## Bonsmara Solar PV (RF) (Pty) Ltd

# Bonsmara Solar PV Facility near Kroonstad, Free State Province

# Visual Impact Assessment

**DESTEA Reference**: **TBC**
**Report Prepared by: Kelly Armstrong and Chris Dalgliesh**
**Issue Date:** 27 March 2023
**Version No.:** 4

# Bonsmara Solar PV (RF) (Pty) Ltd

# Bonsmara Solar PV Facility near Kroonstad, Free State Province

# Visual Impact Assessment

## EXECUTIVE SUMMARY


Bonsmara Solar PV (RF) (Pty) Ltd proposes to develop the 100 MW Bonsmara Solar Photovoltaic (PV) Facility, Battery Energy Storage System and associated infrastructure on a site ~12 km south-east of Kroonstad, in the Free State Province (project). The PV facility is not located within a REDZ, and will occupy ~326 ha across Portion 0 and Portion 1 of Farm 636 in Moqhaka Local Municipality. Two powerline alternatives are proposed: Powerline Alternative 1 will be ~2 km long and connects to the Kroonstad Switching Station located to the west of the site. Powerline Alternative 2 will be ~5.5 km long and will be routed northwards and connect to a new switching station.

SRK Consulting (South Africa) (Pty) Ltd has been appointed by SiVEST (SA) (Pty) Ltd to undertake the Visual Impact Assessment to inform the Environmental Impact Assessment process required in terms of the National Environmental Management Act 107 of 1998, conducted by SiVEST.

Impacts of the PV facility components and the grid connection component (132 kV powerline, switching station and on-site substation) are assessed separately and are likely to be associated with visual intrusion and visual quality.

Construction (and decommissioning) activities associated with the PV facility and the 132 kV powerline are anticipated to be visually intrusive. The impact is assessed to be of *medium* significance and with implementation of mitigation is reduced to *low*.

During the operational phase it is anticipated that the PV array, BESS, internal grid infrastructure, substation, switching station and 132 kV powerline will alter the sense of place and be visually intrusive. These impacts are assessed to be of *high, medium* and *low* significance respectively, and with the implementation of mitigation is reduced to *medium* or *low*. The impact of visual discomfort and impaired visibility resulting from glint and glare is assessed as *medium* and with the implementation of mitigation is reduced to *low*. The visual impact of nightglow is anticipated to be of *medium* significance and with the implementation of mitigation is reduced to *low*.

Key mitigation measures include:

- Limit vegetation clearance and the footprint of construction to what is absolutely essential;
- Consolidate the footprint of the construction camp to a functional minimum;
- Avoid excavation, handling and transport of materials which may generate dust under very windy conditions;
- Keep stockpiled aggregate and sand covered to minimise dust generation;
- Keep construction site tidy;

- Establish screening (e.g. vegetation) of > 2 m in height between the south-western boundary of the PV array and the R76 where technically feasible and in consultation with a qualified botanist and / or landscaper and the project operator;
- Establish screening (e.g. vegetation) of > 1.5 m in height along the north-eastern boundary of the PV array where technically feasible and in consultation with a qualified botanist and / or landscaper and the project operator;
- Install the 33 kV powerlines underground, where possible;
- Fence the perimeter of the site with a green or black fencing;
- Ensure that the roof colour of the proposed buildings blends into the landscape;
- Do not install or affix lights on pylons;
- Reduce the height of lighting masts to a workable minimum; and
- Direct lighting inwards and downwards to limit light pollution.

The visual quality and sense of place is already affected by existing substations and powerlines within the visual landscape. As such, the proposed powerlines, BESS and substations associated with this project will not be the first of their kind. A number of other PV facilities are proposed in the 35 km radius of the proposed project, however, are located far apart and do not constitute a spatially concentrated, high-density network of PV facilities. Therefore, the cumulative impact of the PV facility and 132 kV powerline is assessed to be of medium significance and with the implementation of mitigation is reduced to low.

This project will be largely incongruent with the existing agricultural landscape. As such, visual impacts include altered sense of place, visual intrusion, visual nuisance, and light pollution. This VIA demonstrates that the project will generally result in a moderate visual impact. The construction, operational, decommissioning and cumulative impacts are deemed to be acceptable on the assumption that the mitigation measures listed in this VIA are implemented.

Based on the assessment and the assumption that the proposed mitigation measures will be implemented, the specialist is of the opinion that the visual impacts of the project, including both powerline alternatives are acceptable and, from a visual perspective, there is no reason not to authorise the project. Powerline Alternative 1 is considered the preferred alternative from a visual perspective.

## NATIONAL ENVIRONMENTAL MANAGEMENT ACT, 1998 (ACT NO. 107 OF 1998) AND ENVIRONMENTAL IMPACT REGULATIONS, 2014 (AS AMENDED) - REQUIREMENTS FOR SPECIALIST REPORTS (APPENDIX 6)

| Regulation GNR 326 of 4 December 2014, as amended 7 April 2017, Appendix 6 | Section of Report |
|---|---|
| 1. (1) A specialist report prepared in terms of these Regulations must contain-<br>a) details of-<br>i. the specialist who prepared the report; and<br>ii. the expertise of that specialist to compile a specialist report including a curriculum vitae; | 1.3 |
| b) a declaration that the specialist is independent in a form as may be specified by the competent authority; | Page vi |
| c) an indication of the scope of, and the purpose for which, the report was prepared; | 1 |
| (cA) an indication of the quality and age of base data used for the specialist report; | 1.4.2.1 |
| (cB) a description of existing impacts on the site, cumulative impacts of the proposed development and levels of acceptable change; | 0 and 6 |
| d) the date and season of the site investigation and the relevance of the season to the outcome of the assessment; | 1.4.2.1 |
| e) a description of the methodology adopted in preparing the report or carrying out the specialised process inclusive of equipment and modelling used; | 1.4 |
| f) details of an assessment of the specific identified sensitivity of the site related to the proposed activity or activities and its associated structures and infrastructure, inclusive of a site plan identifying site alternatives; | 6 and 7 |
| g) an identification of any areas to be avoided, including buffers; | 7 |
| h) a map superimposing the activity including the associated structures and infrastructure on the environmental sensitivities of the site including areas to be avoided, including buffers; | N/A |
| i) a description of any assumptions made and any uncertainties or gaps in knowledge; | 2 |
| j) a description of the findings and potential implications of such findings on the impact of the proposed activity, (including identified alternatives on the environment) or activities; | 7 and 8 |
| k) any mitigation measures for inclusion in the EMPr; | 0 |

| Regulation GNR 326 of 4 December 2014, as amended 7 April 2017, Appendix 6 | Section of Report |
|---|---|
| l) any conditions for inclusion in the environmental authorisation; | 0 |
| m) any monitoring requirements for inclusion in the EMPr or environmental authorisation; | 0 |
| n) a reasoned opinion-<br>i. (as to) whether the proposed activity, activities or portions thereof should be authorised;<br>(iA) regarding the acceptability of the proposed activity or activities; and<br>ii. if the opinion is that the proposed activity, activities or portions thereof should be authorised, any avoidance, management and mitigation measures that should be included in the EMPr, and where applicable, the closure plan; | □ |
| o) a description of any consultation process that was undertaken during the course of preparing the specialist report; | N/A |
| p) a summary and copies of any comments received during any consultation process and where applicable all responses thereto; and | N/A |
| q) any other information requested by the competent authority. | N/A |
| 2) Where a government notice *gazetted* by the Minister provides for any protocol or minimum information requirement to be applied to a specialist report, the requirements as indicated in such notice will apply. | N/A |

environmental affairs

Department:
Environmental Affairs
REPUBLIC OF SOUTH AFRICA

DETAILS OF THE SPECIALIST, DECLARATION OF INTEREST AND UNDERTAKING UNDER OATH

| | (For official use only) |
|---|---|
| File Reference Number: | |
| NEAS Reference Number: | DEA/EIA/ |
| Date Received: | |

Application for authorisation in terms of the National Environmental Management Act, Act No. 107 of 1998, as amended and the Environmental Impact Assessment (EIA) Regulations, 2014, as amended (the Regulations)

**PROJECT TITLE**

Bonsmara Solar PV Renewable Energy Facility near Kroonstad, Free State Province

**Kindly note the following:**

1. This form must always be used for applications that must be subjected to Basic Assessment or Scoping & Environmental Impact Reporting where this Department is the Competent Authority.
2. This form is current as of 01 September 2018. It is the responsibility of the Applicant / Environmental Assessment Practitioner (EAP) to ascertain whether subsequent versions of the form have been published or produced by the Competent Authority. The latest available Departmental templates are available at https://www.environment.gov.za/documents/forms.
3. A copy of this form containing original signatures must be appended to all Draft and Final Reports submitted to the department for consideration.
4. All documentation delivered to the physical address contained in this form must be delivered during the official Departmental Officer Hours which is visible on the Departmental gate.
5. All EIA related documents (includes application forms, reports or any EIA related submissions) that are faxed; emailed; delivered to Security or placed in the Departmental Tender Box will not be accepted, only hardcopy submissions are accepted.

**Departmental Details**

**Postal address:**
Department of Environmental Affairs
Attention: Chief Director: Integrated Environmental Authorisations
Private Bag X447
Pretoria
0001

**Physical address**:
Department of Environmental Affairs
Attention: Chief Director: Integrated Environmental Authorisations
Environment House
473 Steve Biko Road
Arcadia

Queries must be directed to the Directorate: Coordination, Strategic Planning and Support at:
Email: EIAAdmin@environment.gov.za

## 1. SPECIALIST INFORMATION

| | | | | |
|---|---|---|---|---|
| Specialist Company Name: | SRK Consulting (South Africa) (Pty) Ltd | | | |
| B-BBEE | Contribution level (indicate 1 to 8 or non-compliant) | 1 | Percentage Procurement recognition | 125% |
| Specialist name: | Kelly Armstrong | | | |
| Specialist Qualifications: | BSocSc (Hons) Environmental Science | | | |
| Professional affiliation/registration: | N/A | | | |
| Physical address: | 183 Main Road, Albion Spring Close, Rondebosch, 7700 | | | |
| Postal address: | Postnet Suite #206, P. Bag X18, Rondebosch, 7701 | | | |
| Postal code: | 7700 | Cell: | 076 114 9254 | |
| Telephone: | 021 659 3060 | Fax: | 086 530 7003 | |
| E-mail: | karmstrong@srk.co.za | | | |

## 2. DECLARATION BY THE SPECIALIST

I, ____Kelly Armstrong________________________________, declare that –

- I act as the independent specialist in this application;
- I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
- I declare that there are no circumstances that may compromise my objectivity in performing such work;
- I have expertise in conducting the specialist report relevant to this application, including knowledge of the Act, Regulations and any guidelines that have relevance to the proposed activity;
- I will comply with the Act, Regulations and all other applicable legislation;
- I have no, and will not engage in, conflicting interests in the undertaking of the activity;
- I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing - any decision to be taken with respect to the application by the competent authority; and - the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;
- all the particulars furnished by me in this form are true and correct; and
- I realise that a false declaration is an offence in terms of regulation 48 and is punishable in terms of section 24F of the Act.

Signature of the Specialist

SRK Consulting (South Africa) (Pty) Ltd

Name of Company:

Date:

## 3. UNDERTAKING UNDER OATH/ AFFIRMATION

I, _____ Kelly Armstrong _________________, swear under oath / affirm that all the information submitted or to be submitted for the purposes of this application is true and correct.

Signature of the Specialist

SRK Consulting (South Africa) (Pty) Ltd

Name of Company

Date

Signature of the Commissioner of Oaths

Date

# Bonsmara Solar PV (RF) (Pty) Ltd

# Bonsmara Solar PV Facility near Kroonstad, Free State Province

# Visual Impact Assessment

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# Glossary of Terms

This list contains definitions of symbols, units, abbreviations, and terminology that may be unfamiliar to the reader.

| | |
|---|---|
| After-image | Visual illusion that refers to an image continuing to appear after exposure to the original image as ceased. |
| Azimuth Angle | Direction (in degrees) measures clockwise from true north. |
| Glint | A momentary flash of bright light caused by a reflection of light off a surface. |
| Glare | A continuous source of bright light. |
| Landscape Integrity | The compatibility of the development/visual intrusion with the existing landscape. |
| Sense of Place | The identity of a place related to uniqueness and/or distinctiveness. Sometimes referred to as genius loci meaning 'spirit of the place'. |
| Viewshed | The topographically defined area from which the project could be visible. |
| Visibility | The area from which the project components would actually be visible and which depends upon topography, vegetation cover, built structures and distance. |
| Visual Absorption Capacity | The potential for the area to conceal the proposed development. |
| Visual Character | The elements that make up the landscape including geology, vegetation and land-use of the area. |
| Visual Exposure | The zone of visual influence or viewshed. Visual exposure tends to diminish exponentially with distance. |
| Visual Impact | A change to the existing visual, aesthetic or scenic environment, either adverse or beneficial, that is directly or indirectly due to the development of the project and its associated activities. |
| Visual Intrusion | The effect of the artificial insertion (construction) of an object into a landscape, typically – but not always - reducing the visual quality of the environment, and sense of place. |
| Visual Obtrusion (or Obstruction) | The effect of the artificial insertion (construction) of an object into a landscape, typically blocking and/or foreshortening views. |
| Visual Quality | The experience of the environment with its particular natural and cultural attributes. |
| Visual Receptors | Potential viewers (individuals or communities) who are subjected to the visual influence of a project. |

## List of Abbreviations

| | |
|---|---|
| BESS | Battery Energy Storage System |
| Bonsmara Solar PV | Bonsmara Solar PV (RF) (Pty) Ltd |
| CSP | Concentrated Solar Power |
| DEA&DP | Department of Environmental Affairs and Development Planning |
| DFFE | Department of Forestry, Fisheries and the Environment |
| EA | Environmental Authorisation |
| EIA | Environmental Impact Assessment |
| EMPr | Environmental Management Programme |
| mamsl | Metres Above Mean Sea Level |
| MW | Megawatt |
| NEMA | National Environmental Management Act 107 of 1998 |
| PV | Photovoltaic |
| REDZ | Renewable Energy Development Zone |
| SiVEST | SiVEST Environmental |
| SRK | SRK Consulting (South Africa) (Pty) Ltd |
| ToR | Terms of Reference |
| VAC | Visual Absorption Capacity |
| VIA | Visual Impact Assessment |
| VP | Viewpoint |
| WEF | Wind Energy Facility |

# Bonsmara Solar PV (RF) (Pty) Ltd

# Bonsmara Solar PV Facility near Kroonstad, Free State Province

# Visual Impact Assessment

## 1. INTRODUCTION

Bonsmara Solar PV (RF) (Pty) Ltd proposes to develop the 100 MW Bonsmara Solar Photovoltaic (PV) Facility, Battery Energy Storage System (BESS) and associated infrastructure on a site approximately 12 km south-east of the town of Kroonstad, in the Free State Province (the project -Figure 1-1). The PV facility and BESS will be located on Portion 0 of Farm 636 and Portion 1 of Farm 636 located in the Moqhaka Local Municipality, in the Fezile Dabi District Municipality. Two powerline alternatives are proposed: Powerline Alternative 1 will be ~2 km long and connects to the Kroonstad Switching Station located to the west of the site. Powerline Alternative 2 will be ~5.5 km long and will be routed northwards and connect to a new switching station (Figure 1-1).

SRK Consulting (South Africa) (Pty) Ltd (SRK) has been appointed by SiVEST Environmental (SiVEST) to undertake the Visual Impact Assessment (VIA) to inform the Environmental Impact Assessment (EIA) process required in terms of the National Environmental Management Act 107 of 1998 (NEMA), conducted by SiVEST.

### 1.1 Scope and Objectives

The primary aims of the study are to describe the visual baseline, assess the visual impacts of the project and identify effective and practicable mitigation measures. The VIA informs the EIA process required in terms of NEMA, and conducted by SiVEST.

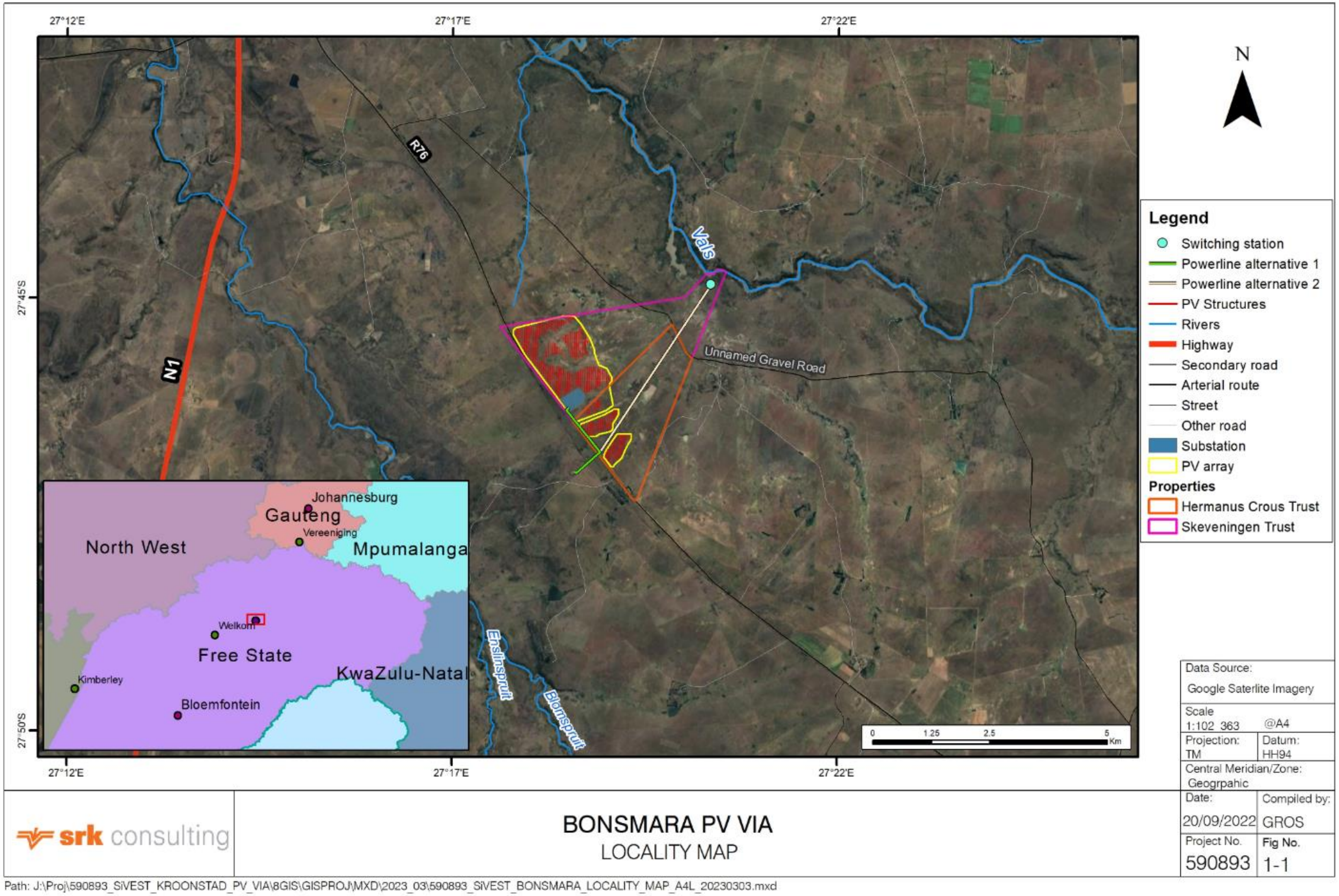


*Figure 1-1: Locality map*

## 1.2 Terms of Reference

The Terms of Reference (ToR) for the study are as follows:

- Describe the baseline visual characteristics of the study area, including landform, visual character and sense of place, and place this in a regional context;
- Identify potential impacts of the project on the visual environment through analysis and synthesis of the following factors:
    - Visual exposure;
    - Visual absorption capacity (VAC);
    - Sensitivity of viewers (visual receptors);
    - Viewing distance and visibility;
    - Landscape integrity; and
    - Solar reflection.
- Model the glare generated by the proposed PV array[1];
- Assess potential the impacts of the project on the visual environment and sense of place using SiVEST's impact assessment methodology (see Appendix B);
- Identify and assess the direct, indirect and cumulative impacts (pre- and post-mitigation) of the proposed project (and alternatives, if applicable) on visual resources in relation to other proposed and existing developments in the surrounding area;
- Compile a report compliant with Appendix 6 of the EIA Regulations and any relevant legislation and guidelines; and
- Recommend practicable mitigation measures to avoid and/or minimise impacts and/or optimise benefits.

