SCIENTIFIC AQUATIC SERVICES

Visual Impact Assessment

AS PART OF THE ENVIRONMENTAL AUTHORISATION PROCESS FOR THE PROPOSED BRITSTOWN SOLAR PHOTOVOLTAIC (PV) FACILITY 1 AS PART OF THE BRITSTOWN SOLAR PV CLUSTER PROJECT NEAR BRITSTOWN, NORTHERN CAPE PROVINCE.

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Report Reference:	SAS 22-1181
Date:	June 2023

Part of the SAS Environmental Group of Companies

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EXECUTIVE SUMMARY

Scientific Aquatic Services (SAS) has been appointed to conduct a Visual Impact Assessment as part of the Environmental Authorisation (EA) Process for the proposed development of the Britstown Solar Photovoltaic (PV) Cluster, Northern Cape Province. The proponent Soyuz Solar 1 PV Park (Pty) Ltd proposes to construct one solar PV facility forming part of the Britstown Solar Cluster, which will have six PV facilities in total, within the Northern Cape.

The Britstown Solar Cluster is located approximately 5,5 km east of the R398 roadway and 6,2 km east of the N12 national roadway, and the town of Britstown is located approximately 6,8 km north west of the Britstown Solar Cluster.

The Soyuz 1 Solar PV Park is located within the Emthanjeni Local Municipality, an administration of the Pixley ka Seme District Municipality. Soyuz 1 Solar PV Park is located on Portion 3 of Farm 145 while the proposed access road is located on Farm 146, and Portions 1, 5, and 9 of Farm Twyfelhoek 127, in the Northern Cape Province. The Soyuz 1 Solar PV Park is situated within a landscape that is associated with open shrub veld (often utilised for grazing).

The proposed Soyuz 1 Solar PV Park is situated in a rural area and due to the arid nature of the climate it restricts stocking densities which has led to relatively large farms across the landscape, resulting in the area being sparsely populated. As such, there is only five receptors located within 5 km of the Soyuz 1 Solar PV Park and access road, in particular the Rietpoort Guest House, located approximately 4,6 km west.

With the Soyuz 1 Solar PV Park and surroundings being dominated by dwarf karoo shrubs and grasses, the vegetative component will not be able to assist in screening the Soyuz 1 Solar PV Park. The Rietpoort Guest House does however have existing dense tree lines which obscures the view towards Soyuz 1 Solar PV Park. The local topography of the Soyuz 1 Solar PV Park is relatively flat to gently sloping with isolated hills and a mountainous backdrop. With the local topography of the Soyuz 1 Solar Park being relatively flat, it is unlikely to assist in absorbing and/ or screening the Soyuz 1 Solar PV Park. The mountainous backdrop will however somewhat assist in absorbing the Soyuz 1 Solar PV Park. The field assessment did however indicate from a distance further than 1 km from the Soyuz 1 Solar PV Park, the gently sloping topography does have an effect on the visibility of the Soyuz 1 Solar PV Park. The Visual Absorption Capacity (VAC) of the area is therefore considered moderate, indicating that the proposed PV structures will be absorbed in the area, to a degree.

The sense of place associated with the Soyuz 1 Solar PV Park can be described as calm, tranquil and peaceful, no development and limited movement, with the exception of the shepherds moving with the livestock. The sense of place is however not unique to the Soyuz 1 Solar PV Park as it extends to the larger region. During the construction phase of the Soyuz 1 Solar PV Park, the sense of place will however be affected, shifting the mood to busy and disturbed with construction vehicles and potential need for some earth moving equipment, however, once the panels are operational there will be limited additional vehicular movement in and out of the area, thus returning the area to a calm and tranquil landscape.

The Soyuz 1 Solar PV Park being located in a rural area, results in limited sources of night-time lighting (Britstown and the five farmsteads), as such the lighting environment is considered intrinsically dark. Development of the Soyuz 1 Solar PV Park may potentially be a source of light pollution during the construction and operational phases, due to security lighting on the perimeter fence and at the buildings (substation, BESS and O&M Buildings). Overall, the impact significance of potential night-time lighting is expected to be moderately low and will be limited to a local area, as the Soyuz 1 Solar PV Park is not a development that requires a significant amount of lighting. As such the introduction of lighting sources in an intrinsically dark area results in the Soyuz 1 Solar PV Park potentially contributing to the effects of sky glow and artificial lighting in the region.

According to the Strategic Environmental Assessment (SEA) Project (2019) the Soyuz 1 Solar PV Park does not fall within any Renewable Energy Development Zone (REDZ), however it is located within the central corridor for Electricity Grid Infrastructure (EGI). According to South African Renewable Energy EIA Application Database (REEA) there are twenty two applications for renewable energy facilities (wind and solar) within a 50 km radius of the Soyuz 1 Solar PV Park, of which twenty one have been approved. This indicates that the larger region has been earmarked for renewable energy facilities, which may alter the landscape character.

Visual impacts are only experienced when there are receptors present to experience the impact, in this context there is only one receptor present within a 5 km radius of the Soyuz 1 Solar PV Park, thus the visual impact is considered low. Based on the field assessment, the undulating topography and dense vegetation associated with the Rietpoort Guest House obscures the view towards the Soyuz 1 Solar PV Park, therefore the visual impact for the Soyuz 1 Solar PV Park is considered low to negligible as the visual intrusion on the receiving environment will be minor, if any.

Summary table of overall significance:

DESCRIPTION OF IMPACT	Overall Significance	
	Without mitigation	**With mitigation**
Construction Phase		
Potential impact on the overall landscape, visual intrusion and exposure of the landscape	Low	Low
Impact on overall landscape, visual intrusion and exposure for the local airstrip	NA	NA
Potential impacts due to night time lighting	Low	Low
Operation Phase		
Potential impact on the overall landscape, visual intrusion and exposure of the landscape	Low	Low
Impact on overall landscape, visual intrusion and exposure for the local airstrip	Low	Low
Potential impacts due to night time lighting	Low	Low
Decommissioning Phase		
Potential impact on the overall landscape, visual intrusion and exposure of the landscape	Low	Low
Impact on overall landscape, visual intrusion and exposure for the local airstrip	NA	NA
Potential impacts due to night time lighting	Low	Low

From a visual resource aspect, there are no fatal flaws associated with the Soyuz 1 Solar PV Park. Hence, it is the professional opinion of the visual specialist that he development of the Soyuz 1 Solar PV Park can be considered for authorisation.
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DOCUMENT GUIDE

The following table indicates the requirements for Specialist Studies as per Appendix 6 of Government Notice 326 as published in Government Notice 40772 of 2017, amendments to the Environmental Impact Assessment (EIA) Regulations, 2014 as it relates to the National Environmental Management Act, 1998 (Act No. 107 of 1998).

