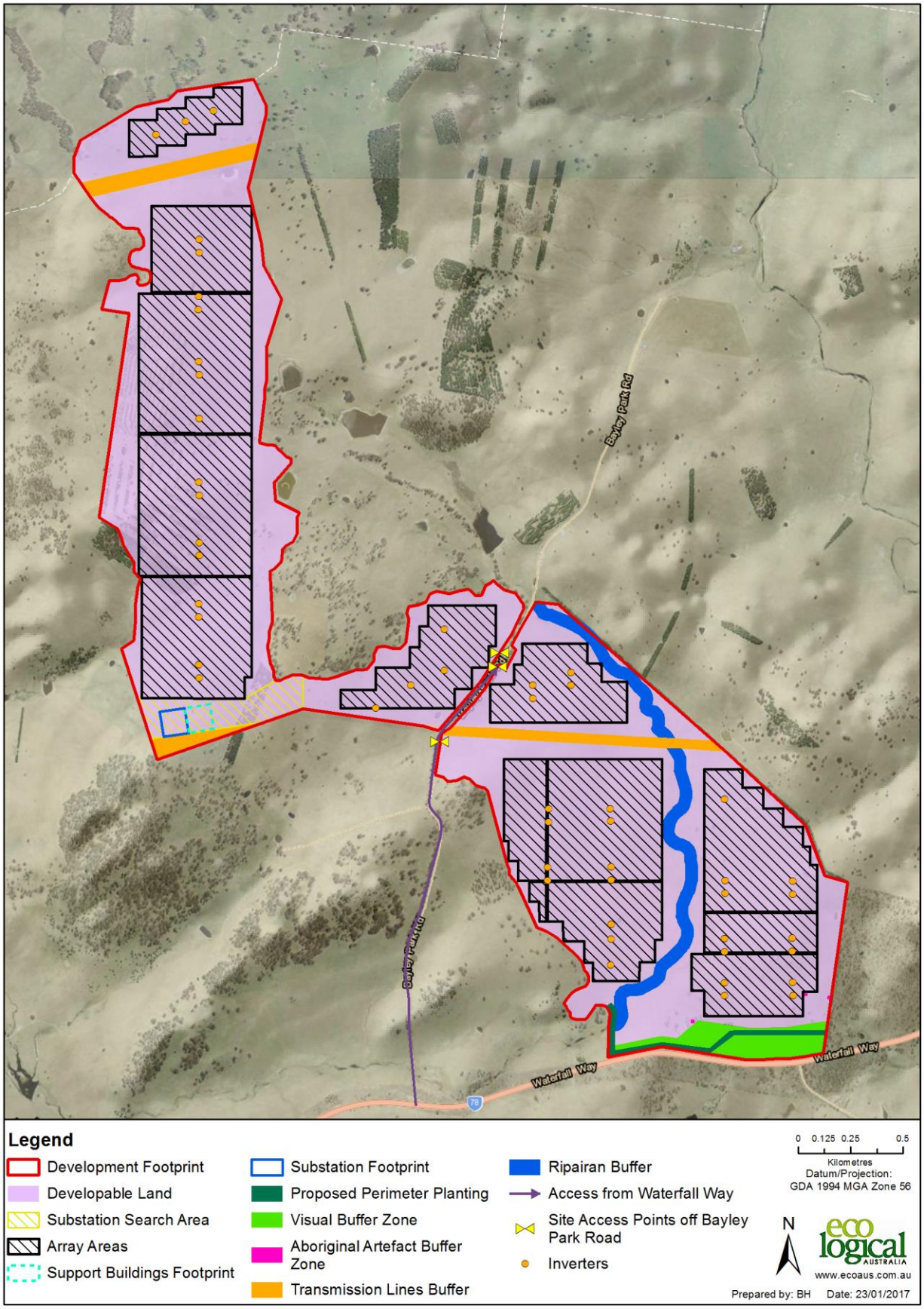

Figure 5: Indicative concept design and Development Footprint.

4 Context of Existing Environment

4.1 General context of the location

The Proposed Development lies adjacent to Waterfall Way, a state highway that joins the Pacific Highway on the NSW North Coast to the New England Highway in Armidale. The landscape is undulating and of rural nature, mainly supporting agricultural enterprises. Access to the development site is via Bayley Park Road, an unpaved, no through local road that provides property access to the landholding. Close by is Bakers Creek Gorge and Bakers Creek Falls, with the main lookout located approximately 1.8 km from the development site along Old Hillgrove Road. The historic village of Hillgrove is located approximately 4.5 km to the south east. The nearest national park is Oxley Wild Rivers National Park, located 11 km downstream of Bakers Creek Falls.

4.2 Landform, Geology & Soils

Landform within the Site consists of undulating hills with a relatively low gradient. The majority of the development site occurs at elevations between 990 to 1090 m above sea level. The landscape grades gently from hillsides with granite outcroppings, to alluvial basins with moderately fertile soils. The valleys are broad. There are no cliffs, escarpments, or gorges within the Site, but such features are located within close vicinity.

The Geology of the Site consists of fine grained Permo-Carboniferous sedimentary rocks, granites and multiple Tertiary basalt flows. Soils across the development site contrast on sedimentary rocks and granite, mellow (soft and friable) and well drained on upper slopes, to harsh and poorly drained on lower slopes. Variable stony loams to deep black earths occur over basalt in valley floors.

4.3 Vegetation

Land within the Site and wider landholding has been historically cleared for grazing purposes and most has been sown with improved pastures. A number of small *Pinus radiata* (Radiata Pine) plantations are located within the proposed Site and there are patches of retained native woodland scattered throughout.

Regionally, cold air drainage influence inverts the tree patterns in wide valleys. *Eucalyptus caliginosa* (Broad-leaved Stringybark), *Eucalyptus melliodora* (Yellow Box), *Eucalyptus blakelyi* (Blakely's Red Gum), *Angophora floribunda* (Rough-barked Apple), and *Eucalyptus bridgesiana* (Apple Box) occurs on sedimentary rocks. *Eucalyptus laevopinea* (Silver-top Stringybark) occurs on dry aspects, and *E. blakelyi*, *E. melliodora*, and *E. bridgesiana* occur on moist, well-drained slopes. Regionally, *Eucalyptus novo-anglica* (New England Peppermint) occurs concurrently with *Eucalyptus viminalis* (Ribbon Gum) on flats, however neither of these species were detected within the development Site.

4.4 Hydrology

The hydrology of the Site is typified by ephemeral first order drainage lines. Several of these drainage lines intersect each other across the development site to form Limerick Creek which is classed as a third order stream (Strahler, 1952).

Limerick Creek joins Cooney Creek approximately 1.5 km downstream of the proposed Site. Cooney Creek flows into Gara Gorge, part of the Oxley Wild Rivers National Park, before joining Salisbury Waters to eventually join the Macleay River and flow to the Pacific Ocean near South West Rocks.

4.5 Landuse

The primary landuse within the region is mixed agriculture including both sheep 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.

Due to altitude, climate, and soil types, plantations of *P. radiata* are common on many pastoral leases within the region and stands of *P. radiata* occur within the development Site.

Near to the Site, within Bakers Creek gorge, is the Hillgrove underground mining operation which produces antimony and gold concentrate.

4.6 Major Roads

Waterfall Way is 165 km long and, as noted, provides the main route to site and is also the major highway connecting the inland centre of Armidale with the northern NSW coast, where it ends at the Pacific Highway. The route passes through scenic countryside in places and has become recognised as a tourist drive providing access to National Parks and spectacular waterfalls, from which it takes its name. Seven national parks, three of which are listed as World Heritage Areas are located on or close to the route. Daily traffic numbers in the vicinity of the Proposed Development site are estimated at 1,676 vehicles per day (TTM, 2017a).

4.7 Minor Roads

Within the broader 5 km study area there are a number of minor roads off Waterfall Way providing access to properties and to the village of Hillgrove, approximately 4.5 km to the Proposed Development's south east. Bayley Park road, intersects Waterfall Way on its northern side and provides access to the development site. It is an unpaved, no through local road that provides property access only to the landholding. Accordingly public access and use of Bayley Park road is extremely low

4.8 Residences and Villages

Although there are a number of residences located on the Landholding itself, the only non-associated, residences within 2 km with potential for visibility of the Proposed Development are:

- "Cubba Cubbah" – Lot 5 DP 606050 – 240 m from southern boundary
- "Kiama" – Lot 1 DP 598741 – 1,035 m from south western boundary

The village of Hillgrove, with an approximate population of less than 100, is located approximately 4.5 km south east of the Proposed Development.

4.9 Landscape Character

The landscape character of the Site and the wider study area can be classified as a single Landscape Character Unit (LCU1) dominated by wide undulating to rolling hills which form part of the broader Armidale Plateau sub-region (OEH, 2016). The LCU is rural, with a few homesteads 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. 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. Typical images of LCU1 are shown in Figures 6 and 7.