## 1.3 Specialist Credentials

The VIA was conducted by staff listed in Table 1-1.

*Table 1-1: VIA staff*

| Staff | Role | Qualification |
|---|---|---|
| Christopher Dalgliesh | Project Review and Director | Chris Dalgliesh is a Partner and Principal Environmental Consultant with over 36 years' experience, primarily in South Africa, Southern Africa, West Africa and South America (Suriname). Chris has worked on a wide range of projects, notably in the natural resources, Oil & Gas, waste, infrastructure (including rail and ports) and industrial sectors. He has managed and regularly reviews Visual Impact Assessments. He has directed and managed numerous Environmental |

[1] The simulation predicts the number of minutes of glare experienced by receptors. Due to the momentary nature of glint, it cannot be meaningfully modelled.

| | | |
|---|---|---|
| | | and Social Impact Assessments (ESIAs) and associated management plans, in accordance with international standards. He regularly provides high level review of ESIAs, frequently directs Environmental and Social Due Diligence studies for lenders, and also has a depth of experience in Strategic Environmental Assessment, State of Environment Reporting and Resource Economics. He holds a BBusSci (Hons) and M Phil (Env) and is a registered Environmental Assessment Practitioner. |
| Kelly Armstrong | Specialist Consultant | Kelly Armstrong is an Environmental Consultant at SRK Consulting. She has five years' experience in managing Basic Assessment, Environmental Impact Assessment and Water Use Authorisation processes and acting as an Environmental Control Officer in the renewable energy, residential, aquaculture, marine and mining sectors. She also manages and contributes to Visual Impact Assessments for infrastructure, renewable energy and mining projects. Kelly holds a BSocSc (Hons) in Environmental and Geographical Studies from the University of Cape Town. |

## 1.4 Assessment Methodology

Visual impacts are a function of the physical transformation of a landscape on account of the introduced object, and the experiential perceptions of viewers.

Given the subjective nature of visual issues, assessing the visual impacts of a project in absolute and objective terms is not achievable. Thus, qualitative as well as quantitative techniques are required.

In this VIA, emphasis has therefore been placed on ensuring that the methodology and rating criteria are clearly stated and transparent. The focus of the study is to determine the character and sensitivity of the visual environment, identify visual receptors and viewing corridors and identify and assess potential visual (including glint and glare) impacts and mitigation measures. Glint and glare are defined as follows:

- Glint: A momentary flash of bright light caused by a reflection of light off a surface; and
- Glare: A continuous source of bright light.

Glare is the more likely and, arguably, more pertinent impact. Impact assessment ratings are motivated and, where possible, assessed against explicitly stated and objective criteria.

### *1.4.1 Approach*

The approach adopted for the VIA is intended to be as accurate and thorough as possible. Analytical techniques are selected to endorse the reliability and credibility of the assessment.

The approach to and reporting of the VIA study comprises three major, phased elements (as summarised in Figure 1-2 below):

- Description of the visual context;
- Identification and discussion of the potential visual (including glint and glare) impacts; and
- Assessment of those potential impacts.

Visual impacts are assessed as one of many interrelated effects on people (i.e. the viewers and the impact of an introduced object into a particular view or scene) (Young, 2000). In order to assess the visual impact the project has on the affected environment, the visual context (baseline) in which the project is located must be described. The inherent value of the visual landscape to viewers is informed by geology / topography, vegetation and land-use and is expressed as Visual Character (overall impression of the landscape), Visual Quality (how the landscape is experienced) and Sense of Place (uniqueness and identity).

Visual impact is measured as the change to the existing visual environment caused by the project as perceived by the viewers (Young, 2000). The visual impact(s) may be negative, positive or neutral (i.e. the visual quality is maintained). The magnitude or intensity of the visual impacts is determined through analysis and synthesis of the VAC of the landscape (potential of the landscape to absorb the project), zone of visual influence or exposure, visibility (viewing distances), compatibility of the project with landscape integrity (congruence), the sensitivity of the viewers (receptors) and the duration and intensity of glare.

Sources of visual impacts are identified for the construction, operational and decommissioning phases of the project. The significance of those visual impacts is then assessed using the prescribed impact rating methodology, which includes the rating of:

- Impact consequence, determined by extent, duration and magnitude/intensity of impact (see above);
- Impact probability;
- Impact significance, determined by combining the ratings for consequence and probability; and
- Confidence in the significance rating.

The significance rating methodology is described in more detail in Appendix B.

Mitigation measures recommended to avoid and/or reduce the significance of negative impacts, or to optimise positive impacts, are identified for the project. Impact significance is re-assessed assuming the effective implementation of mitigation measures.

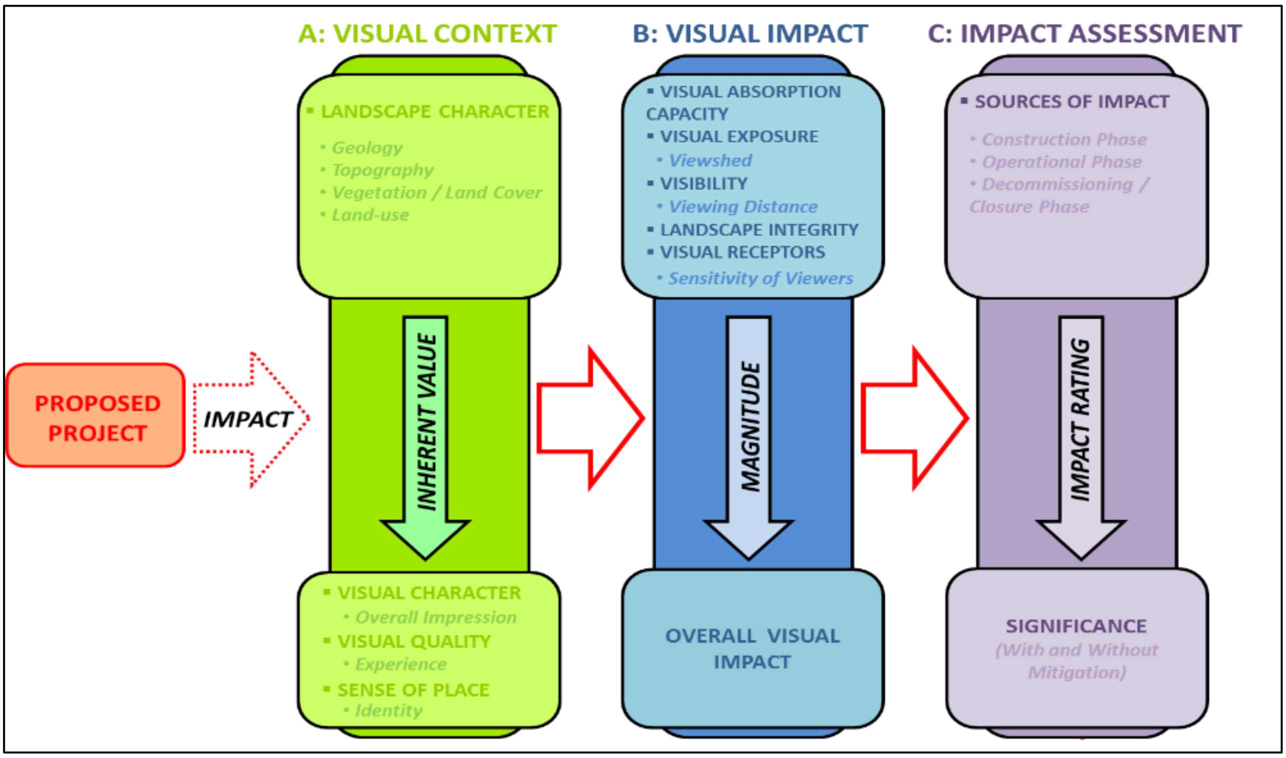


*Figure 1-2: Approach to and method for the VIA*

### *1.4.2 Method*

The following method was used to assess the visual context (baseline) for the project:

1. Describe the project using information supplied by the proponent and EIA team;
2. Collect and review visual data, including data on topography, vegetation cover, land-use and other background information;
3. Undertake fieldwork, comprising a reconnaissance of the study area, particularly the project site and key viewpoints. The objectives of the fieldwork were to:

- Familiarise the specialist with the site and its surroundings;
- Identify key viewpoints / corridors; and
- Determine and groundtruth the existing visual character and quality in order to understand the sensitivity of the landscape.

  Visual 'sampling' using photography was undertaken to illustrate the likely zone of influence and visibility. The location of the viewpoints was recorded with a GPS;

4. Undertake a mapping exercise to define the visual character of the study area; and
5. Identify sensitive receptors.

The following method was used to assess the visual impact of the project:

1. Determine the visual zone of influence or exposure by superimposing the proposed development on aerial imagery, and verified during the site visit;
2. Make field observations at key viewpoints to determine the likely distance at which visual impacts will become indistinguishable;
3. Conduct glare modelling to simulate receptors' potential exposure to (and duration of) glare from the PV panels, if any;
4. Rate impacts on the visual environment and sense of place based on professional opinion and the prescribed impact rating methodology;
5. Recommend practicable mitigation measures to avoid and/or minimise impacts; and
6. Provide environmental management measures to be included in the Environmental Management Programme for the project (EMPr).

#### *1.4.2.1 Glare Analysis Methodology*

Glare can be modelled geometrically to accurately predict whether reflection will be experienced by receptors using the following parameters:

- The earth's orbit around the sun;
- The earth's rotation and orientation;
- The location of the PV array;

- The orientation of the PV panels and the azimuth angle[2]; and,
- Local topography including (comparative) receptor and PV array heights above mean sea level.

The glare model provides a quantified assessment of:

- When and where glare will occur throughout the year for a prescribed PV installation; and
- Intensity of the effects on the human eye at those locations where glare occurs.

ForgeSolar's GlareGauge modelling software was used to model the anticipated intensity and duration of glare from the PV array. Guidelines informing the glint and glare modelling and analysis are further discussed in Section 4. The results of the glare analysis are detailed in Section 6.6.

#### *1.4.3 Site Visit and Data Acquisition*

A site visit was undertaken on 13 September 2022. The site visit duration and timing were appropriate to provide the specialist with a representative impression of the site and surroundings.

The following additional information sources were used:

- Maps indicating the location and layout of the project;
- Topographic data, including spatial files with 5 m contours obtained from the Department of Rural Development and Land Reform;
- Aerial images; and
- Other available data on geology, vegetation, land use, receptors etc.

The information is sufficiently recent and detailed to provide appropriate inputs into the VIA.

## 2. ASSUMPTIONS AND LIMITATIONS

As is standard practice, the VIA is based on a number of assumptions and is subject to certain limitations, which should be borne in mind when considering information presented in this report. These assumptions and limitations include:

- VIA is not, by nature, a purely objective, quantitative process, and depends to some extent on subjective judgments. Where subjective judgments are required, appropriate criteria and motivations for these have been clearly stated;
- The study is based on technical information supplied to SRK, which is assumed to be accurate. This includes the proposed locations, dimensions and layouts of the project components;
- This study conservatively assumes that three clusters of PV arrays, occupying ~326 ha, will be developed;
- The glare analysis does not account for smaller physical obstructions between the PV panels and the receptors (e.g. buildings or tree cover);
- The glare analysis assumes clear, sunny skies year-round;

[2] Direction (in degrees) measures clockwise from true north.

- The PV array tracking model assumes the modules move instantaneously when tracking the sun, and when reverting to the rest position;
- The study area is defined as the area within a 5 km radius of the site, as the visual impact beyond this distance is considered negligible; and
- This study does not provide motivation for or against the project, but rather seeks to give insight into the visual character and quality of the area, its VAC and the potential visual (including glint and glare) impacts of the project.

The findings of the VIA are not expected to be affected by these assumptions and limitations.

# 3. TECHNICAL DESCRIPTION

This section provides a concise description of the proposed project as provided at the time of assessment, focusing on elements relevant to the VIA.

## 3.1 Project Location

Bonsmara Solar PV (RF) (Pty) Ltd (Bonsmara Solar PV) is proposing the construction of the 100MW Bonsmara PV Facility, BESS and associated infrastructure, ~12km south-east of Kroonstad, in the Free State Province (the facility - Figure 1-1). The facility will occupy a footprint of ~326 ha and will be located on Portion 0 of Farm 636 and Portion 1 of Farm 636 located in the Moqhaka Local Municipality, in the Fezile Dabi District Municipality. Two powerline alternatives are proposed for evacuating the power to the grid. These alternatives are discussed in Section 3.2.2 below.

The project is located over the following farm portions as detailed in Table 3-1 and Table 3-2 below.

*Table 3-1: Affected properties for the PV facility*

| Farm Name | SG Code |
|---|---|
| Farm Scheveningen No. 636 Portion 0 | F02000000000063600000 |
| Farm Scheveningen No. 636 Portion 1 | F02000000000063600001 |

*Table 3-2: Affected properties for the 132 kV powerline*

| Farm Name | SG Code |
|---|---|
| Farm Scheveningen No. 636 Portion 0 | F02000000000063600000 |
| Farm Scheveningen No. 636 Portion 1 | F02000000000063600001 |

This project is not located within one of the 11 designated Renewable Energy Development Zones (REDZ) in South Africa. The REDZ are geographically defined areas in which the South African Government has encouraged the development of PV and wind renewable energy projects by promulgating a streamlined authorisation approach. As such, the REDZ have become areas in which the development of PV projects is considered more acceptable, though sites outside REDZ are not precluded.

### *3.1.1 Location Alternatives*

No other location alternatives are being considered. The site is located approximately 2 km from a grid connection point that has been confirmed to have sufficient capacity to evacuate the generated electricity. The land has been confirmed as available by private landowners. A prefeasibility study by an agricultural specialist found the site to be suitable in terms of agricultural sensitivity.

## 3.2 Project Description

The 100 MW PV facility will comprise several arrays of PV panels, BESS and associated infrastructure. An on-site substation and a 132 kV powerline will evacuate the power to the grid.

Preliminary PV facility components include:

- PV modules and mounting structures (monofacial or bifacial) with single axis tracking mounting structures;
- Associated stormwater management infrastructure;
- BESS;
- Site and internal access roads (up to 6 m wide);
- Temporary laydown area during the construction phase for the construction camp and laydown area (which will be a permanent laydown area for the BESS during the operational phase);
- Infrastructure including offices, operational control centre, operation and maintenance area, ablution facilities etc;
- Grid connection infrastructure including medium-voltage cabling between the project components and the facility substation (underground cabling will be used where practical (up to 33 kV));
- Perimeter fencing; and
- Rainwater and/or groundwater storage tanks and associated water transfer infrastructure.

The on-site 33 kV/132 kV substation (facility substation) will step up power from 33 kV to 132 kV for transmission to the national grid. The power will then be evacuated to the national grid by one of the two alternative 132 kV powerlines proposed. A 300 m powerline corridor was assessed (150 m on either side) for both powerline alignment alternatives.

### *3.2.1 Technology Alternatives*

No other activity alternatives are being considered. Concentrated Solar Power (CSP) technology has not been considered suitable for this site because it requires a flat surface, has a high visual impact and requires large volumes of water. In addition, CSP has not been catered for in the IRP2019.

A wind energy facility has not been considered as a technology alternative, as the climatic conditions show that wind resources in the area are not suitable.

### *3.2.2 Layout Alternatives*

The BESS, laydown area and substation are optimally located in the south-east corner of the site closest to the grid connection point and access road.

Two powerline alternatives are proposed. Powerline Alternative 1 will be ~2 km and follows the shortest route to the grid connection point: being routed adjacent the R76 for ~1 km, then southwest to the Kroonstad Switching Station. Powerline Alternative 1 will be routed adjacent to an existing 132 kV powerline. Powerline Alternative 2 will be routed north for ~5.5 km, between the two eastern PV clusters, towards the Vals River where it will connect to a new switching station (Figure 1-1).

### *3.2.3 No Go Alternative*

The 'no-go' alternative is the option of not undertaking the development of the proposed PV facility and / or grid connection infrastructure. Hence, if the 'no-go' option is implemented, there would be no development. The 'no-go' option assumes that the site remains in its current state and the status quo would be preserved.

This alternative would result in no environmental impacts from the proposed project on the site or the surrounding local area. It provides the baseline against which other alternatives are compared and will be considered throughout the report.

## 4. LEGAL REQUIREMENTS AND GUIDELINES

Relevant guidelines that provide direction for visual assessment include the Department of Environmental Affairs and Development Planning's (DEA&DP) "Guideline for Involving Visual and Aesthetic Specialists in EIA Processes" (DEA&DP, 2005), the Landscape Institute's "Guidelines for Landscape and Visual Impact Assessments" (2013), and Germany's Federal Ministry of the Environment's Light Guidelines (Licht-Leitlinie) (2014) which have been considered in this VIA.