NEMA Regulations (2017) - Appendix 6		Relevant section in report
1a	Details of	
	(i) the specialist who prepared the report; and	Appendix H
	(ii) the expertise of that specialist to compile a specialist report including	Appendix H
b	a declaration that the specialist is independent in a form as may be specified by the competent authority;	Appendix H
c	an indication of the scope of, and the purpose for which, the report was prepared;	Section 1.3
cA	an indication of the quality and age of base data used for the specialist report	Section 3.2
cB	a description of existing impacts on the site, cumulative impacts of the proposed development and levels of acceptable change;	Section 5
d	the duration, date and season of the site investigation and the relevance of the season to the outcome of the assessment;	Section 3.2
e	A description of the methodology adopted in preparing the report or carrying out the specialised process inclusive of equipment and modelling used	Section 3 and Appendix A to F
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	Section 4
g	an identification of any areas to be avoided, including buffers	Was provided during scoping phase, and implemented in the design assessed during the EIA phase
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;	Was provided during scoping phase, and implemented in the design assessed during the EIA phase
i	a description of any assumptions made and any uncertainties or gaps in knowledge;	Section 1.5
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;	Section 4 and 5
k	any mitigation measures for inclusion in the EMPr	Section 5
l	any conditions for inclusion in the environmental authorisation	Section 5
m	any monitoring requirements for inclusion in the EMPr or environmental authorisation;	Section 5
n	a reasoned opinion	
	(i)as to whether the proposed activity, activities or portions thereof should be authorised;	Section 6
	(1A) regarding the acceptability of the proposed activity or activities; and	Section 6
	(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;	Section 6
o	a description of any consultation process that was undertaken during the course of preparing the specialist report;	Consultation with interested and affected parties (I&APs) will be undertaken as part of the project
p	summary and copies of any comments received during any consultation process and where applicable all responses thereto; and	Comments and responses that are raised by I&APs will be included in the EIA report compiled by the EAP
q	any other information requested by the competent authority	No information requested at this time

Site sensitivity verification requirements where a specialist assessment is required but no specific assessment protocol has been prescribed, the general protocol is used. Published in Government Notice No. 320 Government Gazette 43110 On 20 March 2020.

See Appendix A for the general requirements.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

GLOSSARY OF TERMS

Best Practicable Environmental Option	This is the alternative/option that provides the most benefit or causes the least damage to the environment as a whole, at a cost acceptable to society, in the long term as well as in the short term.
Characterisation	The process of identifying areas of similar landscape character, classifying and mapping them and describing their character.
Characteristics	An element, or combinations of elements, which make a contribution to landscape character.
Development	Any proposal that results in a change to the landscape and/ or visual environment.
Elements	Individual parts, which make up the landscape, for example trees and buildings.
Feature	Particularly prominent or eye-catching elements in the landscape such as tree clumps, church towers or wooded skylines.
Geographic Information System (GIS)	A system that captures, stores, analyses, manages and presents data linked to location. It links spatial information to a digital database.
Glint and glare	The two terms 'glint' and 'glare' refer to the unwanted reflection of the sun's rays by the face of a reflective surface. Glint is a momentary flash of light. Glare is a continuous source of excessive brightness.
Impact (Visual)	A description of the effect of an aspect of the development on a specified component of the visual, aesthetic or scenic environment within a defined time and space.
Key characteristics	Those combinations of elements which are particularly important to the current character of the landscape and help to give an area its particularly distinctive sense of place.
Land cover	The surface cover of the land, usually expressed in terms of vegetation cover or the lack of it. Related to but not the same as Land use.
Land use	What land is used for based on broad categories of functional land cover, such as urban and industrial use and the different types of agriculture and forestry.
Landform	The shape and form of the land surface which has resulted from combinations of geology, geomorphology, slope, elevation and physical processes.
Landscape	An area, as perceived by people, the character of which is the result of the action and interaction, of natural and/ or human factors.
Landscape Character Type	These are distinct types of landscapes that are relatively homogeneous in character. They are generic in nature in that they may occur in different areas in different parts of the country, but wherever they occur, they share broadly similar combinations of geology, topography, drainage patterns, vegetation and historical land use and settlement pattern, and perceptual and aesthetic attributes.
Landscape integrity	The relative intactness of the existing landscape or townscape, whether natural, rural or urban, and with an absence of intrusions or discordant structures.
Landscape quality	A measure of the physical state of the landscape. It may include the extent to which typical landscape character is represented in individual areas, the intactness of the landscape and the condition of individual elements.
Landscape value	The relative value that is attached to different landscapes by society. A landscape may be valued by different stakeholders for a variety of reasons.
Receptors	Individuals, groups or communities who are subject to the visual influence of a particular project. Also referred to as viewers, or viewer groups.
Sense of place	The unique quality or character of a place, whether natural, rural or urban, allocated to a place or area through cognitive experience by the user. It relates to uniqueness, distinctiveness or strong identity and is sometimes referred to as *genius loci* meaning 'spirit of the place'.
Sky glow	Brightening of the night sky caused by outdoor lighting and natural atmospheric and celestial factors.

Skylining	Siting of a structure on or near a ridgeline so that it is silhouetted against the sky.
Specular Reflection	Specular reflection is a type of surface reflectance often described as a mirror-like reflection of light from the surface. In specular reflection, the incident light is reflected into a single outgoing direction.
View catchment area	A geographic area, usually defined by the topography, within which a particular project or other feature would generally be visible.
Viewshed	The outer boundary defining a view catchment area, usually along crests and ridgelines.
Visibility	The area from which project components would potentially be visible. Visibility is a function of line of sight and forms the basis of the VIA as only visible structures will influence the visual character of the area. Visibility is determined by conducting a viewshed analysis which calculates the geographical locations from where the proposed project elements might be visible.
Visual Absorption Capacity	The ability of an area to visually absorb development as a result of screening topography, vegetation or structures in the landscape.
Visual Character	The overall impression of a landscape is created by the order of the patterns composing it; the visual elements of these patterns are the form, line, colour and texture of the landscape's components. Their interrelationships are described in terms of dominance, scale, diversity and continuity. This characteristic is also associated with land use.
Visual Exposure	The relative visibility of a project or feature in the landscape. Visual exposure is based on distance from the project to selected viewpoints. Visual exposure or visual impact tends to diminish exponentially with distance.
Visual Intrusion	The nature of intrusion of an object on the visual quality of the environment resulting in its compatibility (absorbed into the landscape elements) or discord (contrasts with the landscape elements) with the landscape and surrounding land uses.
Zone of visual influence	An area subject to the direct visual influence of a particular project.

*Definitions were derived from Oberholzer (2005) and the Institute of Environmental Management and Assessment (2013)

LIST OF ACRONYMS

ARC	Agricultural Research Council
BAR	Basic Assessment Report
BESS	Battery Energy Storage System
BLM	(United States) Bureau of Land Management
BPEO	Best Practicable Environmental Option
DEAT	Department of Environmental Affairs and Tourism
DEM	Digital Elevation Model
DFFE	Department of Forestry, Fisheries and the Environment
DM	District Municipality
DTM	Digital Terrain Model
DWS	Department of Water and Sanitation
EA	Environmental Authorisation
EAP	Environmental Assessment Practitioner
EIA	Environmental Impact Assessment
GIS	Geographic Information System
GN	General Notice
GPS	Global Positioning Systems
HIA	Heritage Impact Assessment
IAPs	Interested and Affected Parties
IDP	Integrated Development Plan
IEM	Integrated Environmental Management
KOP	Key Observation Points
LI IEMA	Institute of Environmental Management and Assessment
LM	Local Municipality
m.a.m.s.l.	Meters above mean sea level
MAPE	Mean Annual Potential Evaporation
MAT	Mean Annual Temperature
MASMS	Mean Annual Soil Moisture Stress
MFD	Mean Frost Days
MW	MegaWatt
NEMA	National Environmental Management Act (No. 107 of 1998)
NGL	Natural Ground Level
NPAES	National Protected Areas Expansion Strategy
O&M	Operations and Maintenance
OHPL	Overhead Powerline
PV	Photovoltaic
PVSEF	Photovoltaic Solar Energy Facility
REEA	Renewable Energy EIA Application
REDZ	Renewable Energy Development Zones
SANBI	South African National Biodiversity Institute
SAS	Scientific Aquatic Services
SACAD	South African Conservation Areas Database
SAPAD	South African Protected Areas Database
SEA	Strategic Environmental Assessment
UNESCO	United Nations Educational Scientific and Cultural Organization