Contrasting LCU1 is the Bakers Creek Gorge (LCU2) which lies to the south of Old Hillgrove Road, with its dense native vegetation, dramatic gorge landform and the Bakers Creek Falls. This in turn leads to the World Heritage Listed Oxley Wild Rivers National Park (LCU3) a further 11 km downstream and although outside the study area has been considered due to its importance at the National scale. However, while the landscape sensitivity of each of these LCUs is **high**, as the Proposed Development will not visible from these LCUs they have not been considered further in this report.

Figure 6: Typical regional views from Hillgrove Common showing rolling rural landscape and cleared vegetation.

Figure 7: Southern boundary of the development area as viewed from Waterfall Way looking east (far right).

4.10 General Visibility

The Proposed Development site has a relatively confined area of visibility due to it being positioned within a narrow valley that runs in a general north-east/south-west direction that is at a similar elevation to the surrounding landscape. Infrastructure associated with the Proposed Development is located along the valley floor and lower slopes within the headwaters of the Limerick Creek catchment. The hills defining the Limerick Creek catchment limit views of the majority of the site, which generally only becomes visible in the southern most sections near to Waterfall Way.

The Proposed Development site has a 1.1 km frontage to Waterfall Way. Topography and vegetation in this area naturally obscures potential views of the development site. The potential area of visibility along Waterfall Way extends from east of Bailey Park Road to just east of the junction with Old Hillgrove Road (see Figure 10). Distant view and glimpses of the site are possible from Stockton Road and Hillgrove village.

6 Visual Impact Assessment

6.1 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 is limited to the potential impacts on the single landscape character unit (LCU1) 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 LCU1.

6.1.1 Landscape Character Unit 1 (LUC1)

The visual sensitivity of LUC1 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. LUC1 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 **high**, as the introduction of a solar farm constitutes a large scale change to the visual characteristics of the site and the surrounding area. This is largely due to the otherwise rural nature of LUC1. There will also be relatively minor changes to vegetation cover and landform as a consequence of the development.

It should be noted, that due to the location of the Proposed Development, within an undulating valley, 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.

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).

Based on these findings, with reference to Table 3, the overall impact on the landscape character within the study area is assessed as **low**. With the addition of mitigation, which is discussed in Section 6 below, the overall assessment does not change and residual effects are also assessed as **low**.

6.2 Visual Amenity Impact Assessment

6.2.1 Viewshed analysis

A series of ZTV maps have been generated to understand the potential extent of the visibility of the Proposed Development within the study area (5 km). The ZTVs for the Site and the Substation and support buildings are presented in Figures 8 and 9 respectively.

The ZTV for the Development Footprint clearly illustrates that, despite the large scale of the Proposed Development (Figure 8), 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 was a key factor in the selection of the site. Within the study area (5 km), the main extent

of visibility (the areas in purple) are the areas immediately surrounding the proposed Development out to approximately 500 metres, after this visibility drops away significantly.

The southern section of the Proposed Development is generally more visible than the northern section. Topography, vegetation cover and the absence of sensitive receptors (residences, roads or public access areas) limit potential impacts in other directions. Potential visibility to the north is limited to the highest points in the landscape, which are generally vegetated and due to the vegetation cover are unlikely to have views towards the site, while visibility to the east and west is shielded by the relatively steep hills on either side of the proposed Site.

The ZTV for the substation and support buildings (Figure 9), indicate that despite being considerably taller than the solar arrays, they are noticeably less visible due to careful site selection (including a micro-siting allowance). The most likely views of the Substation and support buildings are to the west of the Site, but again this is only in areas of high elevation without residential receptors or public access. Furthermore, the narrow field of potential visibility lends itself to effective vegetation screening options if it considered necessary.

The 20 m communication tower would have more theoretical visibility than other features due to its height. However, due to its solitary nature and lattice design, coupled with the large degree of shielding from surrounding topography, its visual impact is judged to be low to insignificant within the context of its setting.

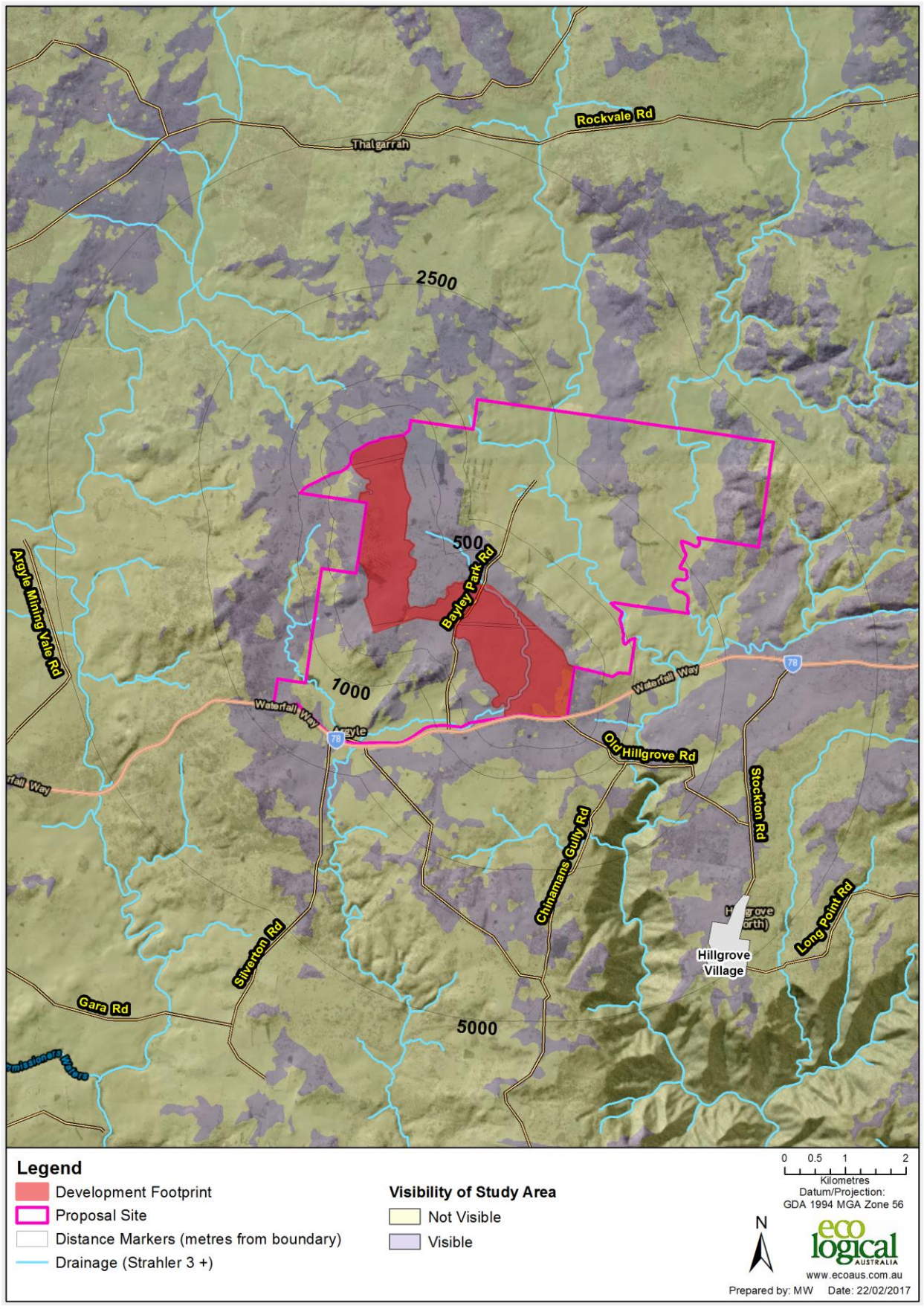

Figure 8: ZTV model indicating Development Footprint visibility at a sub-regional level.