DEA&DP's Guideline (2005) identifies typical components of a visual study:

- Identification of issues and values relating to visual, aesthetic and scenic resources through involvement of stakeholders;
- Identification of landscape types, landscape character and sense of place, generally based on geology, landforms, vegetation cover and land use patterns;
- Identification of viewsheds, view catchment area and the zone of visual influence, generally based on topography;
- Identification of important viewpoints and view corridors within the affected environment, including sensitive receptors;
- Indication of distance radii from the proposed project to the various viewpoints and receptors;
- Determination of the VAC of the landscape, usually based on topography, vegetation cover or urban fabric in the area;
- Determination of the relative visibility, or visual intrusion, of the proposed project;
- Determination of the relative compatibility or conflict of the project with the surroundings; and
- A comparison of the existing situation with the probable effect of the proposed project.

Projects that warrant a visual specialist study include those:

- Located in a receiving environment with:
  - Protection status, such as national parks or nature reserves;
  - Proclaimed heritage sites or scenic routes;
  - Intact wilderness qualities, or pristine ecosystems;
  - Intact or outstanding rural or townscape qualities;
  - A recognized special character or sense of place;
  - Outside a defined urban edge line;
  - Sites of cultural or religious significance;
  - Important tourism or recreation value;
  - Important vistas or scenic corridors;
  - Visually prominent ridgelines or skylines; and/or
- Where the project is:
  - High intensity, including large-scale infrastructure;
  - A change in land use from the prevailing use;
  - In conflict with an adopted plan or vision;
  - A significant change to the fabric and character of the area;
  - A significant change to the townscape or streetscape;
  - A possible visual intrusion in the landscape; or
  - Obstructing views of others in the area.

In terms of the guideline, the proposed PV facility and associated infrastructure can be classified as a Category 5 development, which includes powerlines and large-scale infrastructure. As the project is situated in an area of medium scenic, cultural, and historical significance, a high visual impact is expected (see Table 4-1), since the project introduces:

- Potential intrusion on protected landscapes or scenic resources;
- Noticeable change in the visual character of the area; and
- Establishes a new precedent for development in the area.

Such a project typically warrants a Level 4 assessment (see Table 4-2), which includes the following generic steps:

- Identification of issues and site visit;
- Description of receiving environment and proposed project;
- Establishment of view catchment area, view corridors, viewpoints and receptors;
- Indication of potential visual impacts using established criteria;
- Inclusion of potential lighting impacts at night;

- Description of alternatives, mitigation measures and monitoring programmes; and
- Completion of 3D modelling and simulations, with and without mitigation.

*Table 4-1: Expected visual impact significance*

| **Type of environment** | **Type of development** | | | | |
|---|---|---|---|---|---|
| | **Cat 1** | **Cat 2** | **Cat 3** | **Cat 4** | **Cat 5** |
| Protected / wild areas | Moderate | High | High | Very high | Very high |
| High scenic, cultural, historical value | Minimal | Moderate | High | High | Very high |
| Medium scenic, cultural, historical value | Little or none | Minimal | Moderate | High | **High** |
| Low scenic, cultural, historical value / disturbed | Little or none Possible benefits | Little or none | Minimal | Moderate | High |
| Disturbed or degraded sites | Little or none Possible benefits | Little or none Possible benefits | Little or none | Minimal | Moderate |

*Table 4-2: Recommended approach for visual assessment*

| **Approach** | **Type of issue expected** | | | | |
|---|---|---|---|---|---|
| | **Little or no visual impact** | **Minimal visual impact** | **Moderate visual impact** | **High visual impact** | **Very high visual impact** |
| Level of visual impact recommended | Level 1 visual input | Level 2 visual input | Level 3 visual assessment | **Level 4 visual assessment** | |

Glint and glare (also referred to as solar reflection) analyses are required for projects anticipated to cause visual discomfort to surrounding receptors (particularly aviation activity, motorists and residents). PV panels vary in their reflectivity with none absorbing 100% of the incoming light, thus leading to solar reflection which may be experienced by receptors. Glint and/or glare can only be experienced by receptors with a direct line of sight to the PV array. Whether a receptor experiences glint or glare depends on the receptor's location and movement in relation to the PV panels.

Several countries, including South Africa, require Glint and Glare Impact Assessments for certain projects, *inter alia,* PV projects located in close proximity to aircraft approach and take-off centrelines, an aerodrome or helistop[3]. However, few authorities have released content requirements or associated guidelines relating to thresholds of glare that are considered acceptable. The German Federal Ministry of the Environment has defined acceptable levels of glare as being less than 30 minutes per day or 30 hours per year (Federal Ministry of the Environment, 2014). The German guidelines have been used as a guideline for the Glint and Glare analysis in this VIA.

[3] South African Civil Aviation Authority Obstacle Notice 3/2020: Additional Requirements for Solar Project Applications.

# 5. DESCRIPTION OF THE RECEIVING ENVIRONMENT – VISUAL CONTEXT

The following description of the affected environment focuses on the Visual Character of the area surrounding and including the project (the study area) and discusses the Visual Quality and Sense of Place[4]. This baseline information provides the context for the visual analysis.

## 5.1 Landscape Character

Landscape character is the description of the pattern of the landscape, resulting from particular combinations of natural (physical and biological) and cultural (land use) characteristics. It focuses on the inherent nature of the land rather than the response of a viewer (Young, 2000).

### *5.1.1 Geology and Topography*

The geology and topography of the area, together with the temperate climate, provide the framework for the basic landscape features and visual elements of the study area.

The site is located on a relatively flat portion of land, on the crest of a hill, in an undulating landscape between the Blomspruit and Vals Rivers (Figure 5-2). The property gently slopes from ~1450 m above mean sea level (mamsl) in the south-west of the site to ~1371 mamsl in the north-east, giving the site a slightly north-eastern aspect. To the south-west of the site the hill peaks, before decreasing in elevation to ~1353 mamsl at the Blomspruit River, ~3 km from the south-western boundary of the site.

The Vals River, a tributary of the Vaal River, meanders to the north-east of the Skeveningen Trust property (Figure 5-2).

The project is underlain by the sandstones of the Normadien Formation, of the Beaufort Group.

### *5.1.2 Vegetation*

The project is located within the original extent of the Central Free State Grassland, one of the vegetation types that dominates the Dry Highveld Grassland Biome spatially. The Dry Highland Grassland Biome occurs at mid-altitudes of 1 300 – 1 600 mamsl, characterised by undulating topography with small rocky outcrops and river valleys. The biome comprises grasses (veld) and low shrubby vegetation with small clusters of trees and bushes, partially reminiscent of African savannah landscapes (Figure 5-1).

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[4] These terms are explained in the relevant sections below.

*Figure 5-1: Vegetation in the project area. Photo taken at Viewpoint (VP) 4 looking toward the project site.*

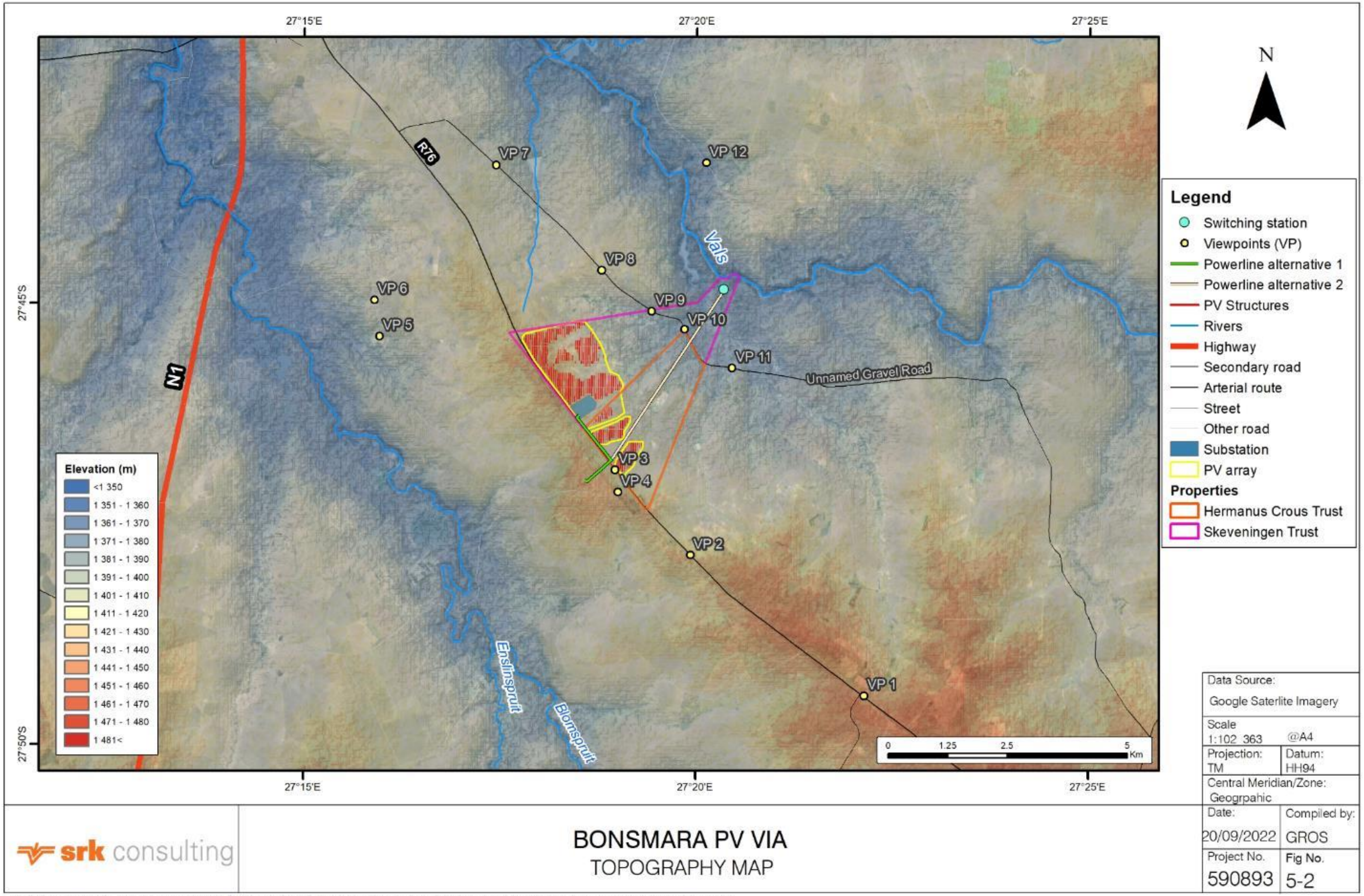



*Figure 5-2: Topographical map*

### *5.1.3 Land Use*

The highveld is home to some of South Africa's most important commercial farming areas, as well as its largest concentration of metropolitan centres. Kroonstad, located ~ 12 km north-west of the site, is the third largest city in the Free State Province. The Free State Province's key economic sectors include agriculture and mining activities, with the province producing over 70% of South Africa's grain.

The area surrounding the site is predominantly characterised by agricultural activities, small urban centres, infrastructure (roads and rail) and natural highveld grassland. Agriculture, mainly crop and cattle farming, is the predominant land use surrounding the site, with farmsteads interspersed throughout the area. National, regional and provincial roads criss-cross the region, converging in Kroonstad. A railway line runs parallel to the R76 (regional road) to the south-west of the site. An existing 132 kV powerline traverses the site in a northeasterly – southwesterly direction (Figure 5-4).

The site is located adjacent to the R76 road connecting the towns of Kroonstad and Steynrus. Surrounding land use includes:

- Agricultural activities including livestock farming (cattle and sheep (Figure 5-3));
- Farmsteads;
- Electrical grid infrastructure including a substation and powerlines (Figure 5-4);
- Serfontein Dam;
- Bossiespruit Military Base;
- Bossiespruit Shooting Range; and
- Kroonstad Airport.

*Figure 5-3: Agricultural land to the east of the site. Photo taken at VP11 looking toward the project site.*

*Figure 5-4: Existing 132 kV powerline extending across the site and over the R76. Photo taken at VP3 looking toward the project.*

The two farms that constitute the project site are undeveloped, covered in grasslands and small clusters of trees and used for grazing.

## 5.2 Visual Character

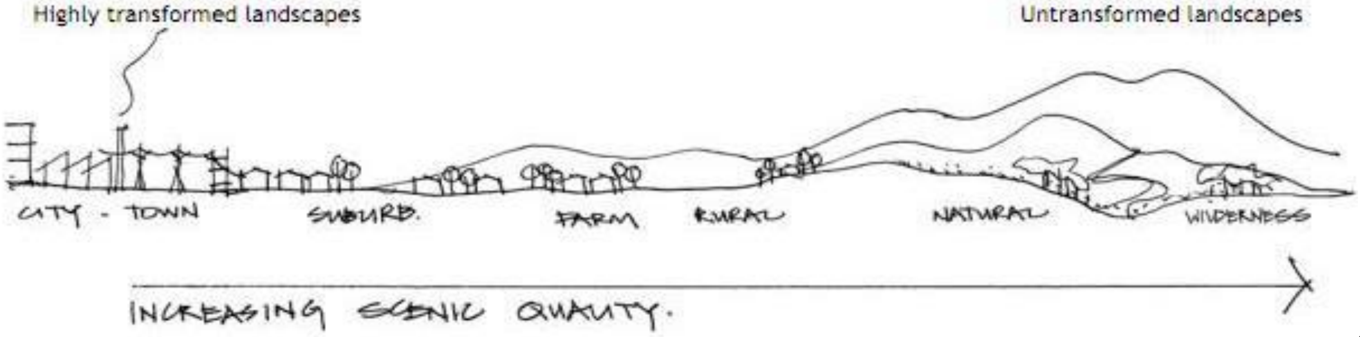
Visual character is descriptive and non-evaluative, which implies that it is based on defined attributes that are neither positive nor negative. It refers to the overall experience and impression of the landscape, such as natural or transformed.

A change in visual character cannot be described as having positive or negative attributes until the viewer's response to that change has been taken into consideration. The probable change caused by the project is assessed against the existing degree of change caused by previous development.

The basis for the visual character is provided by the topography, vegetation and land use of the area, which is a predominantly rural environment characterised by the undulating, vegetated landscape, albeit with pockets of settlements and regional and national roads routed through the surrounding area. The rolling expanse of vegetated landscape surrounding the site evokes a rural, undeveloped environment. The project area can therefore be defined as a modified rural landscape as it is mostly rural but settlements, powerlines and roads and railway are visible in the landscape (Figure 5-5 and Figure 5-6).

*Figure 5-5: Modified rural landscape*

| Highly Transformed Landscape – Urban/Industrial | Transition Landscape | Modified Rural Landscape | Natural Transition Landscape | Untransformed Landscape – Natural |
|---|---|---|---|---|
| Substantially developed landscape. High levels of visual impact associated with buildings, factories, roads and other related infrastructure (e.g. powerlines). | Transitional landscape associated with the interface between, rural, agricultural area and more developed suburban or urban zones. | Typical character is rural landscape, defined by field patterns, forestry plantations and agricultural areas and associated small-scale roads and buildings. | A changing landscape character associated with the interface between natural areas and modified rural / pastoral or agricultural zones. | No / minimal impact associated with the actions of man. National parks, coastlines, pristine forest areas. |




*Source:* (CNDV, 2006)


(Shan Ding Lu, 2009)


(Night Jar Travel South Africa, 2012)


(Boschkloof, 2012)

*Figure 5-6: Typical visual character attributes*

## 5.3 Visual Quality

Aesthetic value is an emotional response derived from our experience and perceptions. As such, it is subjective and difficult to quantify in absolute terms. Studies in perceptual psychology have shown that humans prefer landscapes with higher complexity (Crawford, 1994). Landscape quality can be said to increase when:

- Topographic ruggedness and relative relief increases;
- Water forms are present;
- Diverse patterns of grasslands, shrubs and trees occur;
- Natural landscape increases and man-made landscape decreases; and
- Where land use compatibility increases.

The visual quality of the area can be experienced through rolling views of the gentle hills in the landscape, especially from and across the site (Figure 5-7). The study area is defined by the fabric of the agricultural grazing activity taking place in the area. The naturally undulating landscape is intermittently interrupted by powerlines and railway lines which detract from the visual quality of the surrounding area. The streams, rivers and dams in the area add to the somewhat unspectacular visual quality.

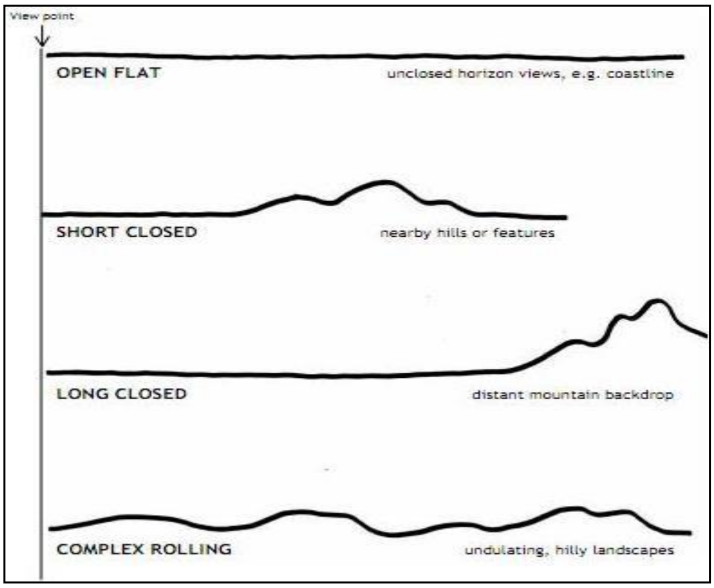



*Figure 5-7: Typical views in the landscape*

Sources: (CNDV, 2006)

*Figure 5-8: Rolling views of the undulating landscape. Photo taken from VP 8 looking toward the project site.*

## 5.4 Visual Receptors

Visual receptors have been identified based on surrounding land uses, including the residential and recreational areas (see Section 5.1.3). The visual receptors are briefly described below and linked to viewpoints (VP) indicated in Table 6-4 and Figure 6-3:

- Surrounding Residents (VP 1, VP 4 - VP 7, VP 11 - VP 12): Isolated farmsteads are interspersed throughout the area surrounding the PV facility in all directions.
- Railway Passengers and Personnel (VP 1 and VP 4): A railway line extends parallel to the R76 to the south-west of the site.
- Motorists (VP 2 - VP 3, VP 6 - VP 12): Two roads are located in close proximity to the project site; the R76 and the Unnamed Gravel Road. The south-western boundary of the site directly abuts the tarred R76[5], which extends in a north-westerly to south-easterly direction, connecting Kroonstad and Steynrus. The Unnamed Gravel Road branches off from the R76 to the north of the site, then extends in a south-easterly direction, and borders the site to the north-east.