VAC	Visual Absorption Capacity
VIA	Visual Impact Assessment
VRM	Visual Resource Management

1. INTRODUCTION

1.1 Background

Scientific Aquatic Services (SAS) has been appointed to conduct a Visual Impact Assessment as part of the Environmental Authorisation (EA) Process for the proposed development of the Britstown Solar Photovoltaic (PV) Cluster, Northern Cape Province. The proponent Soyuz Solar 1 PV Park (Pty) Ltd proposes to construct one solar PV facility, forming part of the Britstown Solar Cluster, which will have six PV facilities in total, within the Northern Cape. Figure 1 indicates the location of the Soyuz 1 Solar PV Park in relation to the Britstown Solar Cluster.

The Britstown Solar Cluster is located approximately 5,5 km east of the R398 roadway and 6,2 km east of the N12 national roadway, and the town of Britstown is located approximately 6,8 km north west of the Britstown Solar Cluster. The location and extent of the Soyuz 1 Solar PV Park is indicated in Figures 2 and 3.

The Soyuz 1 Solar PV Park is located within the Emthanjeni Local Municipality, an administration of the Pixley ka Seme District Municipality. Soyuz 1 Solar PV Park is located on Portion 3 of Farm 145 while the proposed access road associated with the Soyuz 1 Solar PV Park is located on Farm 146, and Portions 1, 5, and 9 of farm Twyfelhoek 127, in the Northern Cape Province. The Soyuz 1 Solar PV Park is situated within a landscape that is associated with open shrub veld (often utilised for grazing).

A VIA entails a process of data collection, spatial analysis, visualisation and interpretation to describe the quality of the landscape prior to development taking place and then identifying possible visual impacts after development. Assessing visual impacts is difficult as it is very subjective due to a person’s perception being affected by more than only the immediate environmental factors (Oberholzer, 2005).

This report, after consideration and description of the visual integrity of the Soyuz 1 Solar PV Park and surroundings, must guide the proponent, authorities and Environmental Assessment Practitioner (EAP), by means of recommendations, as to the suitability of the proposed PV Plant, from a visual impact and aesthetic point of view in consideration of the characteristics of the project and host region. This report should furthermore serve to inform the planning, design and decision-making process as to the layout and nature of the proposed activities.

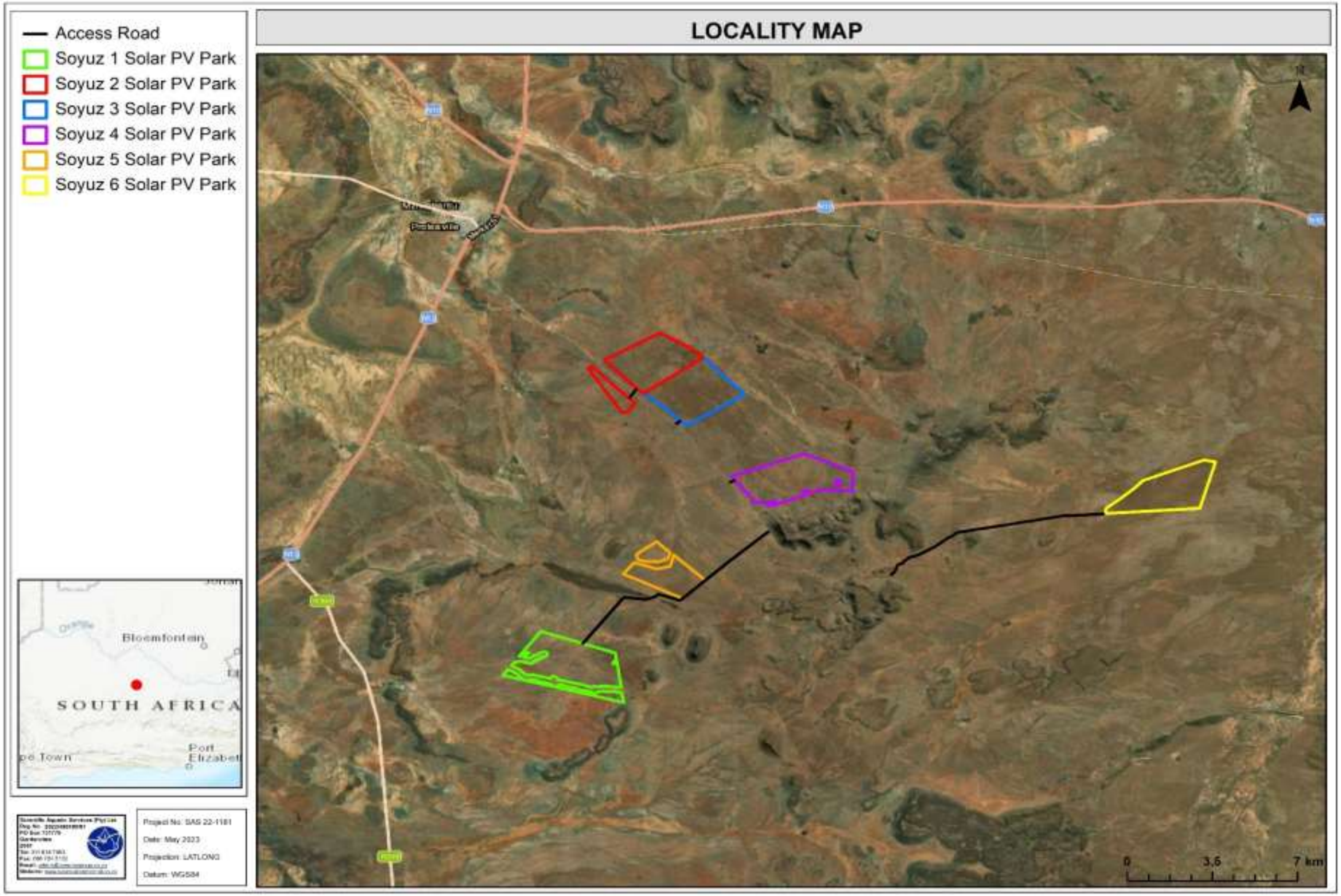


Figure 1: Digital satellite image depicting the Soyuz 1 Solar PV Park in relation to the Britstown Solar Cluster and surrounding area.