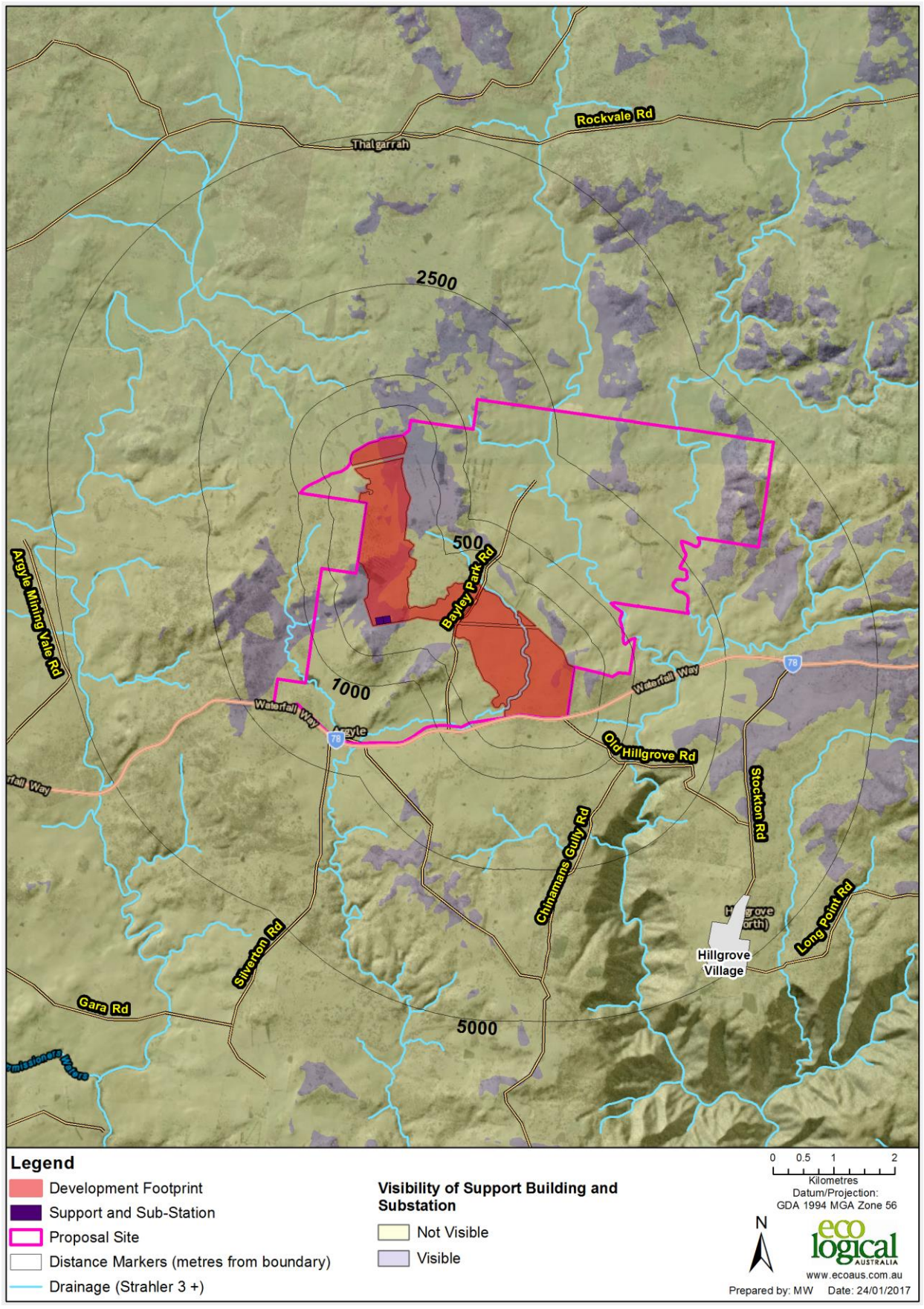

Figure 9: ZTV results illustrating theoretical substation and support building visibility at a sub-regional level.

6.3 Visual Amenity Impact Assessment

Viewpoint selection

Six viewpoints have been selected to inform the visual amenity assessment and to help determine and describe the potential impact of the Proposed Development on visual amenity. The viewpoints represent the most 'exposed' views of the Proposed Development, from the most 'sensitive' receptors, broadly from within the study area (Figure 10).

To illustrate the predicted views of the Proposed Development, photographic views have been produced for each viewpoint. All photographs were taken at 1.7 m above ground level using a 33 mm lens (ISO 50, f/2.4).

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

Table 6: Overview of viewpoints selected for assessment

Viewpoint	Approximate distance from the Development Footprint boundary	Viewpoint description and potential visibility of the Proposed Development	Viewpoint sensitivity
A – Waterfall Way	10 m	Waterfall Way is the main through road between Armidale and the NSW Coast. The Proposed Development would be highly visible along a stretch of approximately 1.3 km of the road. Due to changes in topography and vegetation within the road reserve and broader landscape, the site would generally not be visible elsewhere from Waterfall Way.	Despite limited visibility of the Proposed Development over the road as a whole, and that viewers are likely to be in transit, its proximity to Waterfall Way within the Study Area has the potential for extensive views of the Proposed Development by a high number of road users each day. Therefore the sensitivity of the viewpoint is **high**.
B – Old Hillgrove Road	400 m	Old Hillgrove Rd intersects with Waterfall way to the Proposed Development's south east and is the old route to Hillgrove Village. A small part of the southern Development Footprint is visible for approximately 750 m when travelling in a north westerly direction along Old Hillgrove Road. However, views are obscured by vegetation within Waterfall Way road corridor (Figure 11).	Visual sensitivity of Old Hillgrove Road is assessed as **moderate** due to potential views being limited by existing vegetation and the road being of only local significance, and potential viewers are likely to be in transit.
C – Stockton	3.5 km	Stockton Road intersects Waterfall Way providing the main access to	Visual sensitivity of Stockton Road is assessed as **low** due to the distance of

Viewpoint	Approximate distance from the Development Footprint boundary	Viewpoint description and potential visibility of the Proposed Development	Viewpoint sensitivity
Road		Hillgrove Village. The southern part of the Development Footprint would have some visibility for northbound traffic, albeit distant and oblique to the direction travelled.	more than 3.5 km limiting potential views of the Proposed Development, and potential viewers are likely to be in transit.
D – Hillgrove Common	4.5 km	Hillgrove Common is a publically accessible common at the northern side of Hillgrove. It would have distant views of the southern parts of the Proposed Development although views would be considerably limited through existing vegetation and the narrow vertical band of visibility of the development within the landscape.	Visual sensitivity of Hillgrove Common is assessed as **low** due to the considerable distance from the Proposed Development, meaning that potential views would form only a small portion of an expansive rural view.
R1 – Cubba Cubbah	240 m	This residence is located 240 m south of the southern boundary of the Proposed Development and would have views upwards over part of the south eastern portion of the Proposed Development. The house itself is orientated towards Waterfall Way, a highway that lies between it and the Proposed Development, and onwards towards the Proposed Development. Site visibility is partially obscured due to well established vegetation surrounding the residence itself, as well as moderate vegetation densities within the 134 m wide road corridor. Vegetation screenings have been planted by the landholder along 700 m of the property boundary adjoining the road corridor, with mixed results and generally slow patterns of growth.	The local topography and existing screening provide some limitation of views, However, the sensitivity of the viewer (residential) and its close proximity to the Proposed Development results in a **high** visual sensitivity assessment.
R2 – Kiama	1000 m	This residence is located approximately 1 km south west of the southern boundary of the development area. From this location the Proposed Development occupies a reasonably small portion of the mid ground view (Figure 16). The residence is at a	Due to potential views being limited through distance and screening, the visual sensitivity ranking of this receptor is considered to be **moderate**.

Viewpoint	Approximate distance from the Development Footprint boundary	Viewpoint description and potential visibility of the Proposed Development	Viewpoint sensitivity
		similar elevation to the development however, a low ridge significantly obscures visibility of the development footprint from the residence. Well-developed gardens surrounding the house site would further limit views towards the Proposed Development.	