The Serfontein Dam, Bossiespruit Shooting Range and Military Base and Kroonstad Airport were identified within ~10 km from the site. However, the viewshed (Figure 6-1), topographical map (Figure 5-2) and site verification, indicate that receptors at these locations will not have a view of the proposed facility and therefore are not considered to be visual receptors, nor considered further in this VIA.

## 5.5 Sense of Place

Our sense of a place depends not only on spatial form and quality, but also on culture, temperament, status, experience and the current purpose of the observer (Lynch, 1992). Central to the idea of 'sense of place' or *genius loci* is identity. An area will have a stronger sense of place if it can easily be identified, that is to say if it is unique and distinct from other places. Lynch defines 'sense of place' as "the extent to which a person can recognise or recall a place as being distinct from other places – as having a vivid or unique, or at least a particular, character of its own" (Lynch, 1992).

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5 At the time of the site visit, the R76 was being re-sealed.

It is often the case that sense of place is linked directly to visual quality and that areas / spaces with high visual quality have a strong sense of place. However, this is not an inviolate relationship and it is plausible that areas of low visual quality may have a strong sense of place or – more commonly – that areas of high visual quality have a weak sense of place. The defining feature of sense of place is uniqueness, generally real or biophysical (e.g. trees in an otherwise treeless expanse), but sometimes perceived (e.g. visible but unspectacular sacred sites and places which evoke defined responses in receptors). In this context Cross (2001) identified six categories of relationships with place: biographical, spiritual, ideological, narrative, cognitive and dependent (Table 5-1).

The region has scenic value in terms of its undulating natural landscape and the views over large portions of agricultural land. The natural landscape and rustic character contrast with the anthropogenic influence in the region, *viz.* urban development, albeit, some 12 km away.

*Table 5-1: Relationship to place*

| Type of Relationship | Process |
|---|---|
| Biographical<br>(historical and familial) | Being born in and living in a place. Develops over time |
| Spiritual<br>(emotional, intangible) | Feeling a sense of belonging |
| Ideological<br>(moral and ethical) | Living according to moral guidelines for human responsibility to place<br>Guidelines may be religious or secular |
| Narrative<br>(mythical) | Learning about a place through stories, family histories, political accounts and fictional accounts |
| Cognitive<br>(based on choice and desirability) | Choosing a place based on a list of desirable traits and lifestyle preferences |
| Dependent<br>(material) | Constrained by lack of choice, dependency on another person or economic opportunity |

Sources: Adapted from Cross (2001)

The sense of place of the surrounding area is strongly influenced by the surrounding land use, which can generally be described as a rural agricultural area.  The sense of place is not particularly distinct from the rest of the wider region and is not overly memorable.

The relationship of receptors in the study area (Section 5.4) to place may be predominantly biographical and dependent. A family, for example, whose has farmed in this area for a few generations will have a biographical and dependent attachment to the area.

# 6. ANALYSIS OF THE MAGNITUDE OF THE VISUAL IMPACT

The following section outlines the analysis that was undertaken to determine the **magnitude or intensity** of the overall visual impact resulting from the project. Various factors were considered in the assessment, including:

- Visual exposure;
- Visual absorption capacity;
- Sensitivity of visual receptors;
- Visibility and viewing distance;

- Integrity with existing landscape / townscape; and
- Solar reflection.

The analysis of the magnitude or intensity of the visual impact, as described in this section, is summarized and integrated in Table 6-8 and forms the basis for the assessment and rating of the impact as documented in Section 6.

## 6.1 Visual Exposure

Visual exposure is determined by the zone of visual influence or viewshed. The viewshed is the topographically defined area that includes all the major observation sites from which the project *could* be visible; it is a function of topography and the dimensions of the project *only,* but not the location of the visual receptors. The viewshed analysis assumes maximum visibility of the project in an environment stripped bare of vegetation and structures. The viewshed indicates the visibility of the project, accounting for the decrease in visibility as distance from the project increases (Figure 6-1).

It is anticipated that visibility of the PV array will be moderate due to the size and nature of the project (i.e. a large ~326 ha reflective PV array located in a rural area). It is anticipated that the BESS and on-site substation will be visible to receptors to the north-west, south-east and west of the site due to the location of this infrastructure along the south-western boundary of the site. The smaller dimensions of these components are expected to limit their visibility from across the site to the north. The visual exposure of the two powerline alternatives is likely to differ as Powerline Alternative 1 extends south-westward for 2 km and crosses the R76. Powerline Alternative 2, however, is twice as long (~5.5 km) and routed away from the R76 across the property, and towards the Unnamed Gravel Road. Furthermore, existing powerlines within close proximity to the proposed powerline routes are expected to have inured receptors to powerlines within the landscape.

The viewshed analysis shows the proposed PV array will be highly visible from R76 to transient motorists, and visible from elevated areas to the north-east, east and south of the site. Few of the isolated farmsteads surrounding the site are located within areas identified as having visibility of the site (Figure 6-4). Receptors at viewpoints to the west will not have a view of the site due to intervening topography.

Motorists on northern section of the R76 approaching the site will have a view of the project. The site will be screened to motorists approaching the site from the southern section of the R76, due to intervening topography. Along the Unnamed Gravel Road to the north of the site, the site will be visible in the middle – to background depending on their positioning on the road.

The visual exposure of proposed infrastructure is thus deemed ***moderate.***

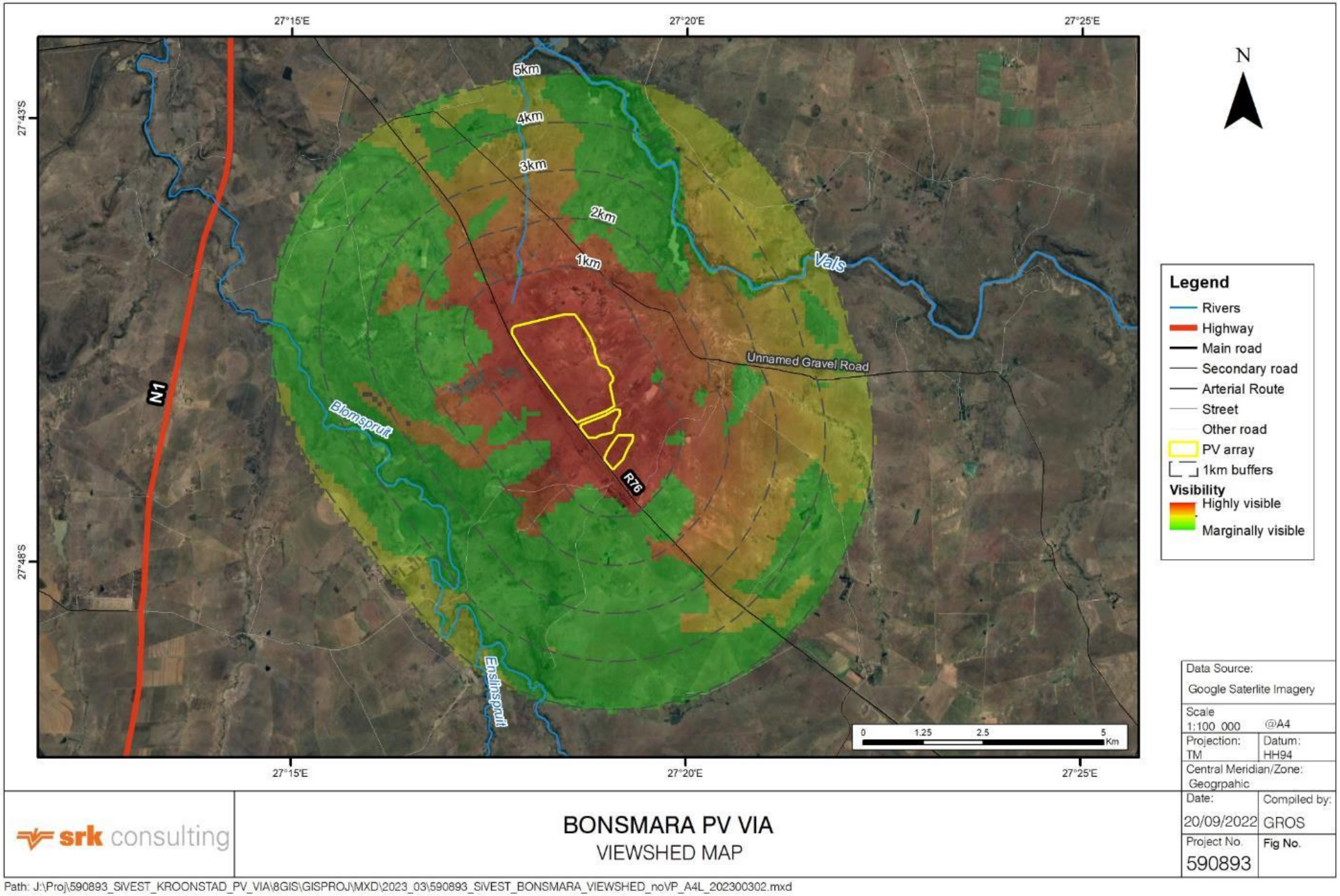



Figure 6-1: Viewshed

## 6.2 Visual Absorption Capacity

The VAC is the potential for an area to conceal and assimilate the proposed project. Criteria used to determine the VAC of the affected area are defined in Table 6-1. The VAC of an area is increased by:

1. Topography and vegetation that is able to provide screening and increase the VAC of a landscape;
2. The degree of urbanisation compared to open space. A highly urbanised landscape is better able to absorb the visual impacts of similar developments, whereas an undeveloped rural landscape will have a lower VAC; and
3. The scale and density of surrounding development.

These factors frequently apply at different scales, by influencing the VAC in the foreground (e.g. dense bush, existing roads and bridges, small structures), middleground and background (e.g. tall forests, hills, cityscapes).

Generally rural areas have a lower VAC, however the VAC of the project area is marginally increased by undulating topography and - to a far more limited extent - by grassland (veld) and small clusters of trees, providing screening to the project. The low vertical profile of the PV panels is anticipated to increase the screening potential of the vegetation and topography. However, vegetation is not able to provide screening to the associated infrastructure such as the substation and pylons (associated with the powerline). The undulating topography will marginally absorb the associated infrastructure.

Urban development can help to increase VAC, but is some distance from the project site, reducing this effect. In addition, the large ~326 ha footprint of the PV array also reduces the VAC.

The study area has a ***low*** VAC for the PV facility and a ***moderate*** VAC for the proposed powerline.

*Table 6-1: Visual absorption capacity criteria*

| High | Moderate | Low |
|---|---|---|
| The area is able to absorb the visual impact as it has:<br>▪ Undulating topography and relief<br>▪ Good screening vegetation (high and dense)<br>▪ Is highly urbanised in character (existing development is of a scale and density to absorb the visual impact). | The area is moderately able to absorb the visual impact, as it has:<br>▪ Moderately undulating topography and relief<br>▪ Some or partial screening vegetation<br>▪ A relatively urbanised character (existing development is of a scale and density to absorb the visual impact to some extent. | The area is not able to absorb the visual impact as it has:<br>▪ Flat topography<br>▪ Low growing or sparse vegetation<br>▪ Is not urbanised (existing development is not of a scale and density to absorb the visual impact to some extent.) |
| <br>http://www.franschhoek.co.za | <br>http://wikipedia.org | <br>http://www.butbn.cas.cz |
| <br>http://commons.wikimedia.org | <br>http://blogs.agu.org | <br>http://fortheinterim.com |

## 6.3 Sensitivity of Visual Receptors

Receptors are important insofar as they inform visual sensitivity. The sensitivity of viewers is determined by the number and nature of viewers.

Viewers can be deemed to have:

1. High sensitivity if they view the project from e.g. residential areas, nature reserves and scenic routes or trails;
2. Moderate sensitivity if they view the project from e.g. sporting or recreational areas or places of work; and
3. Low sensitivity if they view the project from or within e.g. industrial, mining or degraded areas, or are transient viewers on roads.

The sensitivity of potential viewers identified in Section 5.4 is described below:

- **Surrounding Residents:** Residents of the surrounding farmsteads are considered to have sensitivities ranging from low to medium depending on the proximity to the project site. Residents located more than 1km away from the site are anticipated to view the site in the background.
- **Railway passengers and personnel:** Passengers and personnel travelling by rail are anticipated to have a view of the site from certain sections of the railway route where screening by vegetation and topography does not exist. Railway passengers and personnel are considered to have relatively low sensitivity as their views of the project are transient (fleeting) and temporary.
- **Motorists:** Two roads are located in close proximity to the project site (Figure 1-1). The R76 extends in a north-westerly and south-easterly direction and is directly adjacent to the ~4 km long south-western boundary of the site. The R76 connects Kroonstad and Steynrus. Gravel roads branch off the R76 and lead to farms set back from the R76. The Unnamed Gravel Road connecting to the R76 to the north of the site, abuts to the north-eastern boundary of the property. This gravel road leads to various farms located between the R76, to the south, and the Vals River to the north (Figure 1-1).

  Motorists are considered to have relatively low sensitivity as their view of the project is fleeting and temporary.

The sensitivity of the visual receptors potentially affected by the visual impact of the project is considered to be ***moderate*** due to the distance from farmsteads, and proximity to roads and rail infrastructure. It is anticipated that the visual receptors will be more sensitive to the PV array, on-site substation and BESS than the proposed powerline due to the (familiarity with) existing powerlines in the landscape.

## 6.4 Viewing Distance and Visibility

The distance of a viewer from an object is an important determinant of the magnitude of the visual impact. This is because the visual impact of an object diminishes / attenuates as the distance between the viewer and the object increases. Thus, the visual impact at 1 000 m would, nominally, be 25% of the impact as viewed from 500 m. At 2 000 m it would be 10% of the impact at 500 m (Hull and Bishop, 1988 in (Young, 2000)).

Three basic distance categories can be defined for a project of this scale (as discussed and represented in Table 6-2): foreground, middleground and background.

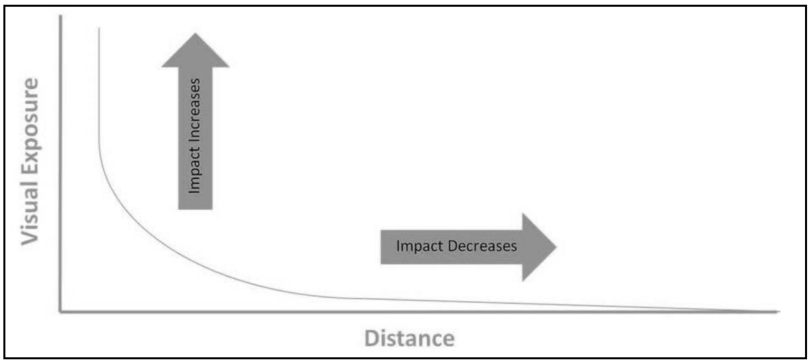



*Figure 6-2: Visual exposure vis-à-vis distance*

Sources: Adapted from Hull and Bishop, 2998 in (Young, 2000)

*Table 6-2: Distance categories*

| | |
|---|---|
| **FOREGROUND (0 – 2 km)** | The zone where the proposed project will dominate the frame of view. The project will be *highly visible* unless obscured. |
| **MIDDLEGROUND (2 - 5 km)** | The zone where colour and line are still readily discernible. The project will be *moderately visible* but will still be easily recognisable. |
| **BACKGROUND (5 -10 km)** | This zone stretches from 2 km to 5 km. Objects in this zone can be classified as *marginally visible* to *not visible*. |

A number of viewpoints were selected to indicate locations from where receptors may (or may not) view the project. The viewpoints are shown in Figure 6-3 and listed in Table 6-4. Current views from these points are shown in Appendix C.

The predicted visibility of (any element of the project) from each viewpoint is described in Table 6-4, based on visibility and the distance categories in Table 6-2. Note that unlike visual exposure (Section 6.1) which describes areas from which the project may be visible without taking local screening into account (i.e. the viewshed), visibility describes predicted, actual visibility. The visibility of the project can be summarised as follows:

- The project will be highly visible in the foreground to motorists travelling to the west of the site (VP 3);
- The project is visible to motorists, railway passengers and residents of farmsteads to the east and west of the site (VP 4, VP 8, VP 9, VP 10);
- The project will be only marginally visible due to distance and / or screening by vegetation to residents located- and motorists travelling- to the north, east and south of the site (VP 2, VP 7, VP 11); and
- The project will not be visible to surrounding residents and motorists over 3 km from the site largely due to intervening topography screening the site (VP 1, VP 5, VP 6, VP 12).

Overall, the visibility of the project is ***moderate*** due to the number of receptors in the foreground and middleground, albeit transient and temporary receptors.