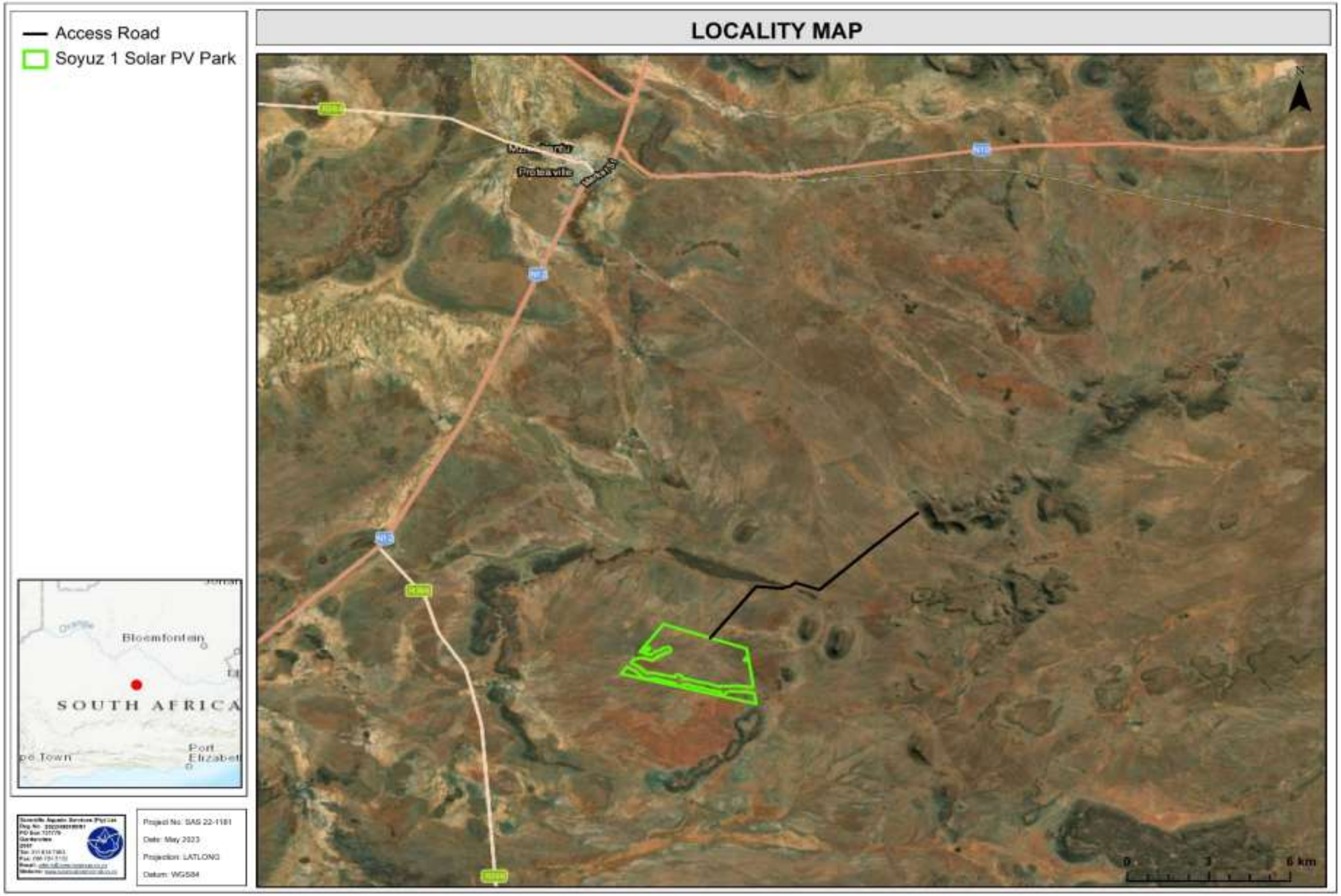


Figure 2: Digital satellite image depicting the Soyuz 1 Solar PV Park in relation to the surrounding area.

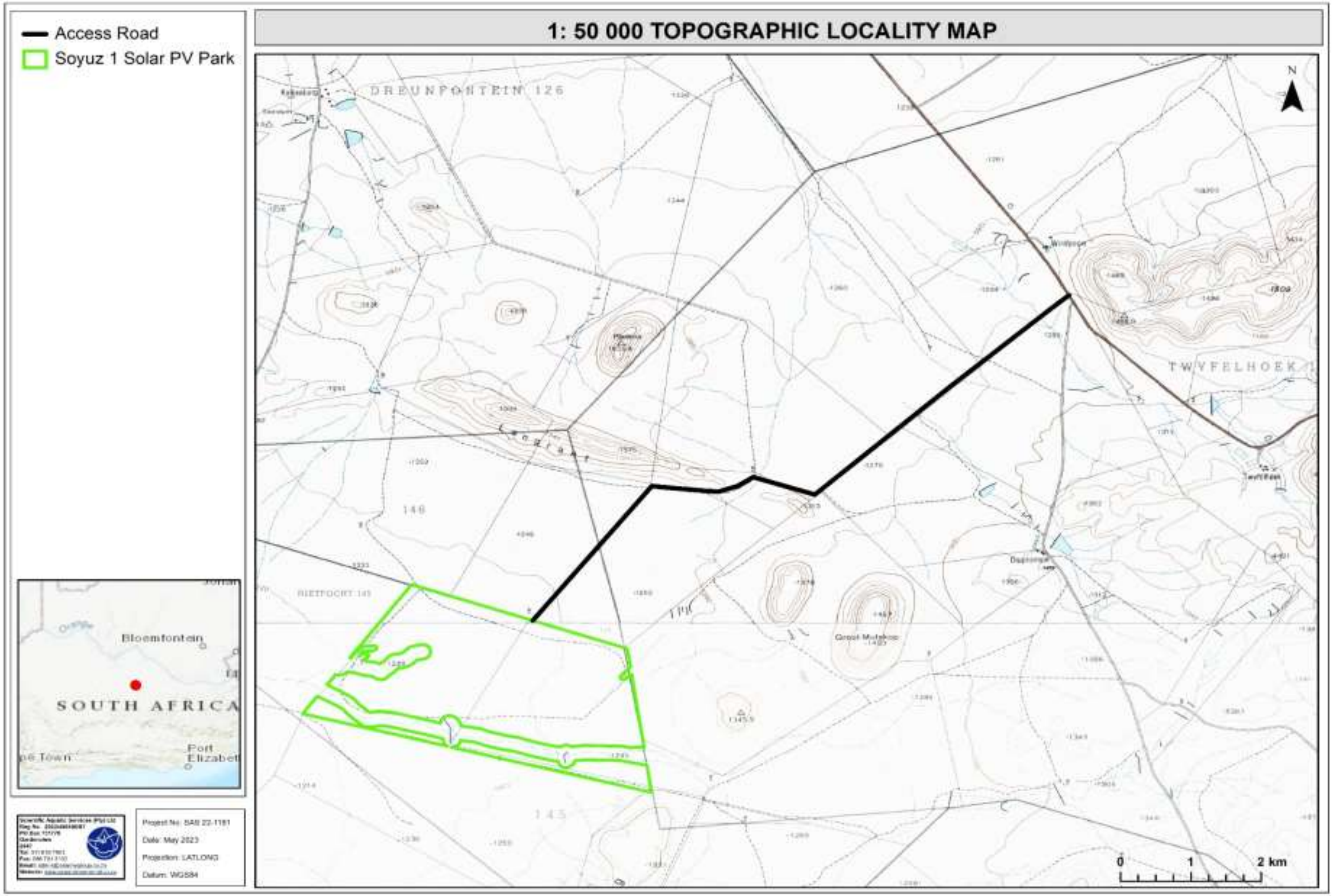


Figure 3: Soyuz 1 Solar PV Park depicted on a 1:50 000 topographical map in relation to the surrounding area.