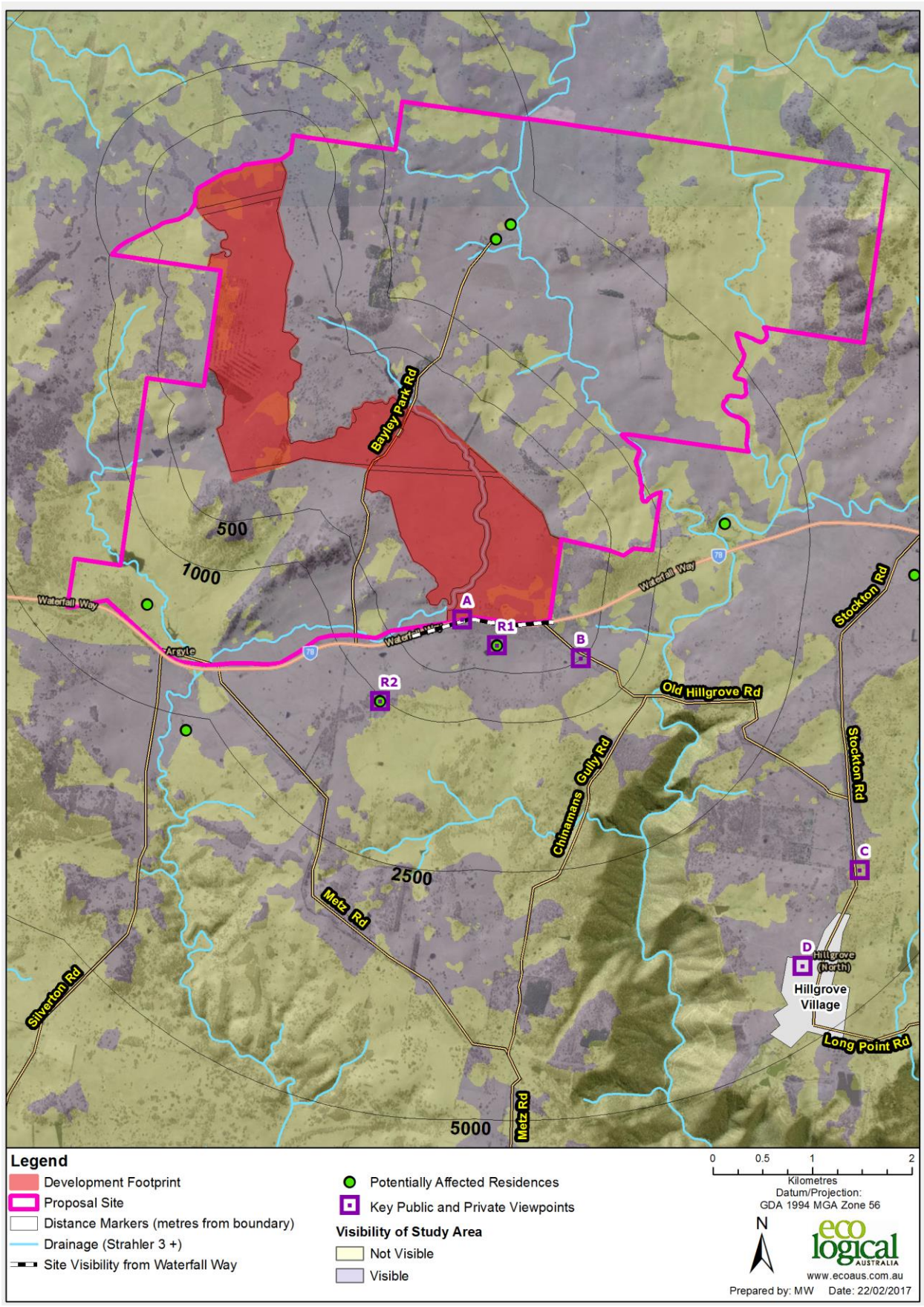

Figure 10: Key Public and Private viewpoints selected for visual amenity impact assessment.

6.4 Impact Assessment for each Viewpoint

Visual amenity impact assessments for each viewpoint are provided in the following section.

6.4.1 Public viewpoints

A - Waterfall Way

Waterfall Way is a main route that links the Pacific Highway on the coast to the New England Highway at Armidale in NSW. Promoted as a tourist drive the road supports both regional and local road users. The view from this viewpoint is typical of the undulating to rolling rural landscape of this area. Due to historic clearing for agriculture, vegetation cover from this viewpoint is generally low except along ridgetops and in isolated patches in both the foreground and mid-ground view.

The Proposed Development is located immediately to the north of Waterfall Way which directly borders the site for approximately 1.1 km (Figure 11). The south east section of the solar array would be highly visible to road uses traveling in an easterly direction from Armidale for approximately 1.3 km. However, the vertical depth of the view would be relatively narrow, limiting the perception of the scale of the development from this viewpoint.

A ZTV from this viewpoint (Appendix A) has been generated to understand the extent of views towards the proposed Site within which the Proposed Development would be located. It confirms that visibility of the Proposed Development would be confined to the southern part of the Site in line with the findings of the viewpoint assessment above.

Figure 11: Viewpoint A – Proposed Development from Waterfall Way (arrows indicate extent of solar array visibility).

Based on the findings of the viewpoint assessment the magnitude of visual change as a consequence of the Proposed Development is considered to be **high** due to the substantial views of the southern area of the solar array that would be observed from this viewpoint. The visual sensitivity of the viewpoint has been assessed as **high** (Table 7), therefore; with reference to Table 3, the visual amenity impact of the Proposed Development from this viewpoint would be **high**.

Mitigation comprising infrastructure setbacks and visual screening using vegetation is proposed to reduce impacts from this viewpoint (discussed in Section 6).

B - Old Hillgrove Road

Old Hillgrove Road intersects with Waterfall Way to the south east of the Proposed Development and is the old route to Hillgrove Village. This road would predominantly be used by local road users. Again, the view from this viewpoint is typical of the undulating agricultural landscape of the area. The landscape rises gently towards a ridge which defines the extent of the site that can be seen from this viewpoint. Vegetation in the area is concentrated in the road corridors and within the traveling stock reserve to the east of the Site.

The southern end of the proposed Site is visible for approximately 750 m when travelling in a north westerly direction along Old Hillgrove Road. However, the extent of the potential views from this viewpoint is restricted by the topography of the Site as illustrated by the ZTV generated for this viewpoint (Appendix A). Additionally, views are further obscured by vegetation within the road corridor of Waterfall Way (Figure 12).

Figure 12: Viewpoint B – Proposed Development from Old Hillgrove Road (arrows indicate extent of solar array visibility).

Based on the findings of the viewpoint assessment, the magnitude of visual change as a consequence of the introduction of the Proposed Development is considered to be **moderate** due to the topography of the site limiting views of the Proposed Development and the existing roadside vegetation that would obscure views towards the site. The visual sensitivity of the viewpoint has been assessed as **moderate** (Table 7); therefore, with reference to Table 3, the visual amenity impact of the Proposed Development from this viewpoint would be **Moderate**.

C - Stockton Road

Stockton Road intersects Waterfall Way providing the main access route to Hillgrove Village. This road is primarily used by local residents and people travelling in vehicles to the mining operation at Hillgrove Mine. Again, the view from this viewpoint is typical of the undulating agricultural landscape of the area. The landscape is extensively cleared with vegetation cover concentrated along ridgetops and in isolated patches in gullies and along waterways and roads. Powerlines linking Hillgrove to the national grid run through the foreground of the view.

Distant views with a limited vertical range of the southern portion of the Proposed Development would be observed from this viewpoint (Figure 13). As the Site is more than 3.5 km away from the viewpoint, views of the Proposed Development would only form a small portion of this expansive rural view.

Based on the findings of the assessment for this viewpoint, the magnitude of visual change that would occur as a consequence of the introduction of the Proposed Development is considered to be **low** due to the distance of the site from the Proposed Development and the intervening vegetation that would obscure views towards the Site. The visual sensitivity of the viewpoint has been assessed as **low** (Table 7); therefore, with reference to Table 3, the visual amenity impact of the Proposed Development from this viewpoint would be **Low/insignificant**.

Figure 13: Viewpoint C – Proposed Development from Stockton Road near Hillgrove Cemetery (arrows indicate extent of solar array visibility).

D - Hillgrove Common

Hillgrove Common is a publically accessible common at the northern side of the Hillgrove Village. The view from this elevated viewpoint is more expansive and open than views obtained from locations closer to the site (Figure 14). Again, the undulating agricultural nature of the landscape is typical of the area. However, vegetation cover is more dominant in this view as the vegetation concentrated along ridgetops obscures views of some of the areas of land which have been cleared for agriculture.

Very distant views of the southern part of the Proposed Development would be visible from this viewpoint. As the viewpoint is more than 4.5 km from the Site the Proposed Development would only be perceived as a narrow vertical band in the background of an otherwise expansive rural view.

Based on the findings of the viewpoint assessment, the magnitude of visual change as a consequence of the introduction of the Proposed Development is considered to be **low** due to the distance between the viewpoint and the Site limiting potential views. The visual sensitivity of the viewpoint has been assessed as **Low** (Table 7); therefore, with reference to Table 3, the visual amenity impact of the Proposed Development from this viewpoint would be **Low/insignificant.**

Figure 14: Viewpoint D – Proposed Development from Hillgrove Common (arrows indicate extent of solar array visibility).

6.4.2 Private viewpoints

The nearest affected residences are located south of Waterfall Way. Each residence was visited in order to assess the relative visibility of the Proposed Development, and to assess and discuss the viability of potential mitigation actions in reducing potential impacts.

R1 - Cubba Cubbah

Located approximately 240 m south of the southern boundary of the Proposed Development, the Cubba Cubbah residence is situated at a lower elevation than the majority of the proposed Site. The house itself is orientated towards Waterfall Way, a highway that lies between the residence and the proposed Site. The view from this viewpoint is dominated in the foreground by a garden that surrounds the property which partly filters views beyond the property boundary. The view then extends over the road corridor (134m), which includes stands of mainly native trees which further filter views up towards the top of a small rise that is mostly cleared and forms part of the proposed Site. In the background, it is possible to see obscured views of the vegetated ridges of the surrounding hills. The landowner has planted a tree line (approximately 700 m) along the property boundary boarding Waterfall Way to the west of the residence. Overall, the view is categorized as agricultural with a manmade feature (the highway) intersecting the mid-ground.