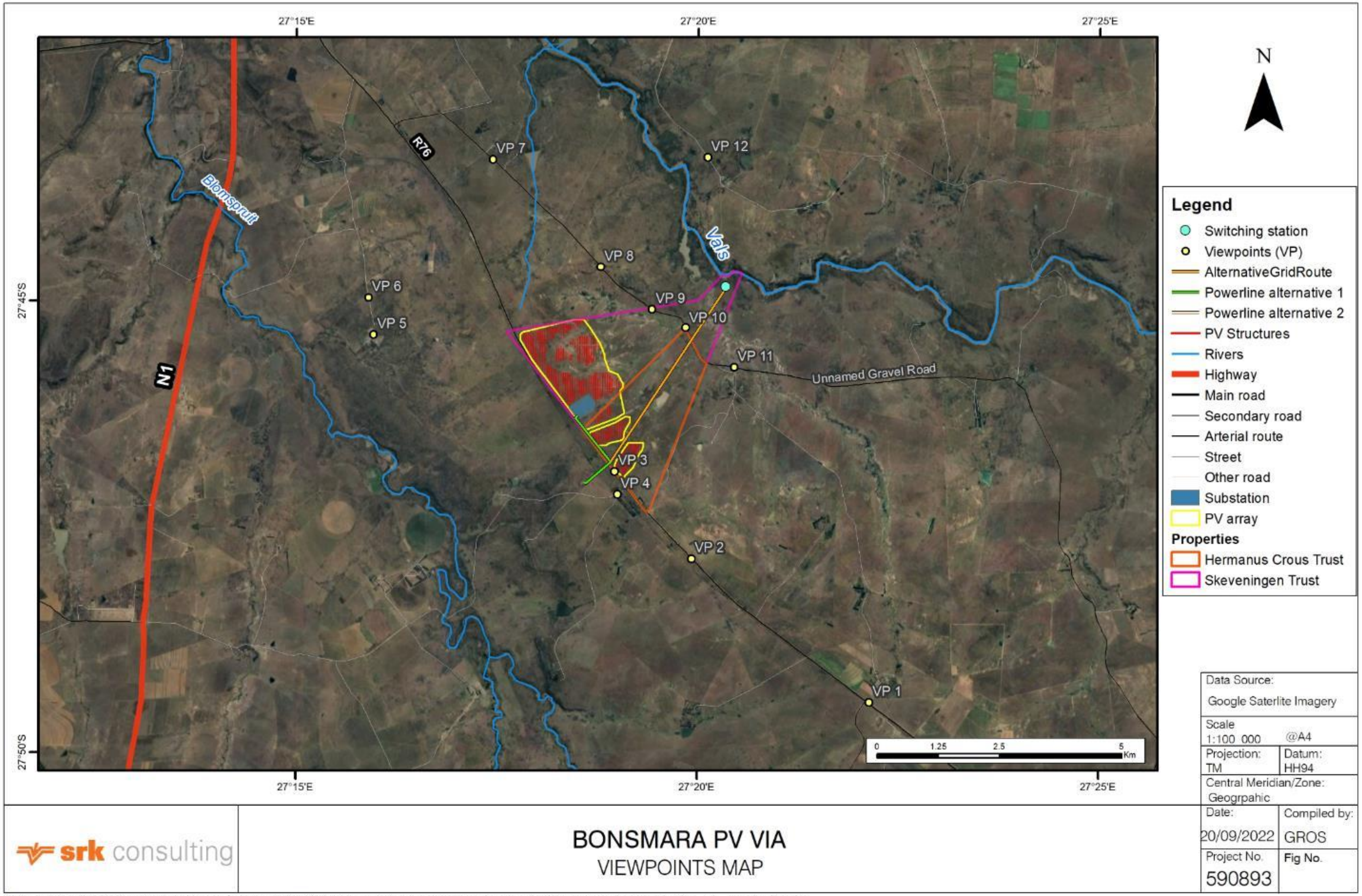
*Table 6-3: Visibility Criteria*

| | | |
|---|---|---|
| **NOT VISIBLE** | Project cannot be seen | |
| **MARGINALLY VISIBLE** | Project is only just visible / partially visible (usually in the background zone) |  |
| **VISIBLE** | Project is visible although parts may be partially obscured (usually in middleground zone) |  |
| **HIGHLY VISIBLE** | Project is clearly visible (usually in foreground or middleground zone) |  |

*Table 6-4: Visibility from viewpoints*

| Viewpoint # | Location | Co-ordinates | Direction of view | Potential Receptors | Visibility |
|---|---|---|---|---|---|
| VP 1 | Dennehof Farm | 27° 49' 25.79"S<br>27° 22' 8.58"E | Looking north-west | Farmsteads on Dennehof Farm and motorists on R76. | **Not Visible**<br>The site is visible from the farmstead and R76 due the undulating topography. |
| VP 2 | R76 south | 27° 47' 50.49"S<br>27° 19' 55.40"E | Looking north | Motorists on R76. | **Marginally Visible**<br>The site is screened by tall, mature trees, limiting visibility of the site in the background from this VP. |
| VP 3 | R76 Bonsmara | 27° 46' 52.61"S<br>27° 18' 57.81"E | Looking north-east | Motorists on R76. | **Highly Visible**<br>The site is visible to motorists in the foreground. |
| VP 4 | Patrijsdraai Farm | 27° 47' 7.95"S<br>27° 18' 59.98"E | Looking north-east | Residents of farms to the west of the R76, e.g. Patrijsdraai and individuals travelling on the railway. | **Visible**<br>The site is visible to motorists travelling to and from the farmsteads to the west and receptors travelling by train. The project will not be visible to the residents to the west of the site as they are located at a lower elevation than the site. |
| VP 5 | Farmstead 1 | 27° 45' 22.08"S<br>27° 15' 57.63"E | Looking south-east | Residents of Farmstead. | **Not Visible**<br>The site is not visible to the residents of this farmstead as it is located at a lower elevation than the site. |
| VP 6 | Lan Crest | 27° 44' 57.43"S<br>27° 15' 53.72"E | Looking south- east | Residents of Lan Crest and motorists. | **Not Visible**<br>The site is not visible to the residents or motorists as the farmstead and road are located at a lower elevation than the site |
| VP 7 | Farmstead 2 | 27° 43' 25.46"S<br>27° 17' 26.58"E | Looking south | Motorists travelling on the gravel road and residents of the farmstead in close proximity to VP 7. | **Marginally Visible**<br>The site is marginally visible to the farmstead in the background due to distance. |
| VP 8 | Unnamed Gravel Road | 27° 44' 36.89"S<br>27° 18' 47.25"E | Looking south | Motorists on unnamed gravel road. | **Visible**<br>The site is visible to the motorists in the middle and background. |
| VP 9 | Unnamed Gravel Road | 27° 45' 4.81"S<br>27° 19' 25.68"E | Looking south-west | Motorists on unnamed gravel road | **Visible**<br>The site is visible to the motorists in the middle- and background. |
| VP 10 | Unnamed Gravel Road | 27° 45' 16.95"S<br>27° 19' 50.77"E | Looking west | Motorists on unnamed gravel road. | **Visible** |

| Viewpoint # | Location | Co-ordinates | Direction of view | Potential Receptors | Visibility |
|---|---|---|---|---|---|
| | | | | | The site is visible to the motorists in the middle- and background. |
| VP 11 | Farmstead 3 | 27° 45' 43.29"S<br>27° 20' 27.21"E | Looking west | Residents of the farmstead and motorists on unnamed gravel road. | **Marginally Visible**<br>The site will be marginally visible to the motorists in the background. |
| VP 12 | Farmstead 4 | 27° 43' 23.84"S<br>27° 20' 7.01"E | Looking south-west | Residents of farmstead and motorists. | **Not Visible**<br>The site is not visible to the farmstead and motorists due to screening provided by the topography. |




Path: J:\Proj\590893_SiVEST_KROONSTAD_PV_VIA\8GIS\GISPROJ\MXD\2023_03\590893_SIVEST_BONSMARA_VIEWPOINTS_MAP_A4L_20230302.mxd

*Figure 6-3: Viewpoint map*

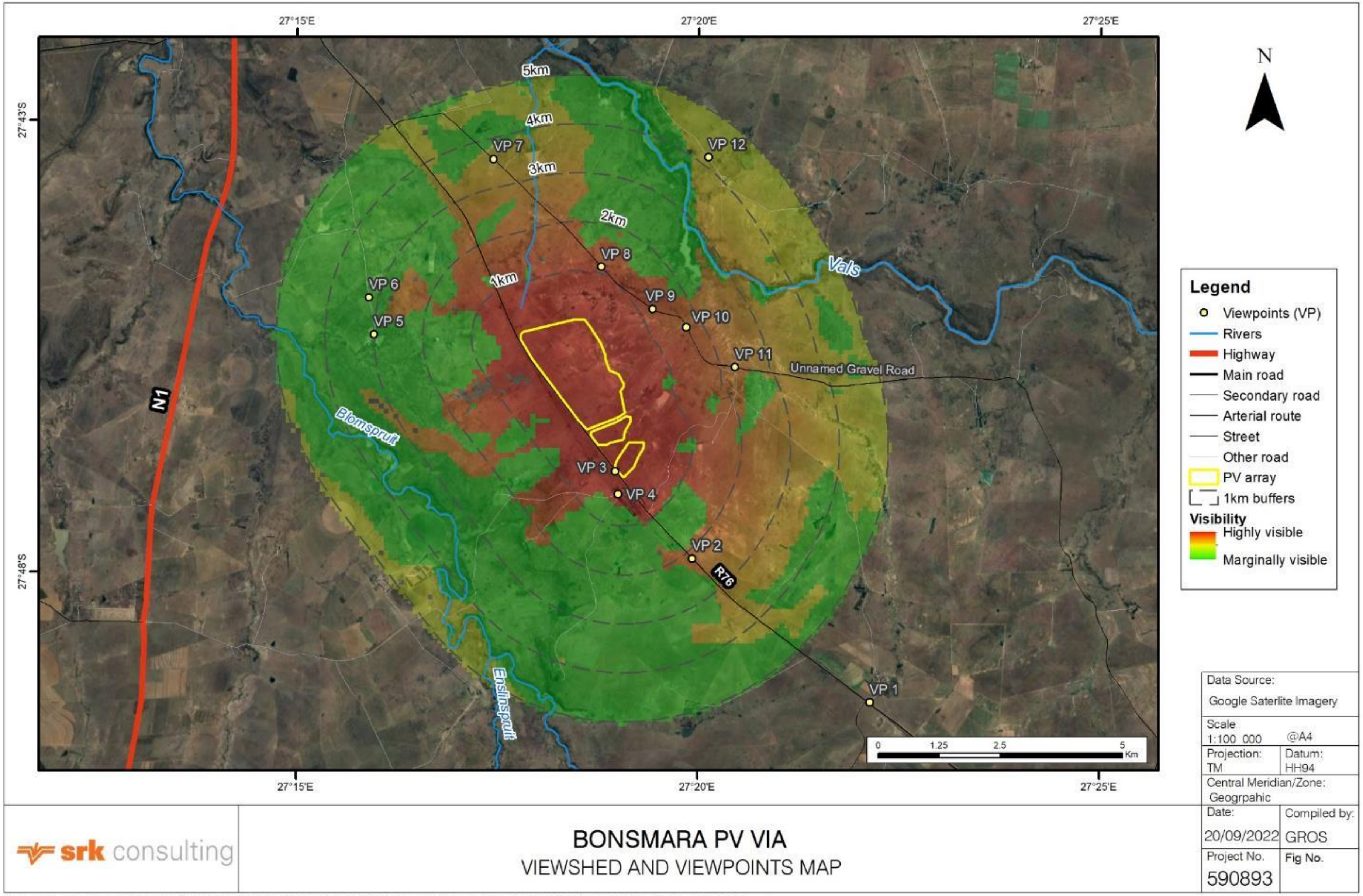



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*Figure 6-4: Viewshed and viewpoints*

## 6.5 Compatibility with Landscape Integrity

Landscape (or townscape) integrity refers to the compatibility of the development / visual intrusion with the existing landscape. The landscape integrity of the project is rated based on the relevant criteria listed in Table 6-5.

*Table 6-5: Landscape integrity criteria*

| Criterion | Landscape integrity | | |
|---|---|---|---|
| | High | Moderate | Low |
| | The project is: | | |
| Consistency with existing land use of the area | Consistent | Moderately consistent | Not consistent / very different |
| Sensitivity to natural environment | Highly sensitive | Moderately sensitive | Not sensitive |
| Consistency with urban texture and layout | Consistent | Moderately consistent | Not consistent / very different |
| Congruence of buildings / structures with / sensitivity to existing architecture / buildings | Congruent / sensitive | Moderately congruent / sensitive | Not congruent / sensitive |
| Scale and size relative to nearby existing development | Similar | Moderately similar | Different |

The proposed project is located within a rural, agricultural area with sprawling grasslands surrounding the proposed project site. A railway line extends parallel to the R76, directly adjacent to the south-western boundary of the site. Existing powerlines, of varied sizes, criss-cross the area surrounding the site, and a substation is located adjacent to the R76 ~ 3 km to the south of the site.

The proposed PV array will introduce a large, uniform, reflective facility into the area and will be discordant with the current land use, scale and texture of the surrounding area. The BESS and proposed switching station will also introduce a novel structure into the landscape that is different and incongruent to the type, size and scale of the existing land use and development in the area. However, the on-site substation and proposed 132 kV powerline will be moderately consistent and congruent with the use, texture, size and form of existing infrastructure and land use surrounding the site.

The project is deemed to have ***low*** integrity with the surrounding landscape.

## 6.6 Solar Reflection

In theory, the suite of visual receptors that may potentially be impacted by glint and glare caused by any new development may include:

- Residents;
- Motorists;
- Train drivers; and
- Pilots and air traffic controllers.

Visual receptors potentially exposed to solar reflection by this project are residents, railway passengers and personnel, and motorists (see Section 6.3).

### *6.6.1 Glare Thresholds*

The ocular (or visual) impact of glare has been categorised into the following three categories (Ho, Ghanbari, & Diver, 2011):

- Green: low potential to cause after-image;
- Yellow: potential to cause temporary after-image; and
- Red: potential to cause retinal burn (permanent eye damage)[6].

The Glare Hazard Plot (Figure 6-5) illustrates the ocular (or visual) impact of solar glare as a function of the intensity of the glare source on the retina (retinal irradiance) and the portion of a viewer's field of vision that the glare occupies (subtended source angle).

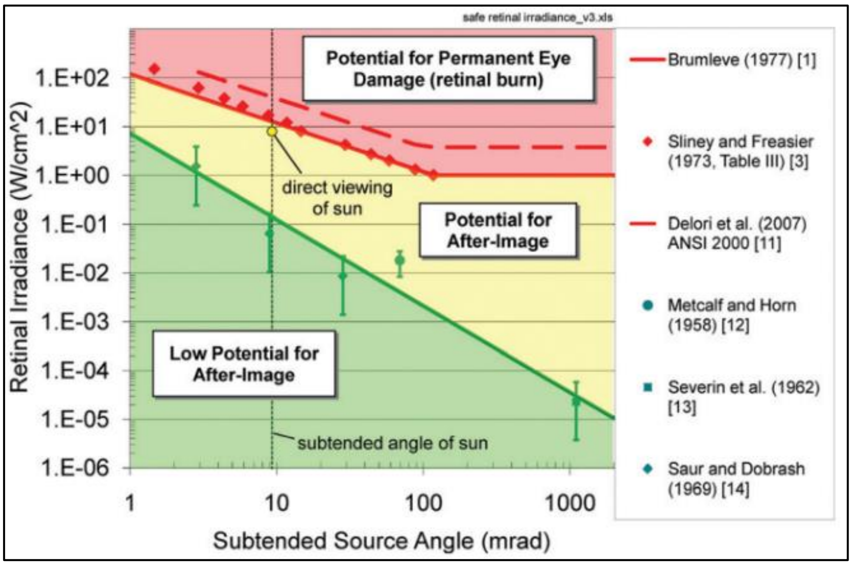


*Figure 6-5: Glare hazard plot*

Source: (Ho, Ghanbari, & Diver, 2011)

As discussed in Section 4, no content requirements or guidelines relating to glint and glare thresholds or reporting have been released by South African authorities. German guidelines on acceptable glare thresholds have been defined as less than 30 minutes per day or 30 hours per year (Federal Ministry of the Environment, 2014). When glare exceeds this threshold, glare is considered significant, and mitigation is required.

SRK's framework for assessing the magnitude of glare is based on the two categories of glare applicable to PV Facilities (Green glare and Yellow glare) in the Glare Hazard Plot (Ho, Ghanbari, & Diver, 2011) and the German guidelines (Federal Ministry of the Environment, 2014). The framework is presented in Table 6-6 below.

[6] Retinal burn is typically not possible from SPV glare as the PV panels do not focus the reflected sunlight.

*Table 6-6: Magnitude of glare impacts for PV Facilities*

| Impact | Category of Glare[7] | Duration of Glare |
|---|---|---|
| High[8] | Yellow | > 30 minutes per day **and** >30 hours per year |
| Moderate | Yellow | > 30 minutes per day **or** > 30 hours per year |
| Low | Yellow or Green | < 30 minutes per day **and** < 30 hours per year |

### *6.6.2 Modelling Glare*

Glare modelling was conducted for the proposed layout of the PV array using ForgeSolar's GlareGauge. The parameter inputs used to model glare for the proposed project are included in Table 6-7 and the GlareGauge report included in Appendix D.

*Table 6-7: Solar reflection model parameters*

| Parameter | Input |
|---|---|
| Panel height (centroid) | 2.5 m |
| Axis Tracking | Single (horizontal) |
| Tracking axis orientation | 0° |
| Tracking axis tilt | 28° |
| Tracking axis panel offset | 0° |
| Maximum tracking angle[9] | 60° |
| Resting angle | 0° |
| Panel material | Smooth glass[10] |
| Receptor height – Residents | 1.53 m |
| Receptor height – Motorists | 1 m |
| Receptor height – Rail Passengers | 2 m |

Eleven observation points representative of the isolated farmsteads around the site were modelled to ascertain whether glare would be experienced by receptors (residents) in these locations (Figure 6-6). The viewshed (Figure 6-1) indicates that farmsteads located to the north, east and south may have visibility of the PV facility, and as such, these receptors are susceptible to glare.

To the north-west, the receptors are located further away (> 3 km) from the site and are not expected to have a view of the PV facility due to screening from intervening topography: this was verified during the site visit (see Table 6-4). Therefore, these receptors will not experience glare, but were nevertheless included in the model.

Glare experienced by motorists on the R76 and Unnamed Gravel Road was modelled in both directions (two-way road) (Figure 6-6). The railway to the west of the site and the flight approach paths to the Kroonstad Airport to the north of the site were also modelled (Figure 6-6).

[7] Category of glare in terms of the Glare Hazard Plot; Red Glare, Yellow Glare and Green Glare (Ho, Ghanbari, & Diver, 2011).

[8] Exceeds the German glare guideline

[9] Maximum rotation (tracking) angle of PV modules in either direction relative to the mid-position on the torque tube.

[10] Conservative assumption that the PV modules will not have anti-glare coating.