1.2 Description of the proposed project

Soyuz 1 Solar PV Park (Pty) Ltd proposes the development of the Soyuz 1 Solar PV Park and associated infrastructure near Britstown, Northern Cape Province. The Soyuz 1 Solar PV Park will be located on Portion 3 of Farm 145. The project will have a generating capacity of no more than 240MW and Battery Energy Storage Systems (“BESS”) of 1000MWh. Bi-facial, single axis trackers will be utilised for the panels. An on-site substation with a capacity of 240MVA, will enable the connection of a 132kV Overhead Powerline (“OHPL”). The final interconnection solution will be dependent on the requirements of Eskom, which are still to be defined. Terramanzi Group (Pty) Ltd have been appointed to facilitate the Scoping & EIA process to obtain environmental authorisation in terms of the National Environmental Management Act (“NEMA”) Environmental Impact Assessment (“EIA”) Regulations (2014), as amended. The purpose of the facility is to generate clean electricity from a renewable energy source (i.e., solar radiation) in order to contribute to the National energy grid and/or any Private off takers (where applicable).

Table 1 below indicates a summary of the project details of the Soyuz 1 Solar PV Park and Figure 4 below provides an example of the Bi-facial trackers. The layout is illustrated in Figure 5.

Table 1: Project details for Soyuz 1 Solar PV Park.

Contracted Capacity of Photovoltaic Solar Energy Facility (PVSEF)	**240MW**
Need and Desirability of the Proposed activity, including the need and desirability of the activity in the context of the preferred location (motivation of the preferred site)	Suitable open land/space for solar facility development with a sufficiently high solar resource Renewable energy generation to add capacity to national grid Contributes to energy mix Employment opportunities Skills development No exceedence of environmental sensitivities
What other infrastructure does the client want to include in this Process (PVSEF, WEF, BESS, Substation, switching station, access roads etc.)	PV Solar Energy Facility including bifacial PV modules, single axis trackers, inverters and transformers, and underground and overhead cabling up to 33kV between project components
	1,500 m² Operations & Maintenance (O&M) building
	2,500 m² Paved areas
	5 ha BESS (1000 MWh)
	6 Ha back to back 132Kv substation (including facility substation, and Eskom collector/switching station with feeder bays) (240MW)
	Access (8m wide) and internal roads (4m wide)
	Fencing around development area
	8,000 m² Temporary construction camp
	32,000 m² Temporary laydown areas

Does the project form part of a Renewable Energy Development Zone (REDZ) as per GN 114? Does the project form part of an Electricity Grid Infrastructure (EGI) as per GN 113 (Strategic Transmission Corridor - STC) ?	Not in REDZ - EAP to also confirm. EGI not applicable now as no OHPL determined yet.
Technical Specifications (Type of Technology used, I.e Fixed tilt, single axis, height of the solar panels etc.)	Bifacial solar PV modules installed on single axis tracker mounting structure at a height of up to 6m above ground level
Lifespan of the project (ex. 30 Years)	30 years
How many new employment opportunities will be created in the development and construction phase of the activity/ies?	Approx 150 during construction Approx 40-50 during operations
Will the labourers be sourced locally / Provincially	Both locally and provincially
Is there a previous EA done for this site/ project	No

Figure 4: Example of Bi-facial solar panels to be utilised for this project.

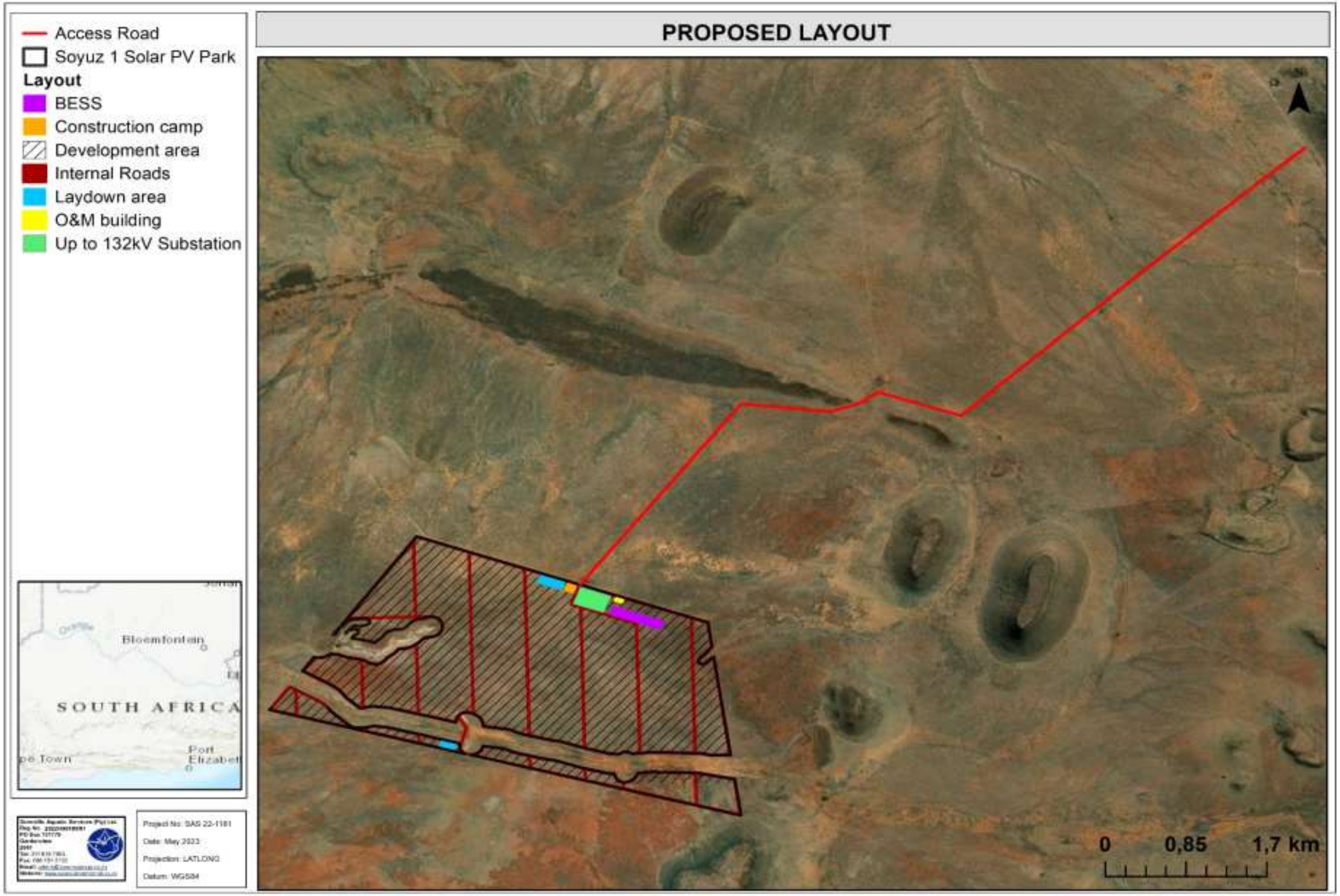


Figure 5: Proposed layout of the Soyuz 1 Solar PV Park.