A detailed assessment of the extent of the likely views of the Proposed Development from this viewpoint indicate that, despite its close proximity, views would be limited to a relatively small section of the southernmost area of the proposed Site. This is clearly illustrated by the ZTV map generated to help understand the extent of potential views of the Proposed Development from this viewpoint (Appendix A, Figure A-3). The purple shading on the ZTV map indicates areas that would be potentially visible within the proposed Site boundary. However, it should be noted that ZTVs do not take into account the screening effect of local features such as subtle variations in landform, or vegetation cover noted in the viewpoint description that would filter and screen views from this viewpoint.

The proposed solar array would be observed from this viewpoint in the mid-ground filtered view through existing vegetation in the garden and the road corridor. This provides a good opportunity to mitigate potential impacts by maximising the distance infrastructure is setback from the Site boundary and developing effective vegetation buffers designed specifically to maximise visual screening at this viewpoint (see Section 6).

Based on the findings of the viewpoint assessment, unmitigated, the Proposed Development would be visible filtered through current vegetation in mid-ground views. This, coupled with its proximity to the Site results in a magnitude of visual change that is **high.** The visual sensitivity of the viewpoint has been assessed as **high** (Table 7); therefore, with reference to Table 3, the visual amenity impact of the Proposed Development from this viewpoint would be **high**.

Figure 15: Viewpoint R1 – north east view towards Proposed Development from outer garden area of Cubba Cubbah (arrows indicate extent of solar array visibility).

During consultation, the landholder indicated two additional potential future home development sites located within the property and subject to differing levels of site preparation. Although on separate titles (*pers. comm.* 6/01/2016), it is understood that no further planning application of consent has been prepared for either site. Although further from the Proposed Development, both sites are located higher in the landscape than the southern part of it.

Without further mitigation, the Proposed Development would be visible from each site, however, in the absence of a formal development strategy, neither site is considered further within this report. It is, however, recommended that the landholder and the proponent maintain a dialogue with the intention of minimising potential adverse impacts to visual amenity from the site, through the agreement of suitable screening locations.

Figure 16: Viewpoint R1 – north view towards Proposed Development from outer garden area of Cubba Cubbah (arrows indicate extent of solar array visibility).

R2 - Kiama

Located approximately 1km south west of the southern boundary of the Proposed Development the Kiama residence is situated at a similar elevation to the majority of the development Site. The house itself is orientated towards Waterfall Way and set well back from the road. This viewpoint (Figure 17) is located in the eastern corner of the established garden surrounding the Kiama residence looking out towards the Proposed Development. The view is typical of the wide, mostly cleared and undulating agricultural landscape of the area. In the foreground the landscape slopes away from the house over the road corroder and down into a small valley before rising up to a ridge which defines the extent of the boundary of the Proposed Development from this viewpoint. The mid-ground and background views are characterised by cleared land punctuated by scattered mostly native paddock trees and clusters of introduced and native trees.

While the Kiama residence is at a similar elevation to the Proposed Development, the topography of the landscape shields most of the Site from this viewpoint. The ZTV map generated to understand the potential extent of views, confirms that views of the Proposed Development would be contained to a relatively small area of the solar array running along Limerick Creek (Appendix A, Figure A-4). These potential views would be limited to a fairly narrow vertical range due to the flat nature of the Proposed Development. It should be noted that ZTVs do not take into account the screening effect of local features such as subtle variations in landform, or vegetation cover noted in the viewpoint description that would filter and screen views from this viewpoint.

As the Proposed Development would be observed from this viewpoint in the mid-ground, filtered through existing vegetation in the garden and the wider landscape, it is proposed that there is potential to further mitigate impacts by developing effective vegetation screens within the development boundary designed to maximise visual screening from this viewpoint (see Section 6).

Figure 17: Viewpoint R2 – Proposed Development from Kiama (arrows indicate extent of solar array visibility).

Based on the findings of the viewpoint assessment, unmitigated, the magnitude of visual change is considered to be **moderate** due to the distance of the Proposed Development and topographical screening that limits the scale of the impact within the broader view. The visual sensitivity of the viewpoint has been assessed as **moderate** (Table 7); therefore, with reference to Table 3, the visual amenity impact of the Proposed Development from this viewpoint would be **moderate**.

Other considered viewpoints

The site is generally obscured or screened from sight from other residences located within 5 km of the site, particularly to the east and west. However, the southern portion of the solar farm will be distantly visible from residences within Hillgrove, particularly those on the western side of Brackin Street. Given that Hillgrove is approximately 4.5 km from the development site, it is not anticipated that there will be significant changes to views from any residences at Hillgrove, which are represented in terms of impact by viewpoint D.

As noted, importantly the Proposed Development is not visible from Bakers Creek Falls or Oxley Wild Rivers National Park and accordingly, these sites were not assessed further as either viewpoints or as part of the broader landscape assessment.

6.4.3 Viewpoints Summary

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
A – Waterfall Way	100 m	High	High	High	Maximise infrastructure setback; Establish vegetation screenings to minimise visibility of solar arrays.
B – Old Hillgrove Road	400 m	Moderate	Moderate	Moderate	Establish vegetation screenings to minimise visibility of solar arrays; and Promote regeneration of vegetation in road corridor (Waterfall Way).
C – Stockton Road	3.5 km	Low	Low	Low/ Insignificant	None required.
D – Hillgrove Common	4.5 km	Low	Low	Low/ Insignificant	None required.
R1 – Cubba Cubbah	240 m	Very High	High	High	Maximise infrastructure setback and relocate from prevalent views; Establish vegetation screenings to minimise visibility of solar arrays; and Promote regeneration of vegetation in road corridor (Waterfall Way).
R2 – Kiama	1000 m	Moderate	Moderate	Moderate	Promote regeneration of vegetation in road corridor (Waterfall Way); and Establish further vegetation screenings to minimise visibility of solar arrays should this be deemed necessary by the landowner post construction.

At sites assessed to have moderate or high visual amenity impacts, the extent of potential views of the Proposed Development were modelled using a GIS viewpoint model (Appendix A). This provides an indication of the extent of theoretical views of the Proposed Development from each site and is a useful tool for developing and accessing potential mitigation strategies. From each of the assessed viewpoints, only parts of the southern section of the Development Footprint would be visible and, in most cases, this would be a relatively small proportion of the total development area.

6.5 Other considerations

6.5.1 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 substation and the support buildings. Lighting at these locations will be predominantly on-demand only. The viewshed analysis indicates that the substation and the support buildings areas are well shielded and not visible from potential sensitive receivers (Appendix A). As such, visual impact assessment is not required.

6.5.2 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).

6.5.3 Air traffic

The nearest public airport is Armidale Regional Airport, located approximately 25 km west of the development site. However, interpretation or topographical maps and aerial imagery indicates 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).

6.5.4 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 screening vegetation between road users and infrastructure.

6.5.5 Cumulative visual impacts

A Development Application has been submitted by Hillgrove Mines Ltd for the establishment of an underground gold and antimony mine at Clarks Gully, near the junction of Old Hillgrove Road and Waterfall Way.

Cumulative visual impacts may result from certain viewpoints, should concurrent development and/or operation of the proposed Metz solar farm and the proposed Clarks Gully Mine occur, particularly:

- R1 - Cubba Cubbah;
- A – Waterfall Way; and
- B – Old Hillgrove Road.

The visual amenity assessment prepared for the Clarks Gully Mine (Envisage, 2016) indicates that the proposed Clarks Gully Mine shall be partially visible from the existing residence at Cubba Cubbah and assessed the overall impact to visual amenity as high. It is considered likely, that from the same vantage point it may be possible to view parts of the Proposed Development, although not necessarily within the same vista due to separation distance and angle. Potential cumulative impacts at this site have been considered and addressed in developing a comprehensive mitigation strategy aimed at significantly reducing the visibility of the Proposed Development from the existing residence at Cubba Cubbah as is discussed below.

The proposed Clarks Gully Mine is not visible to eastbound travellers on Waterfall Way adjacent to the Proposed Development (Envisage, 2015), however, partial views of both developments may occur in rapid succession creating a perceived cumulative visual impact. Proposed mitigation measures (setback and vegetation screening) have been developed to minimise this perception.

Combined views of both Clarks Gully Mine and the Proposed Development may be apparent to westbound travellers on Old Hillgrove Road. In this case, the recommended general and site specific mitigation strategies for Metz solar farm will assist to reduce impacts to visual amenity associated with this development.