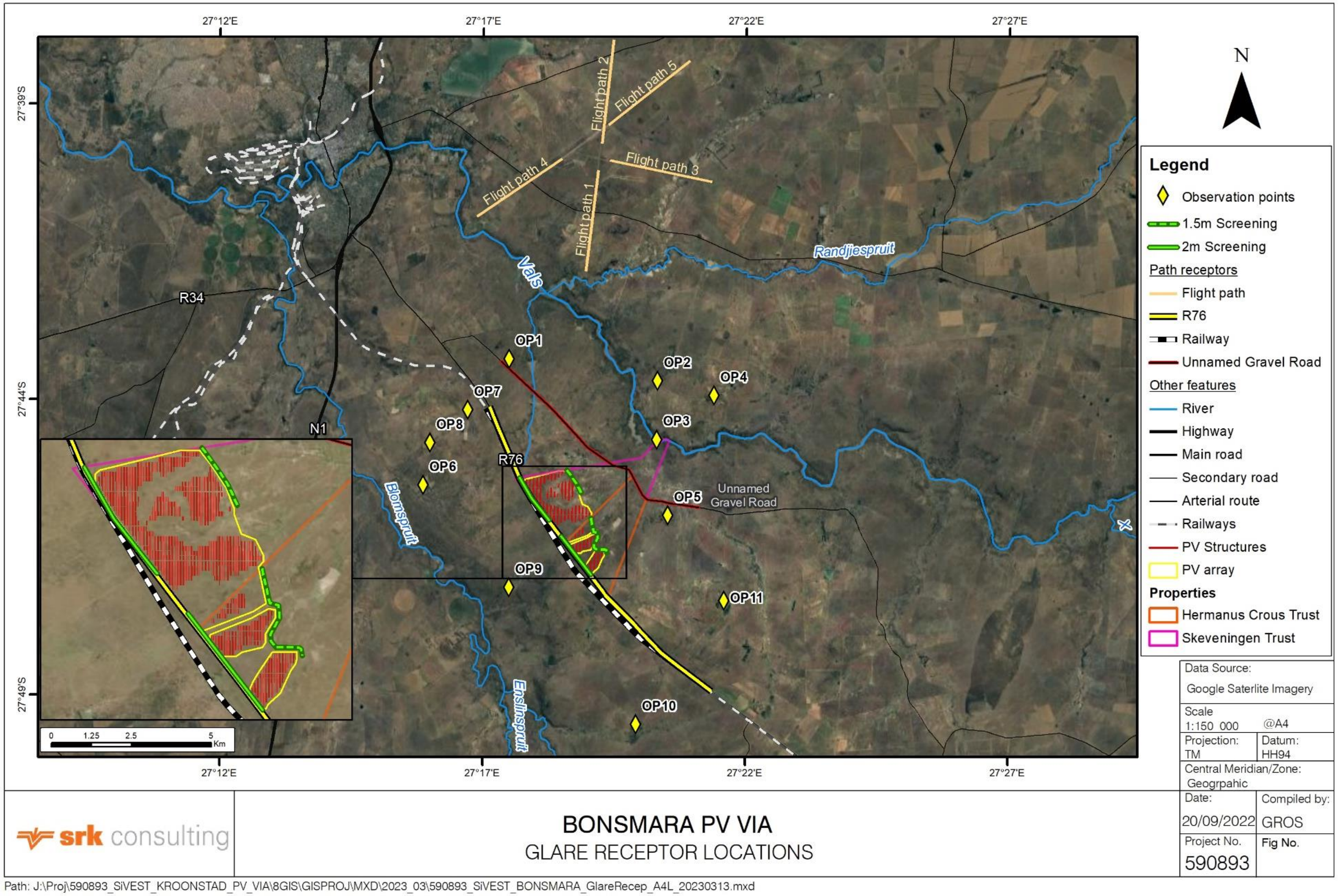


*Figure 6-6: Glare modelling receptors*

Based on the input parameters (Table 6-7) the glare analysis demonstrated that glare from the PV facilities, will be experienced by visual receptors (residents, train users and motorists). The full glare modelling report is included in Appendix D.

Notable findings from the modelling of the glare are summarised below:

- OP 3 will experience < 25 minutes of glare per day between 17h00 and 18h30 between mid October and mid- February;
- OP 5 will experience < 25 minutes of glare per day between 17h00 and 18h30 between September and April;
- Motorists on the ~ 3.5 km section of the R76 directly adjacent to the PV facility will experience glare between 06h00 and 08h00 between September and April. The duration of exposure depends on the speed of travel: at 100 km/h a period of ~2 minutes is projected;
- Motorists on a ~500 m section of the Unnamed Gravel Road will experience glare between 17h00 and 19h00 between September and April. The duration of exposure depends on the speed of travel: at 50 km/h a period of ~40 seconds is projected; and
- Rail staff and passengers travelling along the ~ 3.5 km section of railway adjacent to the PV facility will experience glare between 06h00 and 08h00 between September and April. The duration of exposure depends on the speed of travel: at 80 km/h a period of ~2.5 minutes is projected.

According to the glare model report, OP 4 would experience < 30 minutes of glare per day between 17h00 and 18h00 between November and January and OP 6 would experience < 25 minutes of glare per day between 06h00 and 07h30 between September and April. However, groundtruthing on site indicates that these OPs do not have a view of the project site due to intervening topography and vegetation.

Glint is not modelled. However, if the PV panels are visible to moving receptors, then glint and a degree of after-image may be experienced.

No OP will be exposed for > 30 minutes per day, although all OPs and routes that are expected to experience glare will experience > 30 hours per year, as such exposure to glare is anticipated to be ***moderate***.

## 6.7 Magnitude of the Overall Visual Impact

Based on the above criteria, the magnitude or intensity of the overall visual impact that is expected to result from the project has been rated. Table 6-8 provides a summary of the criteria, a descriptor summarising the status of the criteria and projected impact magnitude ratings.

The overall magnitude of the visual impact that is expected to result from the project is rated as ***moderate***. The moderate visual exposure, low compatibility with landscape integrity and low VAC (for the PV facility) are moderated by the moderate viewer sensitivity and viewing distance, with the project largely screened by vegetation and / or landscape to residents of the surrounding farmsteads.

*Table 6-8: Magnitude of overall visual impact*

| Criteria | Rating | Comments |
|---|---|---|
| Visual Exposure (Viewshed) | Moderate | The project area will highly visible from the few elevated areas to the north-east, east and south-east of the site. The site will not be visible to the few of the isolated farmsteads surrounding the site. Motorists on the R76 will have a view of the site when travelling adjacent to the south-western boundary of the site, however |

| Criteria | Rating | Comments |
|---|---|---|
| | | beyond this portion of the R76 motorists will have limited visibility. |
| Visual Absorption Capacity | Low (PV facility) and Moderate (Powerline) | The VAC of the area is marginally increased by the undulating topography, and - to a far more limited extent – by the grassland (veld) and small clusters of trees, providing screening to the project. The low vertical profile of the PV panels is anticipated to increase the screening potential of the vegetation and topography. However, the vegetation is not able to provide screening to the associated infrastructure such as the substation and pylons. The undulating topography will marginally absorb the associated infrastructure. |
| Viewer Sensitivity (Receptors) | Moderate | Due to the distance of the project from farmsteads (moderately sensitive receptors) and the proximity to roads and rail infrastructure, viewer sensitivity is considered moderate. It is anticipated that the visual receptors will be more sensitive to the PV array, on-site substation and BESS than the proposed powerline due to their (familiarity with) existing powerlines in the landscape. |
| Viewing Distance and Visibility | Moderate | A number of receptors in the foreground and middleground are affected. |
| Landscape Integrity | Low | The proposed PV array will introduce a large, uniform, reflective facility into the area and will be discordant with the current land use, scale and texture of the surrounding area. The BESS will also introduce a novel structure into the landscape that is different and incongruent to the type, size and scale of the existing land use and development in the area. The on-site substation and proposed 132 kV powerline will be moderately consistent and congruent with the use, texture, size and form of existing infrastructure and land use surrounding the site. |
| Solar Reflection | Moderate | Two OPs to the east of the site, motorists on R76 and the Unnamed Gravel Road and the Rail staff and passengers will experience glare from the PV facility. No OP will be exposed to > 30 minutes of glare per day, although all OPs will experience >30 hours of glare per year. |

# 7. SPECIALIST FINDINGS / IDENTIFICATION AND ASSESSMENT OF IMPACTS

The following section describes the potential visual impacts during the construction and operational phases, and assesses the significance of these impacts utilising the impact rating methodology presented in Appendix B.

Possible measures to avoid, mitigate or compensate visual impacts are considered and recommended, depending on the severity of impacts and the feasibility of measures. The mitigation hierarchy and generic, guideline measures are provided below (DEA&DP, 2005):

- Avoid, e.g. by re-examining the need for the proposed project, relocating the project or re-designing the project;
- Mitigate (reduce), e.g. through adjustments to the siting and design of the project, careful selection of finishes and colours, use of earthworks (such as berms) and planting to provide visual screening and dust control where required;
- Rehabilitate and restore, e.g. through on-site and off-site landscape rehabilitation of areas affected by the project, which may include re-instating landforms and natural vegetation, provision of landscaped open space etc.;
- Compensate and offset, where avoidance or mitigation cannot achieve the desired effect; and
- Enhance, where the proposed project is located in run-down areas or degraded landscapes.

The project relates to the greenfield development of a PV facility and associated infrastructure (i.e. powerline, on-site substation and BESS) and the potential visual impacts are more extensive than they would be for a brownfield project.

Direct visual and aesthetic impacts are likely to result from the following project interventions and/or activities:

- Earthworks and construction activities (including clearing of vegetation and associated generation of dust);
- Altered sense of place caused by the project;
- Glint and glare originating from the PV array causing visual discomfort to and impairing visibility of receptors;
- Visual intrusion diminishing vistas across the project area; and
- Increased light pollution.

The visual and aesthetic impacts generated by the project are likely to be associated with visual intrusion and visual quality.

Impacts of the PV facility components[11] and the grid connection component (132 kV powerline, on-site substation and new switching station) are assessed separately.

## 7.1 Construction Phase – PV Facility Components

### *7.1.1 Altered Sense of Place and Visual Intrusion caused by Construction of the PV Facility*

Visual impacts will be generated by construction activities such as earthworks (which can generate dust) and from construction infrastructure, plant and materials on site (e.g. site camp, plant and machinery, and stockpiles of excavated material). Dust generated during construction will be visually unappealing and may detract from the visual quality (and sense of place) of the area. These impacts are typically limited to the immediate area surrounding the construction site, during the construction period.

[11] As noted in Section 3.2, the PV Facility components include the PV array, BESS, auxiliary buildings and internal grid connection infrastructure.

Construction activities will have a greater impact within the foreground (< 200 m) as sensitive receptors in close proximity to these activities, albeit a limited number of receptors, will be particularly exposed to these visual impacts.

These construction phase impacts are anticipated to affect adjacent residential receptors to a larger degree than motorists on the R76 or the Unnamed Gravel Road, as their experience of the area is fleeting .

The impact is assessed to be of ***medium*** significance and with the implementation of mitigation is reduced to ***low*** (Table 7-2).

## 7.2 Construction Phase – Grid Connection

### *7.2.1 Altered Sense of Place and Visual Intrusion caused by Construction of the Grid Connection for Alternative 1 and 2*

Visual impacts will be generated by construction activities such as earthworks (which can generate dust) and from construction infrastructure and plant on site (e.g. plant and machinery, and stockpiles of excavated material). Dust generated during construction will be visually unappealing and may detract from the visual quality (and sense of place) of the area. These impacts are typically limited to the immediate area surrounding the construction site and powerline alignment, during the construction period.

Construction activities will have a greater impact within the foreground (< 200 m) as sensitive receptors in close proximity to these activities, albeit a limited number of receptors, will be particularly exposed to these visual impacts. Furthermore, these receptors are likely to be motorists travelling on the R76 or the Unnamed Gravel Road and are less sensitivity visual receptors due to their experience of the area being fleeting.

The impact is assessed to be of ***medium*** significance and with the implementation of mitigation is reduced to ***low*** for both powerline alternatives (Table 7-3).

## 7.3 Operational Phase – PV Facility Components

### *7.3.1 Altered Sense of Place and Visual Intrusion caused by the PV Array*

The PV array will have a development footprint of ~ 326 ha, and may be perceived as conflicting with the current landscape of the grassland and treescapes. While there is some evidence of anthropogenic influence within the surrounding area, there is limited development at the proposed density and type. As such, the proposed PV array is anticipated to interrupt and/or degrade views, and therefore negatively impact the sense of place and present as a visual intrusion across the landscape.

Visual receptors north and south (VP 3 - VP 4, VP 8 - VP 10) are expected to experience the PV array as a significant transformation in the landscape, with the PV array visible in the middle ground (though not obstructing views).

From further afield where the PV array is visible in the background (VP 2 and VP 11), the vertical dimensions of the PV array are almost indiscernible.

The impact is assessed to be of ***high*** significance and with the implementation of mitigation is reduced to ***medium*** (Table 7-2).

### 7.3.2 Altered Sense of Place and Visual Intrusion caused by the BESS and Internal Grid Infrastructure

The PV facility will include a BESS and internal grid connections (e.g. 33 kV powerlines). Where possible, the powerlines will be installed underground. While there are a few existing powerlines that traverse the landscape surrounding the site, the proposed powerlines will increase the density of powerlines.

Shipping containers are typically used to house the BESS components. Viewed from a distance, shipping containers are not dissimilar from farmstead buildings. However the BESS (containers) typically cover an area of ~2 ha. As such, the new BESS and internal grid connection are anticipated to contribute to visual clutter on the site and introduce different structures into the landscape, therefore negatively impact the sense of place and presenting as a visual intrusion across the landscape.

Visual receptors to the north-east and south of the site (VP 8, VP 9, VP 11 and VP 5) are expected to have a view of the BESS, substation and internal grid infrastructure, or part thereof, and therefore experience it as a significant transformation in the landscape.

The impact is assessed to be of ***medium*** significance with and without the implementation of mitigation (Table 7-2).

### 7.3.3 Visual Discomfort and Impaired Visibility Resulting from Glint and Glare

Due to the proximity of the PV facility to residential areas and roads, the potential glare impact was modelled.

The glare analysis indicated that glare (and potentially glint) will only be experienced at two of the OPs and along all of the routes modelled, *viz*. R76, Unnamed Gravel Road and the railway line. Both of the OPs that will experience glare are located to the east of the PV facility and will experience <25 minutes of glare per day in the evening for at least four months in summer. Annually, these OPs will experience more than 30 hours of glare, exceeding the German glare guidelines (Section 4 and 6.6.1). Motorists on the R76 and the Unnamed Gravel Road will experience glare during a period in the morning or evening. Rail passengers and staff will also experience glare in the morning. The duration of exposure along these routes (R76, Unnamed Gravel Road and the railway line) depends on the speed of travel.

The glare model shows that the introduction of screening (e.g. by vegetation and / or berms – see Figure 6-6) > 2 m in height along the south-western boundary, and > 1.5 m in height along the north-eastern boundary reduces the glare experienced by receptors travelling along these routes by between 29% - 72% and at these OPs by 43% - 72%. Overall, the implementation of this mitigation would reduce glare experienced at these OPs (OP3 and OP5) to under 30 minutes per day and (less than) 33 hours per year (still exceeding the German Guidelines by 3 hours per year - see Appendix D).

These exposure durations are not considered of a level that will cause visual discomfort or impaired visibility, but are expected to be experienced as a nuisance by the receptors if not mitigated.

A glint and glare model and analysis should be conducted and a specialist should advise on any amendments to the recommended mitigation measures, e.g. if the layout of the PV array varies significantly during the design phase.

The impact is assessed to be of ***medium*** significance and with the implementation of mitigation is reduced to ***low*** (Table 7-2).

*7.3.4 Altered Visual Quality caused by Light Pollution at Night*

Lighting will be installed along the perimeter of the PV array(s) and / or around the BESS to improve security.

The installation of lighting on the site perimeter and / or around the BESS will generate nightglow across the natural, undeveloped site and beyond. As such, the introduction of lighting on the site alters the sense of place and visual quality to surrounding receptors, especially those (farmstead) receptors not currently exposed to nightglow emanating from Kroonstad.

Lighting is not easily screened by vegetation or topography, and the proposed lighting for the PV facility is anticipated to contribute to nightglow from the surrounding residential areas (e.g. Kroonstad) and alter visual quality of the surrounding area.

The impact is assessed to be of ***medium*** significance and with the implementation of mitigation is reduced to ***low*** (Table 7-2).

## 7.4 Operational Phase – Grid Connection

*7.4.1 Altered Sense of Place and Visual Intrusion caused by Powerline Alternative 1.*

Powerline Alternative 1 will be ~2 km long and will connect the on-site substation to the Kroonstad switching station ~ 1.5 km to the south of the site.

The ~ 15 ha on-site substation will be located adjacent to the south-western boundary of the site.

Due to the short length of Powerline Alternative 1 and routing adjacent to an existing powerline, it is not anticipated to add to visual intrusion, nor impact the views of receptors. The powerline may be partially obscured by the existing powerline that traverses the site from north-east to south-west.

An existing substation is located adjacent to the R76, ~2 km south of the proposed project. The proposed on-site substation will not, therefore, be a novel structure, but will nevertheless contribute to visual intrusion and visual clutter in the landscape.

The impact is assessed to be of ***medium*** significance and with the implementation of mitigation is reduced to ***low*** (Table 7-3).

*7.4.2 Altered Sense of Place and Visual Intrusion caused by Powerline Alternative 2*

Powerline Alternative 2 will be ~5.5 km long and will connect the on-site substation to a new switching station located to the north-east of the site.

The ~ 15 ha on-site substation will be located adjacent to the south-western boundary of the site.

Powerline Alternative 2 will be routed adjacent to an existing powerline across the site from the north-east to the south-west. Due to its length, Powerline Alternative 2 will be visible to more receptors than alternative 1, *viz.* motorists on the R76 and the Unnamed Gravel Road. The powerline may be partially obscured by the existing powerline.

An existing substation is located adjacent to the R76, ~2 km south of the proposed project. The proposed on-site substation will not, therefore, be a novel structure, but will nevertheless contribute to visual intrusion and visual clutter in the landscape.

Little infrastructure has been developed to the north of the site and south of the Vals River; consequently the proposed switching station is novel within this area and will result in visual intrusion and alter the sense of place to motorists on the Unnamed Gravel Road, despite their fleeting experience of the area.

The impact is assessed to be of ***medium*** significance and with the implementation of mitigation is reduced to ***low*** (Table 7-3).

#### *7.4.3 Altered Visual Quality caused by Light Pollution from the Substation at Night*

Lighting will be installed around the substation to improve security.

The installation of lighting around the substation is anticipated to generate nightglow, altering the sense of place and visual quality to surrounding receptors, especially those (farmstead) receptors not currently exposed to nightglow emanating from Kroonstad.

Lighting is not easily screened by vegetation or topography, and the proposed lighting for the substation is anticipated to contribute to nightglow from the surrounding residential areas (e.g. Kroonstad) and alter visual quality of the surrounding area.

The impact is assessed to be of ***medium*** significance and with the implementation of mitigation is reduced to ***low*** (Table 7-3).

#### *7.4.4 Altered Visual Quality caused by Light Pollution from the Switching Station at Night*

Lighting will be installed around the proposed Switching Station to improve security. This is anticipated to generate nightglow, altering the sense of place and visual quality to surrounding receptors, especially those (farmstead) receptors not currently exposed to nightglow emanating from Kroonstad.

Lighting is not easily screened by vegetation or topography and will contribute to nightglow from the surrounding residential areas (e.g. Kroonstad).

The impact is assessed to be of ***medium*** significance and with the implementation of mitigation is reduced to ***low*** (Table 7-3). This impact will only be realized if Powerline Alternative 2 is developed.

## 7.5 Decommissioning Phase – PV Facility Components

#### *7.5.1 Altered Sense of Place caused by Decommissioning Activities*

While the proposed PV facility and associated infrastructure are anticipated to operate in the long-term, when decommissioning is required, visual impacts will be generated.