1.3 Project Scope

The purpose of this report is:

- To determine the Category of Development and Level of Assessment as outlined by Oberholzer (2005) and with this information undertake an appropriate Visual Impact Assessment;
- To describe the receiving environment in terms of regional context, location and environmental and landscape characteristics;
- To describe and characterise the proposed project and the receiving environment in its envisioned future state;
- To identify the main viewsheds through undertaking a viewshed analysis, based on the proposed height of infrastructure components and the Digital Elevation Model (DEM), as a mechanism to identify the locations of potential sensitive receptors sites and the distance of these receptor sites from the Soyuz 1 Solar PV Park, if necessary;
- To identify and describe potential sensitive visual receptors residing at or utilising receptor sites;
- To establish receptor sites and identify Key Observation Points (KOPs) from which the proposed project will have a potential visual impact, if necessary;
- To prepare a photographic study and conceptual visual simulation of the proposed project as the basis for the viewshed identification and analysis, if necessary;
- To assess the potential visual impact of the proposed project from selected receptors sites in terms of standard procedures and guidelines; and
- To describe mitigation measures in order to minimise any potential visual impacts.

1.4 Principles and Concepts of VIAs

Visual resources have value in terms of the regional economy and inhabitants of the region. Furthermore, these resources are often difficult to place a value on as they normally also have cultural or symbolic values. Therefore, VIAs are to be performed in a logical, holistic, transparent and consistent manner. Oberholzer (2005) identifies the following concepts to form an integral part of the VIA process:

- Visual resources include the visual, aesthetic, cultural and spiritual aspects of the environment, which contribute toward and define an area’s sense of place;
- Natural and cultural landscapes are inter-connected and must be considered as such;
- All scenic resources, protected areas and sites of special interest within a region need to be identified and considered as part of the VIA;
- All landscape processes such as geology, topography, vegetation and settlement patterns that characterise the landscape must be considered;

- Both quantitative criteria, such as 'visibility' and qualitative criteria, such as aesthetic value or sense of place has to be included as part of the assessment;
- VIAs must inform the Environmental Impact Assessment (EIA) process in terms of visual inputs; and
- Public involvement must form part of the process.

The guideline furthermore recommends that the VIA process identifies the Best Practicable Environmental Option (BPEO) based on the following criteria:

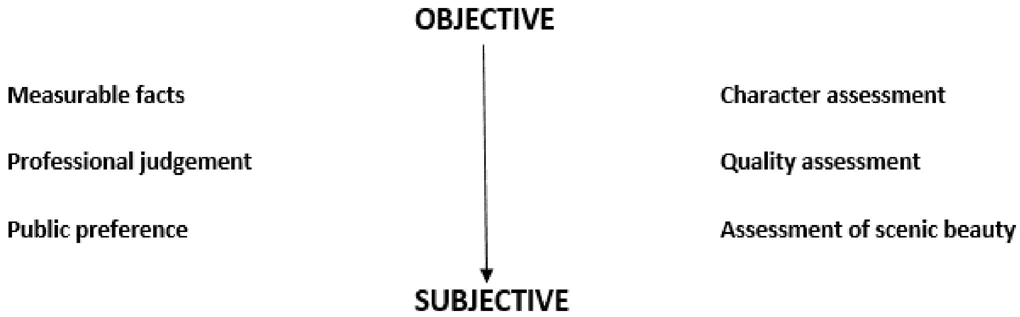
- Long term protection of important scenic resources and heritage sites;
- Minimisation of visual intrusion on scenic resources;
- Retention of wilderness or special areas intact as far as possible; and
- Responsiveness to the area's uniqueness, or sense of place.

1.5 Assumptions and Limitations

- No specific national legal requirements for VIAs currently exist in South Africa. However, the assessment of visual impacts is required by implication when the provisions of relevant acts governing environmental management are considered and when certain characteristics of either the receiving environment or the proposed project indicate that visibility and aesthetics are likely to be significant issues and that visual input is required (Oberholzer, 2005);
- Distance and terrain play a critical role when assessing the visual impacts of an area. Due to the mountainous terrain of the area and relatively low height of the proposed PV structures and associated infrastructure, it was deemed necessary to identify all potential sensitive receptors within a 5 km radius, on a desktop-level, which would then be verified during the field assessment. The 5 km radius can be considered the "visual assessment zone". It should be noted that the visibility of an object decreases exponentially the further away the observer is from the source of impact;
- Due to the isolated location of the Soyuz 1 Solar PV Park, there are very limited visual receptors, therefore no viewshed analysis and visual simulations were undertaken;
- Due to a lack of guidelines for specialist visual impact assessments as part of the EIA process within the Northern Cape Province, the "Guidelines for Involving Visual and Aesthetic Specialists in the EIA Process" (Oberholzer, 2005), prepared for the Western Cape Department of Environmental Affairs & Development Planning, was used;
- All information relating to the proposed project as referred to in this report is assumed to be the latest available information. Additionally, best practice guidelines were taken

into consideration and utilising the maximum expected heights of the infrastructure and the placement thereof in viewshed calculations as a precautionary approach; and

- Abstract or qualitative aspects of the environment and the intangible value of elements of visual and aesthetic significance are difficult to measure or quantify and as such depend to some degree on subjective judgements. It, therefore, is necessary to differentiate between aspects that involve a degree of subjective opinion and those that are more objective and quantifiable, as outlined in the diagram below (The Landscape Institute and Institute of Environmental Management and Assessment (LI IEMA, 2002).



2. LEGAL, POLICY AND PLANNING CONTEXT FOR VIAs

Oberholzer (2005) indicates that current South African environmental legislation governing the BA and EIA process, which may include consideration of visual impacts if this is identified as a key issue of concern, is the National Environmental Management Act (NEMA) (Act No. 107 of 1998). This includes the 2014 NEMA EIA regulations as amended (published in General Notice (GN) No. R 982 as well as R 983 Listing Notice 1, R 984 Listing Notice 2 and R 985 Listing Notice 3).

In addition, the following acts and guidelines are applicable (Oberholzer, 2005):

The National Environmental Management: Protected Areas Act (Act No. 57 of 2003)
This act was developed in 2003 for the protection and conservation of ecologically viable areas representative of South Africa's biological diversity and its natural landscapes and seascapes

- Restricted activities involving national and protected parks:

According to the South African Protected Areas Database (SAPAD, 2022) and the National Protected Areas Expansion Strategy (NPAES, 2018) Dataset, there are no protected areas located within a 10 km radius of the Soyuz 1 Solar PV Park, therefore the Protected Areas Act is currently not relevant to the proposed project.

The National Heritage Resources Act (Act No. 25 of 1999)

The purpose of the Act is to protect and promote good management of South Africa's heritage resources, and to encourage and enable communities to nurture and conserve their legacy so it is available to future generations.