7 Mitigation Measures

7.1 Proposed Mitigation Measures

The following mitigation measures will be implemented over the life of the project. Specifically they are targeted at mitigating impacts from Viewpoints 'A' (Waterfall Way, high potential impact), 'B' (Old Hillgrove Rd, moderate potential impact), 'R1' (Cubba Cubbah, high potential impact) and 'R2' (Kiama, moderate potential impact). However, the measures will have the overall effect of reducing severity of impacts at all representative viewpoints and as such, visual impacts throughout the local area:

- Establish an infrastructure free Visual Buffer Zone (Figure 17) that will, as far as practical, maximise infrastructure setbacks from areas along Waterfall Way that can be viewed by the public (50 m minimum setback from the Site boundary, increasing to 160 m from the site boundary in areas visible from Cubba Cubbah);
- Minimum setback distances of 150 m (from the Site boundary) proposed in areas that can be viewed from Cubba Cubbah (providing a total set back from the residence of 400m);
- Establish a vegetation buffer within the Visual Buffer Zone where Waterfall Way boarders the southern boundary of the Proposed Development (Figure 17);
- Establish vegetation buffers within the Site boundary to help screen views from Kiama (Figure 17);
- Ensure the establishment of the vegetation buffers are commissioned as one of the first activities of site construction;
- Continue to consult with neighbouring landholders to identify, where possible, the location of mutually agreeable vegetation screening both pre and post construction. Ensure actual screening meets mitigation expectations and broaden planting if it does not;
- 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;
- Locate substation, support buildings, construction site compound and lay down areas away from visual receptors and apply visual screening if necessary;
- Minimise night lighting at the substation and associated support buildings; and
- Minimise vegetation clearing and earthworks and rehabilitate progressively.

7.2 Draft Landscaping Plan

The draft landscaping plan has been developed in response to the findings of this assessment and in consultation with affected landholders, with the objective of minimising visual impacts at sensitive receptors, particularly viewpoints 'A', 'R1' and 'R2'.

The draft landscaping plan responds directly to concerns raised during stakeholder consultation undertaken by Eco Logical Australia staff on Friday 6 January 2017 and by Infinergy Pacific personnel on Wednesday 10 August 2016 and Wednesday 11 January 2017.

The proposed planting area comprises a 20 m vegetation buffer running the entire length of the frontage with Waterfall Way and up along the edge of the Site boundary which faces R2. The buffer is located to compliment changes in topography, with the intention of maximising the effectiveness of the Visual Buffer Zone from impacted viewpoints (Figure 17).

In keeping with the precautionary approach, the vegetation buffer has been designed against the impact of the maximum potential footprint of the Proposed Development, while the final development could result in a reduction in visual impact. It should be noted that to further enhance mitigation, for viewpoints A, R1 and R2, with the agreement of the residents of R1 and R2, post construction assessments will be conducted at each of these locations to identify if any additional planting is required to optimise screening from these viewpoints.

While outside the scope of this Visual Impact Assessment it is noted that positive bio-diversity outcomes would be another objective of the landscaping plan.

It is proposed that the planting screens be revaluated both pre and post-construction to ensure that the effects of screening are optimised with respect to the final design.

The following preparation, planting, care and maintenance recommendation will maximise the effectiveness of the proposed vegetation screening:

- Tree planting is to be carried out as early as possible in the construction process to maximise growth over this period;
- Tree planting within the buffer areas should be undertaken in prepared planting beds with a density to achieve roughly one tree every 5 m;
- Bed preparation shall include weed removal and cultivation to a depth of at least 300 mm;
- Selected plants should be at least 700 mm high at the time of planting and protected with plant guards suitable to enhance plant growth and protection from vertebrate pests;
- Watering and maintenance shall be undertaken for at least 3 years, including weed management to ensure a weed-free area of 1 m around each trunk;
- Plant species establishment success shall assessed following planting and modified as appropriate;
- Plants that fail shall be replaced, and alternative species considered if plant failure is an ongoing issue throughout the operational period; and
- Local endemic plants should be selected in consultation with Armidale Tree Group or a similar organisation. Suitable species could include:
    - *Eucalyptus blakelyi*;
    - *Eucalyptus melliodora*;
    - *Eucalyptus bridgesiana*;
    - *Acacia filicifolia*;
    - *Acacia rubida*; and
    - *Jacksonia scoparia*.

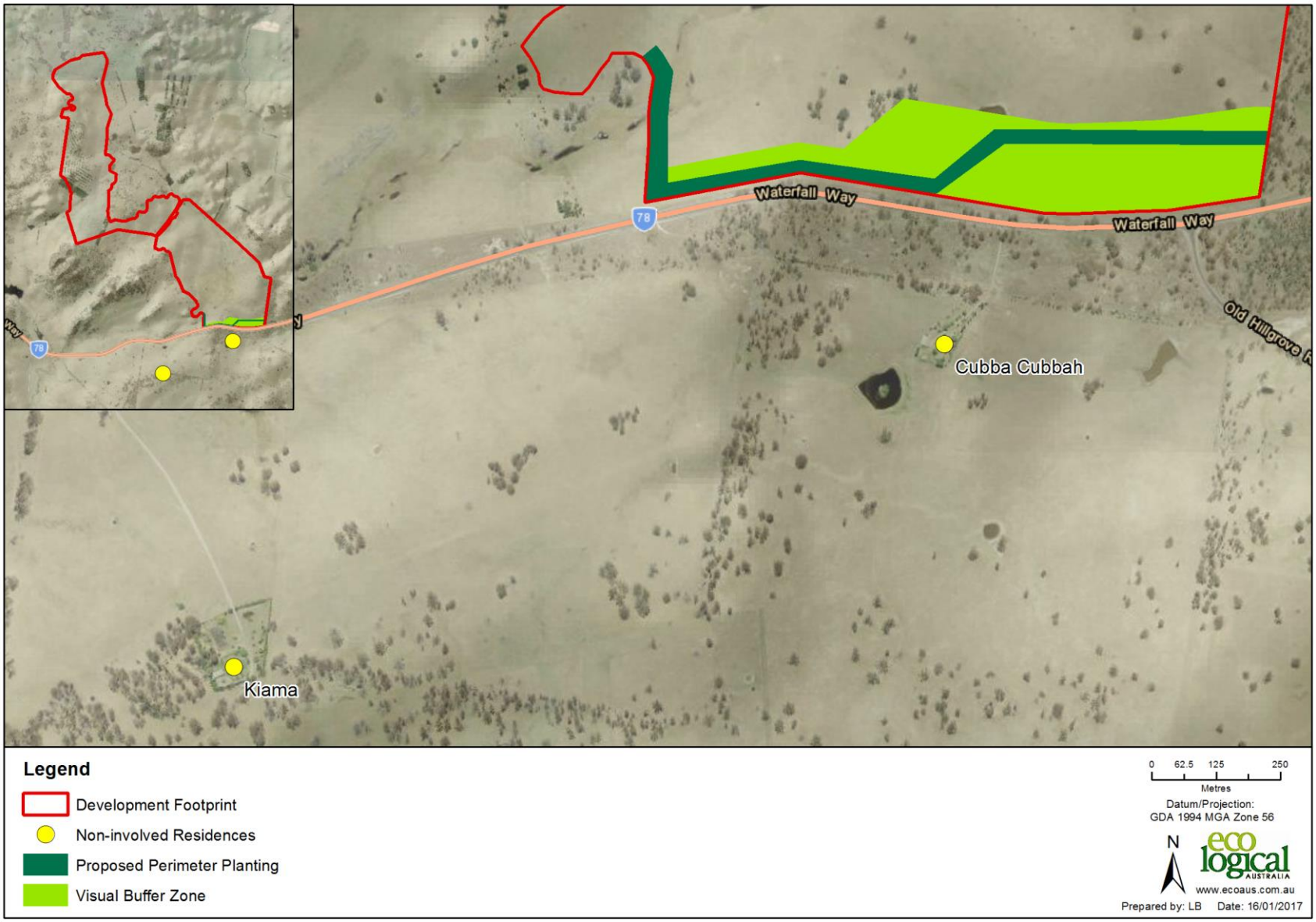

Figure 17: Draft perimeter landscaping plan (green buffer strip adjacent to Waterfall Way – nearby residences circled red).

8 Residual Impacts

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

Table 8: Summary of residual effects

Assessment area	Impact Assessment	Anticipated residual effect following mitigation
Landscape character	**Low**	**Low.** Vegetation planting will, over time, further reduce changes within the landscape in proximity to the Proposed Development.
A – Waterfall Way	**High**	**Moderate,** with the introduction of the Visual Buffer Zone, reducing to **low** as the vegetation buffers establish and combine with existing vegetation to further obscure views.
B – Old Hillgrove Road	**Moderate**	**Moderate,** with the introduction of the Visual Buffer Zone, reducing to **low** as vegetation buffers establish and combine with existing vegetation to obscure views.
C – Stockton Road	**Low**	**Low / Insignificant.**
D – Hillgrove Common	**Low**	**Low / Insignificant.**
R1 – Cubba Cubbah	**High**	Reducing to H**igh/Moderate** with the introduction of the Visual Buffer Zone, and further reducing to **Moderate** and then **low** over time as vegetation buffer will almost entirely shield development.
R2 – Kiama	**Moderate**	**Moderate,** reducing to **low** as vegetative planting is established and combines with existing vegetation to obscure views.