The decommissioning of the PV facility and associated infrastructure will include earthworks, the movement of plant and equipment on site (e.g. plant and machinery, and stockpiles of excavated and salvaged material). Dust generated during decommissioning will be visually unappealing and may detract from the visual quality (and sense of place) of the area. These impacts are typically limited to the immediate area surrounding the site, during the decommissioning period.

Decommissioning activities will have a greater affect within the foreground (< 200 m) as sensitive receptors in close proximity to these activities, albeit a limited number of receptors, will be particularly exposed to these visual impacts.

These decommissioning impacts are anticipated to impact adjacent residential receptors to a larger degree than motorists on the R76, as their experience of the area is fleeting.

The impact is assessed to be of ***medium*** significance and with the implementation of mitigation is reduced to ***low*** (Table 7-2).

## 7.6 Decommissioning Phase – Grid Connection

### *7.6.1 Altered Sense of Place caused by the Decommissioning Activities*

While the proposed powerline is anticipated to operate in the long-term, when decommissioning is required visual impacts will be generated.

The decommissioning of the powerline will include earthworks, the movement of plant and equipment on site (e.g. plant and machinery, and stockpiles of excavated/salvaged material). Dust generated during decommissioning will be visually unappealing and may detract from the visual quality (and sense of place) of the area. These impacts are typically limited to the immediate area surrounding the site, during the decommissioning period.

Decommissioning activities will have a greater impact within the foreground (< 200 m) as sensitive receptors in close proximity to these activities, albeit a limited number of receptors, will be particularly exposed to these visual impacts.

These decommissioning impacts are anticipated to impact adjacent residential receptors to a larger degree than motorists on the R76 or the Unnamed Gravel Road, as their experience of the area is transient.

The impact is assessed to be of ***medium*** significance and with the implementation of mitigation is reduced to ***low*** (Table 7-3).

## 7.7 Cumulative Impacts

### *7.7.1 Introduction*

For the purposes of this report, cumulative impacts are defined as 'direct and indirect impacts that act together with existing or future potential impacts of other activities or proposed activities in the area / region that affect the same resources and / or receptors'.

For the most part, cumulative effects or aspects thereof are too uncertain to be quantifiable, due mainly to a lack of data availability and accuracy. This is particularly true of cumulative effects arising from potential or future projects, the design or details of which may not be finalised or available and the direct and indirect impacts of which have not yet been assessed.

For practical reasons, the identification and management of cumulative impacts are limited to those effects generally recognised as important on the basis of scientific concerns and/or concerns of affected communities, in this case effects of other renewable energy facilities and large-scale infrastructure projects.

### *7.7.2 Cumulative Impacts Analysis*

In addition to the project, other past, present and future activities have taken place or are proposed within a 35 km radius of the project site that might have caused or may cause impacts and may interact with impacts caused by the project. These are briefly discussed in this section.

Two approved and three proposed PV facilities and associated grid connection infrastructure projects within a 35 km radius of the proposed project site are listed on the Department of Forestry, Fisheries and the Environment (DFFE) South African Renewable Energy EIA Application Database (DFFE, 2022). These projects are listed in Table 7-1 and their location shown in Figure 7-1.

*Table 7-1: PV projects within a 35 km radius of the project site*

| Facility Name / Description | Status | MW | Approximate Footprint |
|---|---|---|---|
| Rondavel Solar Facility | Approved | 100 MW | ~3 500 ha |
| Steynrus Solar Facility | Under Amendment | 5 MW | ~350 ha |
| Vrede Solar Facility | In process | 100 MW | ~540 ha |
| Heuningspuit PV1 Facility | In process | 5 MW | ~140 ha |
| Heuningspuit PV2 Facility | In process | 5 MW | ~175 ha |
| | | **Total** | **~4 705 ha** |

No Wind Energy Facility (WEF) projects within 35 km of the site are listed on the DFFE South African Renewable Energy EIA Application Database.

There are already numerous substations and powerlines in the region, already affecting visual quality and sense of place in this modified rural landscape. As such, the proposed powerlines, BESS and substations associated with these projects are not the first of their kind in the visual landscape. The Bonsmara PV facility and other proposed facilities listed above have a combined footprint of ~4 705 ha; although large, the facilities are far apart and do not constitute a spatially concentrated, high density network of PV facilities, which mitigates cumulative impacts.

SiVEST's Impact Assessment methodology has been used to evaluate the cumulative visual impacts of the project on the sense of place of the surrounding 35 km radius. The cumulative impact of the PV facility and the 132 kV powerline is assessed to be of ***medium*** significance and with the implementation of mitigation is reduced to ***low*** (Table 7-2 and Table 7-3).

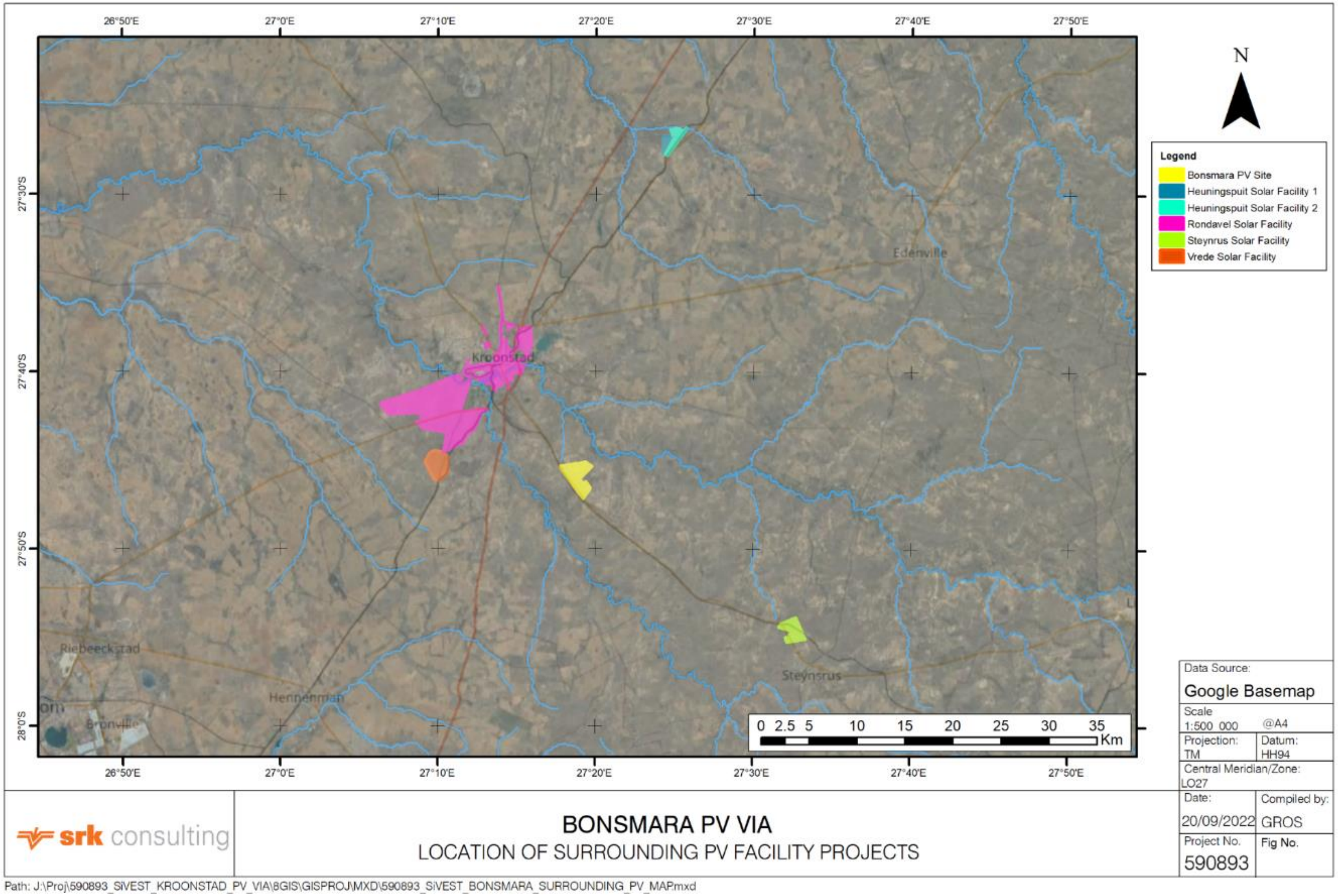


*Figure 7-1: Location of surrounding PV facility projects*

## 7.8 Overall Impact Rating

The impact assessment and ratings for the PV facility and 132 kV powerline alternatives are summarised in Table 7-2 and Table 7-3 below, respectively.

*Table 7-2: Rating of impacts – PV facility Components*

| ENVIRONMENTAL PARAMETER | ISSUE / IMPACT / ENVIRONMENTAL EFFECT/ NATURE | ENVIRONMENTAL SIGNIFICANCE BEFORE MITIGATION | | | | | | | | | RECOMMENDED MITIGATION MEASURES | ENVIRONMENTAL SIGNIFICANCE AFTER MITIGATION | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | E | P | R | L | D | I / M | TOTAL | STATUS (+ / -) | S | | E | P | R | L | D | I / M | TOTAL | STATUS (+ / -) | S |
| **Construction Phase** | | | | | | | | | | | | | | | | | | | | |
| Altered Sense of Place and Visual Intrusion caused by Construction Activities | Dust generated during construction will be visually unappealing and may detract from the visual quality (and sense of place) of the area. These impacts are typically limited to the immediate area surrounding the construction site, during the construction period. | 2 | 4 | 1 | 2 | 1 | 3 | 30 | - | Medium | • Limit vegetation clearance and the footprint of construction to what is absolutely essential.<br>• Consolidate the footprint of the construction camp to a functional minimum.<br>• Avoid excavation, handling and transport of materials which may generate dust under very windy conditions.<br>• Keep stockpiled aggregates and sand covered to minimise dust generation.<br>• Keep construction site tidy. | 2 | 3 | 1 | 2 | 1 | 2 | 18 | - | Low |
| **Operational Phase** | | | | | | | | | | | | | | | | | | | | |
| Altered Sense of Place and Visual Intrusion caused by the PV Array | The development of this PV array may be perceived as conflicting with the current landscape of the grassland and treescapes. The proposed PV facility is anticipated to interrupt and/or degrade views, and therefore negatively impact the sense of place and present as a visual intrusion across the landscape. | 2 | 4 | 2 | 3 | 3 | 3 | 42 | - | Medium | • Fence the perimeter of the site with a green or black fencing. | 2 | 3 | 2 | 2 | 3 | 3 | 36 | - | Medium |

| ENVIRONMENTAL PARAMETER | ISSUE / IMPACT / ENVIRONMENTAL EFFECT/ NATURE | ENVIRONMENTAL SIGNIFICANCE BEFORE MITIGATION | | | | | | | | | RECOMMENDED MITIGATION MEASURES | ENVIRONMENTAL SIGNIFICANCE AFTER MITIGATION | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | E | P | R | L | D | I / M | TOTAL | STATUS (+ /-) | S | | E | P | R | L | D | I / M | TOTAL | STATUS (+ / -) | S |
| Altered Sense of Place and Visual Intrusion caused by the BESS, Substation and Internal Grid Infrastructure | The BESS and internal grid connections (where possible will be installed underground). is anticipated to contribute to visual clutter on the site and therefore negatively impact the sense of place and present as a visual intrusion across the landscape. | 2 | 4 | 2 | 3 | 3 | 2 | 28 | - | Medium | • Fence the perimeter of the site with a green or black fencing.<br>• Ensure that the roof colour of the proposed buildings blends into the landscape. | 2 | 3 | 2 | 2 | 3 | 2 | 24 | - | Medium |
| Visual Discomfort and Impaired Visibility resulting from Glint and Glare | Two OPs and receptors travelling on the R76, Unnamed Gravel Road and the railway line will experience moderate glare. The exposure to glare is not considered of a level that will cause visual discomfort or impaired visibility, but may be experienced as a nuisance. | 2 | 4 | 2 | 1 | 3 | 3 | 36 | - | Medium | • Establish screening (e.g. vegetation) of > 2 m in height between the south-western boundary of the PV array and the R76, where technically feasible and in consultation with a qualified botanist and / or landscaper and the project operator.<br>• Establish screening (e.g. vegetation) of > 1.5 m in height along the north-eastern boundary of the PV array, where technically feasible and in consultation with a qualified botanist and / or landscaper and the project operator. | 2 | 3 | 2 | 1 | 3 | 2 | 22 | - | Low |
| Altered Visual Quality caused by Light Pollution at Night | The installation of lighting on the site perimeter and / or around the BESS will generate nightglow across the natural, undeveloped site and beyond. Lighting is not easily screened by vegetation or topography, and the proposed lighting for the PV facility is | 2 | 4 | 1 | 3 | 3 | 3 | 39 | - | Medium | • Reduce the height of lighting masts to a workable minimum.<br>• Direct lighting inwards and downwards to limit light pollution. | 2 | 3 | 1 | 2 | 3 | 2 | 22 | - | Low |

| ENVIRONMENTAL PARAMETER | ISSUE / IMPACT / ENVIRONMENTAL EFFECT/ NATURE | ENVIRONMENTAL SIGNIFICANCE BEFORE MITIGATION | | | | | | | | | RECOMMENDED MITIGATION MEASURES | ENVIRONMENTAL SIGNIFICANCE AFTER MITIGATION | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | E | P | R | L | D | I / M | TOTAL | STATUS (+ /-) | S | | E | P | R | L | D | I / M | TOTAL | STATUS (+ / -) | S |
| | anticipated to contribute to nightglow from the surrounding residential areas (e.g. Kroonstad) and alter visual quality of the surrounding area. | | | | | | | | | | | | | | | | | | | |
| **Decommissioning Phase** | | | | | | | | | | | | | | | | | | | | |
| Altered Sense of Place caused by the decommissioning activities | Dust generated during decommissioning will be visually unappealing and may detract from the visual quality (and sense of place) of the area. These impacts are typically limited to the immediate area surrounding the site, during the decommissioning period. | 2 | 4 | 1 | 2 | 1 | 3 | 30 | - | Medium | • Limit vegetation clearance and the footprint of decommissioning to what is absolutely essential.<br>• Avoid excavation, handling and transport of materials which may generate dust under very windy conditions.<br>• Keep stockpiled aggregates and sand covered to minimise dust generation.<br>• Keep site tidy. | 2 | 3 | 1 | 2 | 1 | 2 | 18 | - | Low |
| **Cumulative Impact** | | | | | | | | | | | | | | | | | | | | |
| Altered Sense of Place caused by the PV facility | There are already numerous substations and powerlines in the region, already affecting visual quality and sense of place in this modified rural landscape. As such, the proposed powerlines, BESS and substations associated with these projects are not the first of their kind in the visual landscape. The Bonsmara PV facility and other proposed facilities listed above have a combined footprint of approximately | 2 | 4 | 1 | 3 | 3 | 2 | 26 | - | Medium | • Encourage other project owners to implement measures to mitigate the impact of these projects on visual intrusion and altered sense of place, such as screening (vegetation) and limit the light pollution generated by these facilities. | 2 | 3 | 1 | 2 | 3 | 2 | 22 | - | Low |

| ENVIRONMENTAL PARAMETER | ISSUE / IMPACT / ENVIRONMENTAL EFFECT/ NATURE | ENVIRONMENTAL SIGNIFICANCE BEFORE MITIGATION | | | | | | | | | RECOMMENDED MITIGATION MEASURES | ENVIRONMENTAL SIGNIFICANCE AFTER MITIGATION | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | E | P | R | L | D | I / M | TOTAL | STATUS (+ /-) | S | | E | P | R | L | D | I / M | TOTAL | STATUS (+ / -) | S |
| | ~4 705 ha; although large, the facilities are far apart and do not constitute a spatially concentrated, high density network of PV facilities, which mitigates cumulative impacts. | | | | | | | | | | | | | | | | | | | |

*Table 7-3: Rating of impacts – grid connection (Powerline Alternative 1 and 2)*

| ENVIRONMENTAL PARAMETER | ISSUE / IMPACT / ENVIRONMENTAL EFFECT/ NATURE | ENVIRONMENTAL SIGNIFICANCE BEFORE MITIGATION | | | | | | | | | RECOMMENDED MITIGATION MEASURES | ENVIRONMENTAL SIGNIFICANCE AFTER MITIGATION | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | E | P | R | L | D | I / M | TOTAL | STATUS (+ / -) | S | | E | P | R | L | D | I / M | TOTAL | STATUS (+ / -) | S |
| **Construction Phase** | | | | | | | | | | | | | | | | | | | | |
| Altered Sense of Place and Visual Intrusion caused by Construction Activities (applicable to both powerline alternatives) | Dust generated during construction will be visually unappealing and may detract from the visual quality (and sense of place) of the area. These impacts are typically limited to the immediate area surrounding the construction site and powerline alignment, during the construction period. | 2 | 4 | 1 | 2 | 1 | 3 | 30 | - | Medium | • Limit vegetation clearance and the footprint of construction to what is absolutely essential.<br>• Consolidate the footprint of the construction camp to a functional minimum.<br>• Avoid excavation, handling and transport of materials which may generate dust under very windy conditions.<br>• Keep stockpiled aggregates and sand covered to minimise dust generation.<br>• Keep construction site tidy. | 2 | 3 | 1 | 2 | 1 | 2 | 18 | - | Low |
| **Operational Phase** | | | | | | | | | | | | | | | | | | | | |
| Altered Sense of Place and Visual Intrusion caused by the Powerline Alternative 1 (applicable to Powerline Alternative 1) | Powerline Alternative 1 is not anticipated to add to visual intrusion, nor impact the views of receptors. The substation will not be a novel structure in the landscape. The substation will contribute to visual intrusion and visual clutter in the landscape. | 2 | 3 | 2 | 2 | 3 | 2 | 24 | - | Medium | • Do not install or affix lights on pylons. | 2 | 2 | 2 | 2 | 3 | 2 | 22 | - | Low |