A heritage impact assessment has been commissioned as part of the EA for this project.

The Advertising on Roads and Ribbons Act (Act No. 21 of 1940)

Visual pollution is controlled, to a limited extent, by the Advertising on Roads and Ribbons Act (Act 21 of 1940), which deals mainly with signage on public roads.

Municipal Systems Act (Act No. 32 of 2000)

In terms of the Municipal Systems Act (Act No. 32 of 2000), it is compulsory for all municipalities to initiate an Integrated Development Planning (IDP) process in order to prepare a five-year strategic development plan for the area under their control. The IDP process, specifically the spatial component is based in certain areas and provinces on a bioregional planning approach to achieve continuity in the landscape and to maintain important natural areas and ecological processes. The Soyuz 1 Solar PV Park is situated within the Emthanjeni Local Municipality (LM), which is an administrative area of the Pixley ka Seme District Municipality (DM). According to the Draft IDP 2022 to 2027 of the LM and DM, the municipalities are regarded as a centre for renewable energy and are investing in eight renewable energy projects to strengthen the economic growth of the municipalities, thus reducing the dependence on coal resources. The municipalities also envision a tourism factor that is likely to be associated with the renewable energy facilities, thus attracting more tourists to the area, in turn increasing the economic growth.

Strategic Environmental Assessment (SEA) and Renewable Energy Development Zones (REDZ)

A Strategic Environmental Assessment (SEA, 2015 and 2019) was undertaken by the former Department of Environmental Affairs (DEA), which is now known as the Department of Forestry, Fisheries and the Environment (DFFE), in order to identify geographical areas most suitable for the rollout of wind and solar PV energy projects and the supporting electricity grid network. The Phase 1 Wind and Solar Strategic Environmental Assessment (SEA) (2015), aimed to facilitate the efficient rollout of wind and solar PV energy. These areas are referred to as Renewable Energy Development Zones (REDZs), in which development will be incentivised and streamlined. The Phase 2 assessment (2019) focused on utilising existing information to anticipate the impacts of wind and solar PV facilities and suggesting mitigation measures and identifying thresholds for cumulative impacts.

Sensitivity was determined using criteria that influence the value of visual/scenic resources, and ultimately their significance. The criteria are considered spatially, with the addition of buffers, based on the relative sensitivity of the feature or receptor. The study categorises four levels of sensitivity, very high, high, medium and low sensitivity (DFFE, 2019). The criteria considered for the sensitivity levels determination includes visually sensitive landforms and water features, proclaimed or protected areas such as national parks or nature reserves, visually sensitive receptors such as settlements and routes, as well as heritage resources (DFFE, 2019). Table 2 below contains features and criteria considered during the visual assessment for the SEA, as well as the sensitivity rating with buffers, providing the basis for the sensitivity mapping (DFFE, 2019).

Table 2: Spatial data used in the landscape assessment (DFFE, 2019).

Sensitivity Feature Class	Data Source & Date of Publications	Sensitivity Mapping Application		
		Sensitivity	Wind Buffer Distance	Solar Buffer Distance
Topographic features, including mountain ridges	Inferred from Digital Elevation Model (DEM), 2015, National Geospatial Information (NGI).	VH	0 - 500m	0 – 250m
Steep slopes	Modelled from DEM, 2015, NGI.	Very High Sensitivity areas with slopes of more than 1:4	Feature	Feature
		High Sensitivity areas with slopes between 1:4 and 1:10	Feature	Feature
Major rivers, water bodies perennial rivers and wetlands with scenic value as identified by landscape specialists	National Freshwater Ecosystem Priority Areas (NFEPA) 2011	VH	0 – 500m	0 – 500m
		H	0 – 250m	0 – 250m
		M	250 – 500m	250 – 500m
Coastal zone	Surveys and Mapping 1:50 000 topographical maps of South Africa	VH	0 1km	0 – 1km
		H	1 – 2km	1 2km
		M	2 – 4km	2 – 3km
Protected Areas : National Parks	South African Protected Areas Database (SAPAD) – Q2, 2017, SANParks	VH	0 – 5km	0 – 2km
		H	5 10km	2 – 4km
		M	10 – 15km	4 – 6km
Protected Areas: Nature Reserves	SAPAD – Q2, 2017	VH	0 – 3km	0 – 1km
	South African Conservation Areas Database (SACAD) – Q1, 2017	H	3 – 5km	1 – 2km
		M	5 – 10km	2 – 3km
Private reserves and game farms	Provincial Private Reserves/Conservation Areas and Game Farms	VH	0 – 1.5km	0 – 500m
		H	1.5 – 3km	500 – 1km
		M	3 – 5km	1 – 2km
Cultural landscapes	Not mapped	VH	Feature	Feature
		H	0 500m	500m – 1km
		M	500m – 1km	1 – 2km
	SAHRA, 2015	VH	Feature	Feature

Sensitivity Feature Class	Data Source & Date of Publications	Sensitivity Mapping Application		
		Sensitivity	Wind Buffer Distance	Solar Buffer Distance
Heritage Sites Grades I, II and III		H	0 500m	0 500m
		M	500m – 1km	500m – 1km
Towns and villages	AfriGIS SG Towns, 2017	VH	0 – 2km	0 – 500m
		H	2 – 4km	500 – 1km
		M	4 – 6km	1 – 2km
National roads	NGI, 2016	VH	0 – 1km	0 – 500m
		H	1 – 2.5km	500 – 1km
		M	2.5 – 5km	1 – 2km
Scenic routes	Western Cape Department of Transport, 2013	VH	0 – 1km	0 – 500m
		H	1 – 2.5km	500 – 1km
		M	2.5 – 5km	1 – 2km
Provincial and arterial routes		VH	0 – 500m	-
		H	500 – 1km	
		M	1km – 3km	
Passenger rail lines		VH	0 – 500m	0 – 250m
		H	500 – 1km	250 – 500m
		M	1km – 3km	500 1km
Small airfields	REDZs 1 SEA dataset, EGI SEA dataset, 2015	VH	0 3km	0 3km
Square Kilometre Array (SKA) corridors	Square Kilometre Array SEA	VH	0 36km	0 16km

VH = Very High; H = High; M = Medium; REDZ = Renewable Energy Development Zone
***Feature refers to the actual sensitivity feature class e.g. the actual delineated and declared heritage site, thus no buffer.**

The Soyuz 1 Solar PV Park is not located within any REDZ however it is located within the central corridor for Electricity Grid Infrastructure (EGI) as per GN 113.

Furthermore, according to the South African Renewable Energy EIA Application Database (REEA, 2022) there are twenty two applications for renewable energy facilities (wind and solar) within a 50 km radius of the Soyuz 1 Solar PV Park, of which twenty one are approved and one is still in process. This indicates that the larger region has been earmarked for renewable energy facilities, which may alter the landscape character.

International Finance Corporation (IFC) Performance Standards on Environmental and Social Sustainability

The IFC Sustainability Framework articulates the Corporation's strategic commitment to sustainable development, and is an integral part of IFC's approach to risk management. The sustainability framework comprises IFC's Policy and Performance standards on Environmental and Social Sustainability, and IFC's Access to Information Policy. The IFC Performance Standards (PS) are designed to assist the client in designing and implementing a project in a manner where risks and impacts associated with the project are identified and mitigated to ensure the project is completed sustainably. The applicant deemed it necessary that the environmental assessment had to consider, were applicable and/or include the

Equator Principles as well as Performance Standards 1,3,4,6 and 8. For a detailed description of the Performance Standards please see **Appendix A**.