9 Conclusion

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 a valley, surrounded by undulating hills;
- Screening from exiting vegetation;
- A sparsely populated setting; and
- The use of visual screening techniques as a mitigation strategy.

The Proposed Development requires the installation of solar panels within a potential Development Footprint area of approximately 507 ha, which is currently land used for agricultural purposes.

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. The southern section of the Proposed Development is generally more visible than the northern section. Topography, vegetation cover and the absence of sensitive receptors (residences, roads or public access areas) limit impacts in other directions. Potential visibility to the north is limited to the highest points in the landscape, which are generally vegetated and, due to the vegetation cover, are unlikely to have views towards the site. Visibility to the east and west is shielded by the relatively steep hills on either side of the proposed Site.

Within the study area (5 km), the main extent of visibility are the areas immediately surrounding the Proposed Development out to approximately 500 m, after this visibility drops away significantly. The main visual impacts (moderate to high) occur to the south of the Site, where Waterfall Way (a highway of regional significance) borders the Proposed Development and two residential properties lie within 1 km of the Site boundary. Visual impacts at viewpoints beyond 1 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 a commitment to significant setbacks from Waterfall Way and the development of a range of visual screening options aimed at minimising visibility. Properly designed, installed and managed a vegetation buffer zone that enhances natural topographic screening, in conjunction with infrastructure setbacks would provide an effective visual mitigation strategy, as well as providing positive biodiversity outcomes. Consequently at the three receptors with the highest level of impact (high or moderate), with the introduction of the mitigation measures, potential impacts reduce to 'moderate' and then to 'low' over time, as screening matures to limit views.

In conclusion, the Proposed Development will 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, once landscape mitigation has been implemented, and vegetation screening around the site has matured, the overall visual impact of the Metz Solar Farm will be low.

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Appendix A – Development visibility from selected viewpoints

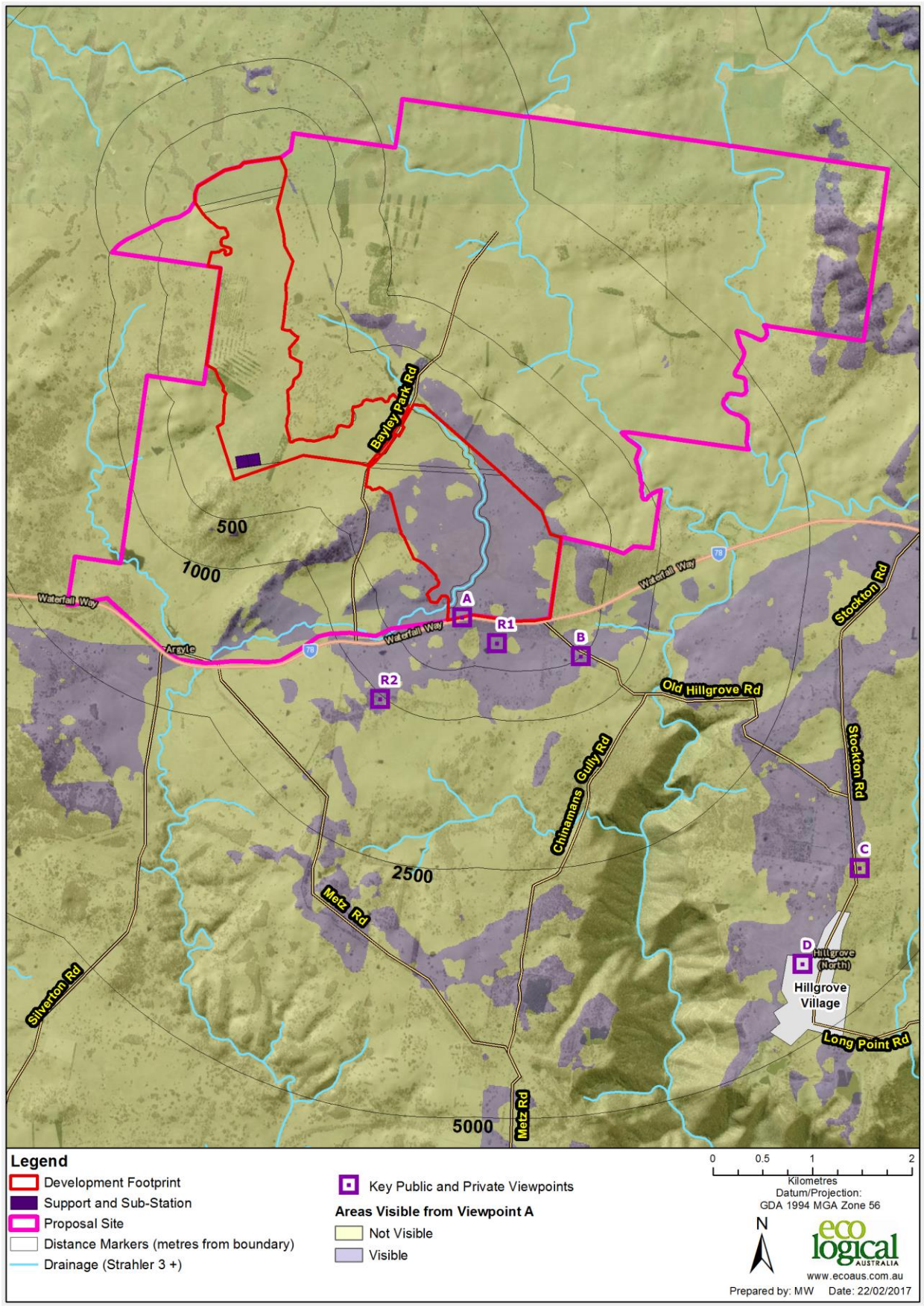

Figure A-1: Visibility from Viewpoint A.

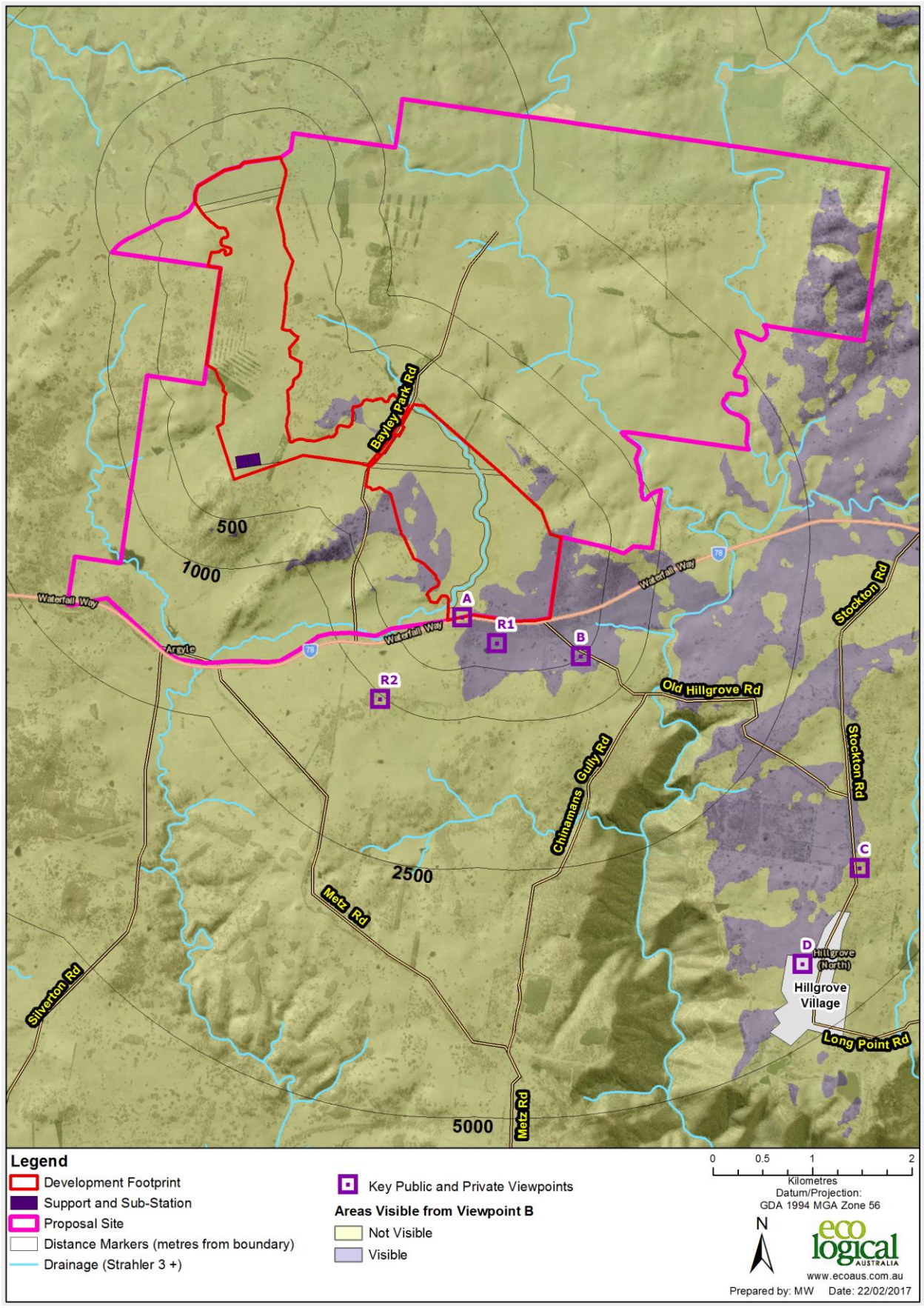

Figure A-2: Visibility from Viewpoint B.