| ENVIRONMENTAL PARAMETER | ISSUE / IMPACT / ENVIRONMENTAL EFFECT/ NATURE | ENVIRONMENTAL SIGNIFICANCE BEFORE MITIGATION | | | | | | | | | RECOMMENDED MITIGATION MEASURES | ENVIRONMENTAL SIGNIFICANCE AFTER MITIGATION | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | E | P | R | L | D | I / M | TOTAL | STATUS (+ / -) | S | | E | P | R | L | D | I / M | TOTAL | STATUS (+ / -) | S |
| Altered Sense of Place and Visual Intrusion caused by the Alternative 2 (applicable to Powerline Alternative 2) | Powerline Alternative 2 will be visible to more receptors than Alternative 1. The substation will not be a novel structure in the landscape. The new switching substation will be different to the surrounding area. Both the substation and the switching station will contribute to visual intrusion and visual clutter in the landscape. | 2 | 3 | 2 | 2 | 3 | 2 | 24 | - | Medium | • Do not install or affix lights on pylons. | 2 | 2 | 2 | 2 | 3 | 2 | 22 | - | Low |
| Altered Visual Quality caused by Light Pollution from the Substation at Night (applicable to both powerline alternatives) | The installation of lighting around the substation is anticipated to generate nightglow, altering the sense of place and visual quality to surrounding receptors, especially those (farmstead) receptors not currently exposed to nightglow emanating from Kroonstad. | 2 | 4 | 1 | 3 | 3 | 3 | 39 | - | Medium | • Reduce the height of lighting masts to a workable minimum.<br>• Direct lighting inwards and downwards to limit light pollution. | 2 | 3 | 1 | 2 | 3 | 2 | 22 | - | Low |
| Altered Visual Quality caused by Light Pollution from the Switching Station at Night (applicable to Powerline Alternative 2) | The installation of lighting around the switching station is anticipated to generate nightglow, altering the sense of place and visual quality to surrounding receptors, especially those (farmstead) receptors not currently exposed to nightglow emanating from Kroonstad. | 2 | 4 | 1 | 3 | 3 | 3 | 39 | - | Medium | • Reduce the height of lighting masts to a workable minimum.<br>• Direct lighting inwards and downwards to limit light pollution. | 2 | 3 | 1 | 2 | 3 | 2 | 22 | - | Low |

| ENVIRONMENTAL PARAMETER | ISSUE / IMPACT / ENVIRONMENTAL EFFECT/ NATURE | ENVIRONMENTAL SIGNIFICANCE BEFORE MITIGATION | | | | | | | | | RECOMMENDED MITIGATION MEASURES | ENVIRONMENTAL SIGNIFICANCE AFTER MITIGATION | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | E | P | R | L | D | I / M | TOTAL | STATUS (+ / -) | S | | E | P | R | L | D | I / M | TOTAL | STATUS (+ / -) | S |
| **Decommissioning Phase** | | | | | | | | | | | | | | | | | | | | |
| Altered Sense of Place caused by the Decommissioning Activities (applicable to both powerline alternatives) | Dust generated during decommissioning will be visually unappealing and may detract from the visual quality (and sense of place) of the area. These impacts are typically limited to the immediate area surrounding the site, during the decommissioning period. | 2 | 4 | 1 | 2 | 1 | 3 | 30 | - | Medium | • Limit vegetation clearance and the footprint of construction to what is absolutely essential.<br>• Avoid excavation, handling and transport of materials which may generate dust under very windy conditions.<br>• Keep stockpiled aggregates and sand covered to minimise dust generation.<br>• Keep site tidy. | 2 | 3 | 1 | 2 | 1 | 2 | 18 | - | Low |
| **Cumulative Impact** | | | | | | | | | | | | | | | | | | | | |
| Altered Sense of Place caused by the Grid Connection | There are already numerous substations and powerlines in the region, already affecting visual quality and sense of place in this modified rural landscape. As such, the proposed powerlines, BESS and substations associated with these projects are not the first of their kind in the visual landscape. The Bonsmara PV facility and other proposed facilities listed above have a combined footprint of approximately ~4 705 ha; although large, the facilities are far apart and do not constitute a spatially concentrated, high density network of PV | 2 | 4 | 2 | 3 | 3 | 2 | 28 | - | Medium | • Encourage other project owners to implement measures to mitigate impacts of the powerlines and substations on the visual intrusion and altered sense of place, such as no affixing lights to powerlines and routing the powerlines within corridors. | 2 | 3 | 2 | 2 | 3 | 2 | 24 | - | Low |

| ENVIRONMENTAL PARAMETER | ISSUE / IMPACT / ENVIRONMENTAL EFFECT/ NATURE | ENVIRONMENTAL SIGNIFICANCE BEFORE MITIGATION | | | | | | | | | RECOMMENDED MITIGATION MEASURES | ENVIRONMENTAL SIGNIFICANCE AFTER MITIGATION | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | E | P | R | L | D | I / M | TOTAL | STATUS (+ /-) | S | | E | P | R | L | D | I / M | TOTAL | STATUS (+ / -) | S |
| | facilities, which mitigates cumulative impacts. | | | | | | | | | | | | | | | | | | | |

## 7.9 Input into the EMPr

Table 7-4 provides a description of the key monitoring recommendations for each mitigation measure identified for each phase of the project for inclusion in the EMPr or Environmental Authorisation (EA).

*Table 7-4: EMPr measures*

| Impact / Aspect | Mitigation / Management Actions | Responsibility | Methodology | Mitigation / Management Objectives and Outcomes | Frequency |
|---|---|---|---|---|---|
| **Construction Phase** | | | | | |
| Visual Quality (PV facility and Grid Connection) | • Limit vegetation clearance and the footprint of construction to what is absolutely essential. | Contractor | • Plan which areas require the clearance of vegetation.<br>• Only clear the vegetation when works in the area will be undertaken. | • Limit deterioration of visual quality. | Throughout construction |
| | • Consolidate the footprint of the construction camp to a functional minimum. | | • Ensure that the construction camp is consolidated during the design phase | | |
| | • Avoid excavation, handling and transport of materials which may generate dust under very windy conditions. | | • During very windy conditions cease excavation, handling and transportation of materials which may generate dust. | | |
| | • Keep stockpiled aggregates and sand covered to minimise dust generation. | | • Stockpile all aggregates and sand.<br>• Keep stockpiles covered when not in use. | | |
| | • Keep construction site tidy. | | • Implement measures to keep the site tidy. | • Limit visual clutter and deterioration of visual quality. | |
| **Operational Phase** | | | | | |
| Altered Sense of Place and Visual Intrusion (PV facility) | • Install the 33 kV powerlines underground, where possible. | Developer | • Incorporate underground powerlines in the design. | • Limit visual intrusion and altered sense of place. | Throughout construction. Throughout operation. |

| Impact / Aspect | Mitigation / Management Actions | Responsibility | Methodology | Mitigation / Management Objectives and Outcomes | Frequency |
|---|---|---|---|---|---|
| | • Fence the perimeter of the site with a green or black fencing. | Developer | • Install a perimeter fence. | | |
| | • Ensure that the roof colour of the proposed buildings blends into the landscape. | Developer | • Incorporate colour requirements in the design. | | |
| Altered Sense of Place and Visual Intrusion (Grid Connection) | • Do not install or affix lights on pylons. | Contractor | • Prohibit installation of lighting on pylons in the design. | • Limit light pollution. | Once the powerline is installed. Throughout operation. |
| Visual Discomfort and Impaired Visibility (PV facility) | • Establish screening (e.g. vegetation) of > 2 m in height between the south-western boundary of the PV array and the R76, where technically feasible and in consultation with a qualified botanist and / or landscaper and the project operator.<br>• Establish screening (e.g. vegetation) of > 1.5 m in height on the north-eastern boundary of the PV array, where technically feasible and in consultation with a qualified botanist and / or landscaper and the project operator. | Contractor | • Incorporate screening in the design.<br>• Implement proposed screening in construction phase. | • Limit glint and glare. | Throughout construction. |

| Impact / Aspect | Mitigation / Management Actions | Responsibility | Methodology | Mitigation / Management Objectives and Outcomes | Frequency |
|---|---|---|---|---|---|
| Altered Visual Quality (PV facility and Grid Connection) | • Reduce the height of lighting masts to a workable minimum.<br>• Direct lighting inwards and downwards to limit light pollution. | Developer and Contractor | • Incorporate lighting requirements in the design. | • Limit light pollution. | Once construction activities have concluded. Throughout operation |
| **Decommissioning Phase** | | | | | |
| Visual Quality (PV facility and Grid Connection) | • Limit vegetation clearance and the footprint of decommissioning to what is absolutely essential. | Contractor | • Plan which areas require the clearance of vegetation.<br>• Only clear the vegetation when works in the area will be undertaken. | • Limit deterioration of visual quality | Throughout decommissioning |
| | • Consolidate the footprint of the decommissioning camp to a functional minimum. | | • Ensure that the decommissioning camp footprint is consolidated where possible. | | |
| | • Avoid excavation, handling and transport of materials which may generate dust under very windy conditions. | | • During very windy conditions cease excavation, handling and transportation of materials which may generate dust. | | |
| | • Keep stockpiled aggregates and sand covered to minimise dust generation. | | • Stockpile all aggregates and sand.<br>• Keep stockpiles covered when not in use. | | |
| | • Keep site tidy. | | • Implement measures to keep the site tidy. | | |

## 7.10 Comparative Assessment of Alternatives

The impacts associated with Powerline Alternative 1 and Powerline Alternative 2 are outlined in Sections **Error! Reference source not found.** - 7.4.4 and in Table 7-3. These powerline alternatives have been comparatively assessed in Table 7-5 below.

*Table 7-5: Comparative assessment of alternatives*

| Alternative | Preference | Reasons (incl. potential issues) |
|---|---|---|
| **POWERLINE ROUTE ALTERNATIVES** | | |
| Powerline Alternative 1 | Preferred Alternative | This alternative will result in altered sense of place and visual quality due to the powerline and pylons as well as light pollution from the substation. |
| Powerline Alternative 2 | Favourable | This alternative will result in more impacts when compared to Powerline Alternative 2 (i.e. altered sense of place and visual quality due to the powerline and pylons, as well as light pollution form the substation and the switching station). |

Both powerline alternatives are acceptable from a visual perspective. Powerline Alternative 1 is considered the preferred alternative, in comparison to Powerline Alternative 2, as no additional light pollution from the switching substation associated with Powerline Alternative 2 will be realised.

## 7.11 No-Go Alternative

The No Go alternative entails no change to the status quo, in other words, no PV facility and / or 132 kV powerline (see Section 3.2.3).

Should the application for the Bonsmara 100 MW PV Facility and associated infrastructure be refused the visual impacts will not be realised.

# 8. CONCLUSION

The VIA describes and interprets the visual context or affected environment in which the project is located: this provides a visual baseline or template and aims to ascertain the aesthetic uniqueness of the project area. To better understand the magnitude or intensity of visual and sense of place impacts, the capacity of the project area and receptors to accommodate, attenuate and absorb impacts was analysed. To assess impact significance, the project was "introduced" into the baseline, taking account of the attenuating capacity of the project area.

The following findings are pertinent:

- Bonsmara Solar PV (RF) (Pty) Ltd propose to develop a 100 MW PV facility and associated infrastructure, including *inter alia,* a BESS, on-site substation, internal grid connections and a 132 kV powerline to connect the proposed facility to either the Kroonstad Switching Station or a new

Switching Station. The proposed PV facility will occupy ~326 ha on Portion 0 and Portion 1 of Farm 636, near Kroonstad, in the Free State.

- The basis for the visual character of the region is predominantly rural characterised by undulating, vegetated landscapes, albeit with pockets of settlements and regional and national roads routed around the site. The project is defined as a modified rural landscape.
- The visual quality of the area can be experienced through the rolling views of the gentle hills in the landscape and is defined by the fabric of agricultural and grazing land use, with powerlines and a railway line intermittently interrupting views of over the undulating landscape.
- The region has modest scenic value in terms of its undulating natural landscape and the views over large portions of agricultural land. The natural landscape and rustic character contrast the anthropogenic influence in the region, *viz.* urban development some 12 km away.
- The viewshed shows that the PV array will be highly visible to motorist on the R76, and visible from elevated areas to the north-east, east and south of the site. The site will not be visible to the few isolated farmsteads surrounding the site. The visual exposure of the PV array will be moderate. Motorists travelling on the R76 adjacent to the south-western boundary of the site will have a view of the site. The visual exposure of the two powerline alternatives differs as they follow two different routes with different lengths. Existing powerlines near the proposed powerline route are expected to have inured receptors to powerlines within the landscape.
- The VAC of the area is generally low due to its rural nature. However, the VAC is increased by the undulating topography and – to a far more limited extent – by the grassland (veld) and small clusters of trees providing screening. The vegetation is not able to provide screening to the associated infrastructure. The undulating topography will marginally absorb the associated infrastructure.
- The potential receptors of the project include surrounding residents of farmsteads, individuals travelling by rail and motorists on the R76 and the Unnamed Gravel Road. The residents are considered moderately sensitive visual receptors. Motorists and receptors travelling by rail are considered to have relatively low sensitivity as their view of the project is fleeting and temporary. Overall the sensitivity of the visual receptors potentially affected by the visual impact of the project is considered to be moderate.
- The project will be visible in the foreground to motorists travelling directly to the west of the site. The visibility of the project to railway passengers travelling to the west and south-east of the site is decreased due to screening by intervening vegetation. The project ranges in visibility to residents of farmsteads, being visible to receptors up to ~2 km from the site and marginally visible thereafter The visibility of the project is moderate due to the number of receptors in the foreground and middleground.
- The proposed PV array will be discordant with the current land use, scale and texture of the surrounding area, and the BESS will be different and incongruent in type, size and scale to existing land use and development in the area. The on-site substation and proposed 132 kV powerline will be moderately consistent and congruent with the use, texture, size and form of existing infrastructure and land use surrounding the site. The PV facility and powerline are deemed to have low integrity with the surrounding landscape.
- Glare modelling indicates that two residential OPs, to the east of the site, and three routes will experience glare for less than 30 minutes per day, but for more than 30 hours per year. Therefore, the glare experienced by the receptors around the site will be moderate and will required mitigation.

- Construction activities associated with the PV facility and 132 kV powerline will generate visual impacts related to earthworks and construction infrastructure, plant and materials on site. These activities are visually intrusive and will mostly impact receptors in the foreground (<200 m). The impact is assessed to be of ***medium*** significance and with the implementation of mitigation is reduced to ***low***.
- The PV array will introduce what may be perceived as a low, uniform industrial artefact into the landscape that is perceived as conflicting with the current landscape. As such, the PV array is anticipated to interrupt and / or degrade views, and therefore negatively impact the sense of place and present as a visual intrusion in the landscape. The impact is assessed to be of ***medium*** significance with and without the implementation of mitigation.
- Where possible the powerlines will be installed underground, mitigating additional visual clutter. The BESS and substation will contribute to visual clutter on the site and therefore negatively impact the sense of place and present as a visual intrusion across the landscape. The impact is assessed to be of ***medium*** significance with and without the implementation of mitigation.
- The development of either powerline alternative is not anticipated to materially degrade views of visual receptors. The impact is assessed to be of ***medium*** significance and with the implementation of mitigation is reduced to ***low***.
- Glare is expected to emanate from the PV array and be experienced by two OPs and all of the routes modelled, *viz*. R76, Unnamed Gravel Road and the railway line. Prior to mitigation, all receptors modelled would experience more than 30 hours of glare per year, exceeding the German glare guidelines. The impact is assessed to be of ***medium*** significance and with the implementation of mitigation is reduced to ***low***.
- Installation of lighting at the PV facility, substation and switching station may expose sensitive receptors (e.g. residents) to light pollution, i.e. nightglow. The impact is assessed to be of ***medium*** significance and with the implementation of mitigation is reduced to ***low***.
- The decommissioning activities associated with the PV facility and the 132 kV powerline will include earthworks and movement of plant and equipment. Dust generated during decommissioning will be visually unappealing and detract from the visual quality and sense of place. The impact is assessed to be of ***medium*** significance and with the implementation of mitigation is reduced to ***low***.
- Numerous substations and powerlines in the region already affect visual quality and sense of place in this modified rural landscape. As such, the proposed powerlines, BESS and substations associated with these projects are not the first of their kind in the visual landscape. The Bonsmara PV facility and other proposed PV facilities within a 35 km radius of Bonsmara PV facility have a combined footprint of ~4 705 ha, however, are located far apart and do not constitute a spatially concentrated, high density network of PV facilities. The cumulative impact of the PV facility and the 132 kV powerline is assessed to be of ***medium*** significance and with the implementation of mitigation is reduced to ***low***.

## 8.1 Impact Statement

The proposed project introduces a man-made artefact into an agricultural environment, changing the fabric of a large area (~326 ha). The surrounding area also features a 132 kV powerline traversing the landscape. Both powerline alternatives are routed adjacent to the existing powerline for some distance.

The undulating landscape provides some VAC for the PV facility, and is expected to marginally screen the powerline. The proposed project is anticipated to have a limited impact on highly sensitive receptors due to the limited number of highly sensitivity visual receptors directly adjacent to the project area. However, railway passengers and motorists – to a greater degree – will have the greatest visibility of the site. This visibility is anticipated to be moderated by their low sensitivity as transient and temporary receptors.

This project will be largely incongruent with the existing agricultural landscape. As such, visual impacts include altered sense of place, visual intrusion, nuisance from glint and glare and light pollution. This VIA demonstrates that the project will generally result in a moderate visual impact and is not located within a REDZ. The construction, operational, decommissioning and cumulative impacts are deemed to be acceptable on the assumption that the mitigation measures listed in Table 7-4 are implemented.

Based on the assessment and the assumption that the mitigation measures will be implemented, the specialist is of the opinion that the visual impacts of the project are acceptable and, from a visual perspective, there is no reason not to authorise the project. From a visual perspective, Powerline Alternative 1 is considered preferred as less impacts are associated with this alternative.

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## Appendix A: Specialist CV

# Appendix B: Impact Assessment Methodology

## Appendix C: Views from Viewpoints

Viewpoint 1: Dennehof Farm - looking north-west towards the site. The proposed site is not visible due to the undulating topography.

Viewpoint 2: R76 South - looking north towards the site. The proposed site is largely screened by tall trees and vegetation, however may be visible in the background to receptors.

Viewpoint 3: R76 Bonsmara – looking north towards the site. The proposed site is visible in the foreground to receptors.

Viewpoint 4: Patrijsdraai Farm – looking north-east towards the site. The site is visible to motorists travelling to and from the farmstead as well as receptors travelling by train. The view of the project will be in the background.

Viewpoint 5: Farmstead 1 – looking south-east towards the site. Due to the topography, the site is not visible to these receptors.

Viewpoint 6: Lan Crest – looking south-east towards the site. Due to the topography, the site is not visible to these receptors.

Viewpoint 7: Farmstead 2 – looking south towards the site. Due to topography, the site is marginally visible to receptors in the background.

Viewpoint 8: Unnamed Gravel Road – looking south. The site will be visible in the background to receptors.

Viewpoint 9: Unnamed Gravel Road – looking south-west. The site will be visible in the middle- and background to receptors.

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| Viewpoint 10: Unnamed Gravel Road – looking west towards the site. The site will be visible in the middle- and background to receptors. |
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| Viewpoint 11: Farmstead 3 – looking west towards the site. The site will be marginally visible in the background to receptors. |
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| Viewpoint 12: Farmstead 4 – looking south-west towards the site. Due to topography and vegetation, the site is not visible to receptors. |

## Appendix D: Glare Modelling Results