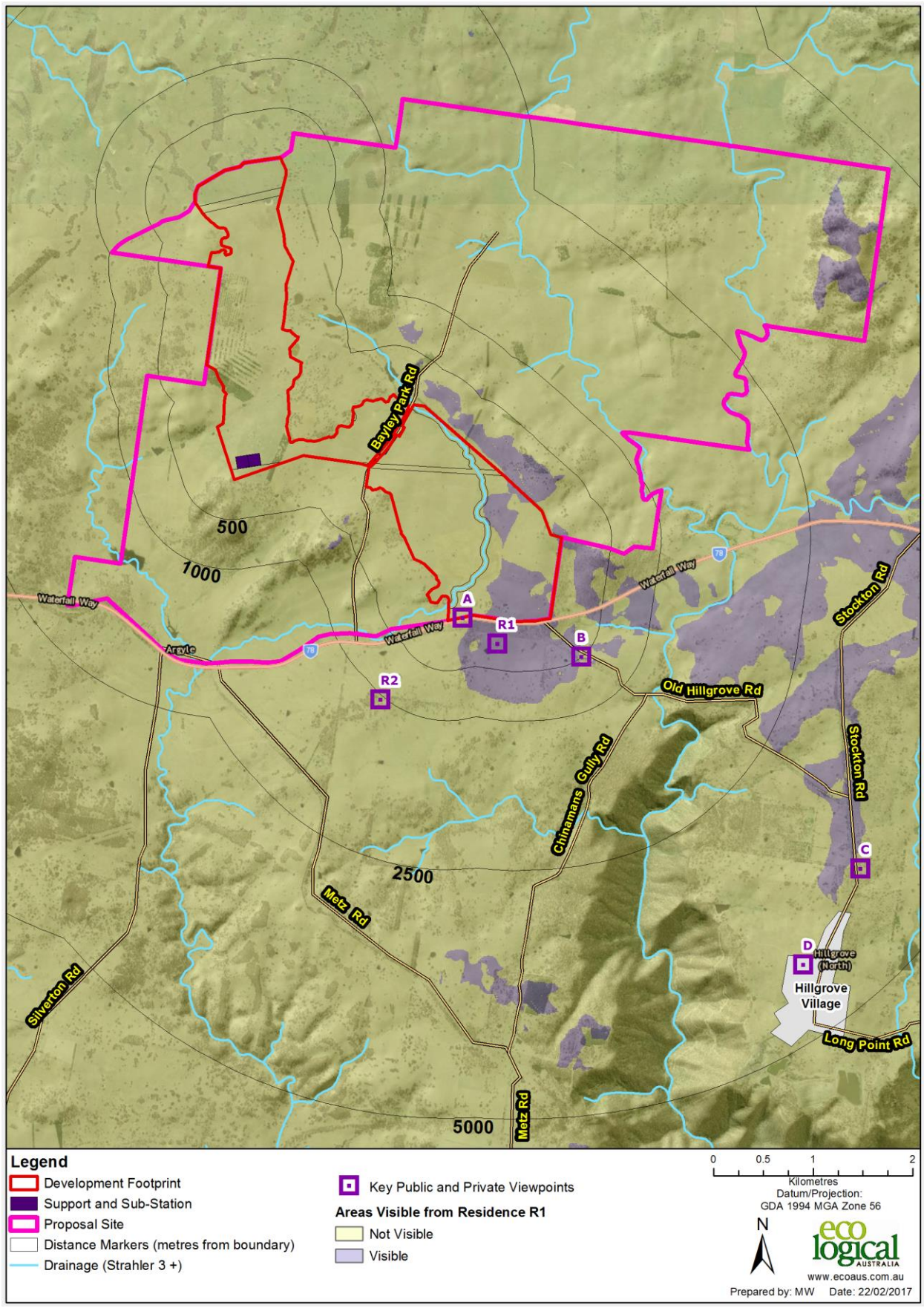

Figure A-3: Visibility from Residence R1.

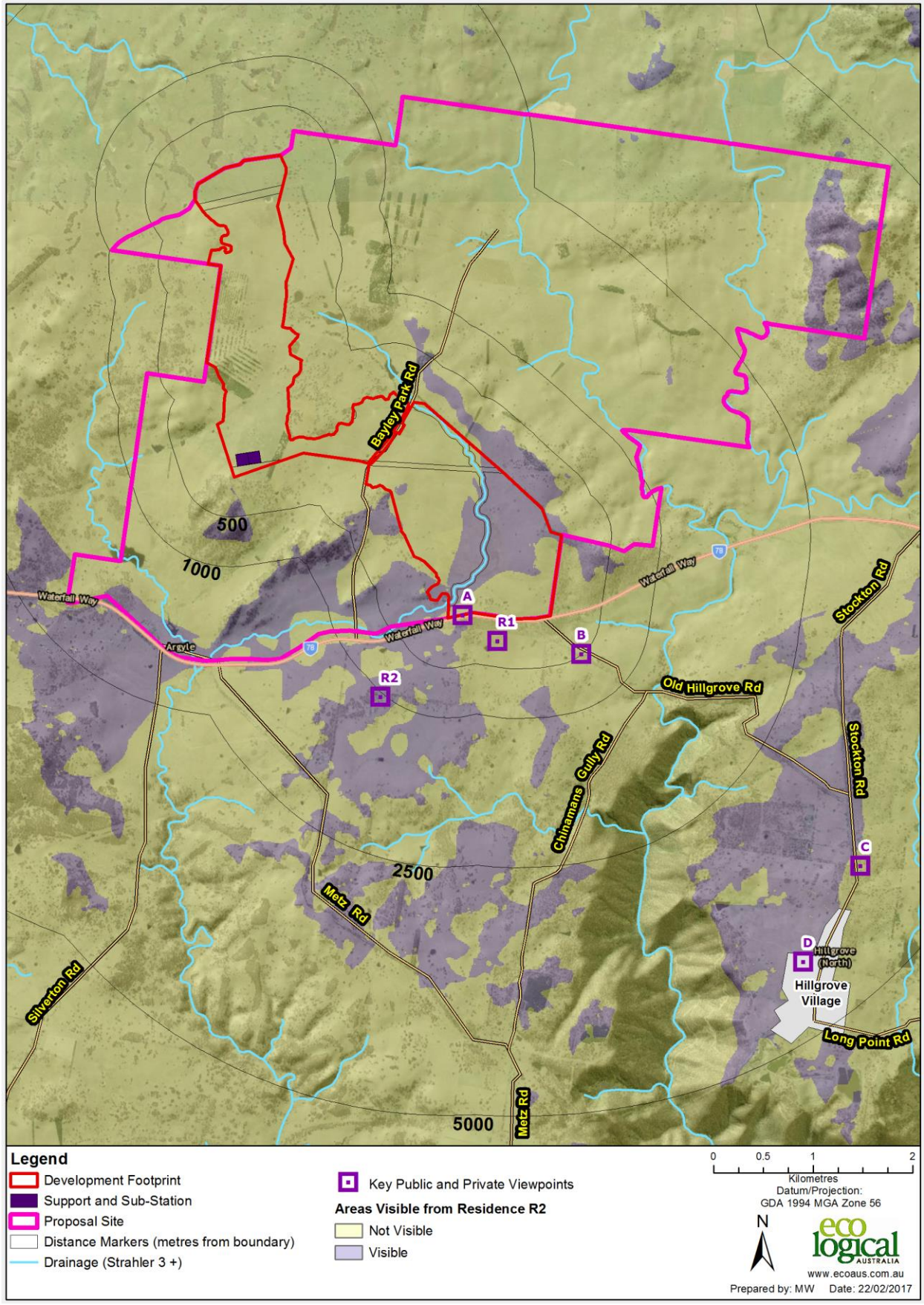

Figure A-4: Visibility from Residence R2.

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