In the context of the visual assessment the following IFC Performance Standards are applicable:

- **IFC PS1** is applicable to all projects which pose potential risk and may have an impact on the receiving environment. IFC PS1 (2012) states that should the host country have legislative control for the management of the environment that overlaps with the guidelines of the IFC standards, the more stringent measure should be implemented for the project. The objectives of IFC PS1 (2012), where applicable to the freshwater assessment, are summarised as follows:
  - The identification and quantification of environmental risks and impacts associated with the proposed Soyuz 1 Solar PV Park, as well as the identification of -mitigation measures to be implemented at the site to minimise or avoid said risks and impacts (Please see Section 5 for the impacts and mitigation measures pertaining to the proposed Soyuz 1 Solar PV Park);
  - To encourage and ensure that the client runs the project as sustainably as possible using efficient and effective environmental management plans; and
  - To ensure that relevant stakeholders (e.g. local communities, government, etc.) are aware of the project and their respective communications and queries are responded to and managed effectively.
- **PS 3** recognizes that increased economic activity and urbanisation often generate increased levels of pollution to air, water, and land, and consume finite resources in a manner that may threaten people and the environment at the local, regional, and global levels. The objectives of PS 3 is to:
  I. Avoid or minimize adverse impacts on human health and the environment by avoiding or minimizing pollution from project activities;
  II. To promote more sustainable use of resources, including energy and water; and
  III. To reduce project-related greenhouse gases (GHG) emissions.

This assessment focused on the impact that the proposed development will have on the aesthetics of the landscape related to Soyuz 1 Solar PV Park and surrounding environment by implementing an approved Impact Assessment (Section 5). The impact assessment was applied assuming that the mitigation hierarchy as advocated by the DEA *et al.* (2013) would be followed, i.e. the impacts would be avoided, minimised if avoidance is not feasible, rehabilitated as necessary and offset if required.

- **PS 8** recognizes the importance of cultural heritage for current and future generations. Consistent with the Convention Concerning the Protection of the World Cultural and Natural Heritage, this Performance Standard aims to ensure that clients protect cultural heritage in the course of their project activities. In addition, the requirements of this Performance Standard on a project's use of cultural heritage are based in part on standards set by the Convention on Biological Diversity. The objectives of this PS is to protect cultural heritage from adverse impacts of project activities and support its preservation and to promote the equitable sharing of benefits from the use of cultural heritage.

  According to the DWS National Web-Based Screening Tool (2022), the Soyuz 1 Solar PV Park is situated within an area that displays a low sensitivity in terms of Archeological and Cultural Significance.

Equator Principles

The Equator Principles are intended to serve as a common baseline framework for financial institutions to identify, assess and manage environmental and social risks when financing Projects.

Other

- Visual and aesthetic resources are also protected by local authorities, where policies and by-laws relating to urban edge lines, scenic drives, special areas, signage, communication masts, etc. have been formulated; and
- Other decision-making authorities such as the Department of Water and Sanitation (DWS) and relevant authorities of the local and district municipality, in terms of their particular legislative frameworks, may also require VIAs to support informed decision-making.

3. METHOD OF ASSESSMENT

3.1 Desktop Assessment

The method of assessment for this report is based on a spatial analysis of the Soyuz 1 Solar PV Park and the surrounding areas, using Geographic Information Systems (GIS) such as Planet GIS, ArcGIS, Global Mapper as well as digital satellite imagery, photographs, various databases and most relevant available data on the Soyuz 1 Solar PV Park and surroundings. The desktop assessment served to guide the field assessment through identifying preliminary areas of importance in terms of potential sensitive receptors possibly exposed to potential visual impacts.

The desktop study included an assessment of the current state of the environment of the area including the climate of the area, topography, land uses and land cover with data obtained from the websites of the South African National Biodiversity Institute (SANBI) and the Agricultural Research Council (ARC). All databases used were published within the last 5 years and contain up to date and relevant information.

During the desktop assessment, which took place prior to and in preparation of the field assessment, the 1:50 000 topographical map, as well as high-definition aerial photographs from Google Earth Pro were used to identify the dominant landforms and landscape patterns. These resources together with digital elevation data were utilised to establish a parameter within which potential sensitive receptors were to be identified via Google Earth Pro. These parameters can henceforth be referred to as the visual assessment zone. Based on the mountainous terrain of the area, the visual assessment zone encompasses a 5 km radius of the Soyuz 1 Solar PV Park, on a desktop level. The potentially sensitive receptors identified within the visual assessment zone during the desktop assessment was verified during the field assessment.

Detailed assessment methods used to determine the landscape characteristics of the receiving environment and potential visual impacts of the project are outlined in the relevant sections below as well as in Appendices A – F.

3.2 Field Assessment

A field assessment was undertaken during the summer season on the 16th to 18th of January 2023. As the Soyuz 1 Solar PV Park is located in a arid area where rainfall is limited, vegetation is short (shrubs and grass) and agricultural practices are dominant, the season within which the VIA takes place is irrelevant as the vegetation screening factor will remain similar (low). Some seasonal colour variation will however be evident between winter and summer.

The field assessment included a drive-around and on-foot survey of the Soyuz 1 Solar PV Park and drive around in the visual assessment zone (5 km radius), in order to determine the visual context within which the proposed project is to be developed. The visibility of an object decreases exponentially the further away the observer is from the source of impact. Points from where the proposed solar facilities were determined to be visible were recorded (making use of Global Positioning Systems (GPS) to confirm these aesthetically sensitive viewpoints and potential sensitive visual receptors in relation to the proposed project.

4. RESULTS OF INVESTIGATION

4.1 Public Involvement

A public involvement process will be initiated as part of the EA Assessment application process, whereby stakeholders are invited to provide input concerning the proposed development. Should any comments be received during this process, the comments will be addressed and the report will be amended.

4.2 Development Category and Level of Impact Assessment

Through the application of the VIA methods of assessment as presented in Appendix A, it was determined that the proposed project can be defined as a Category 5 development, which includes renewable energy structures. According to the National Web-Based Screening Tool (2022), the overall Archaeological and Cultural Heritage Combined Sensitivity of the Soyuz 1 Solar PV Park is considered low, thus with the environment being classified as low cultural significance, a high visual impact is still possible.

The Screening Tool further does not have a section for the Landscape (Solar) theme sensitivity for the Soyuz 1 Solar PV Park, as such the landscape associated with the Soyuz 1 Solar PV Park was not flagged as a concern in terms of the proposed solar development (Appendix I).

Based on the outcome of the desktop and field assessments it is evident that the proposed Soyuz 1 Solar PV Park is situated in a rural area and due to the arid nature of the climate stocking densities are restricted which has led to relatively large farms across the landscape, resulting in the area being sparsely populated. As such, there is only one receptor located within 5 km of the Soyuz 1 Solar PV Park, namely the Rietpoort Guest House, located approximately 4,6 km west. There are however four farmsteads located within the 5 km visual assessment zone of the proposed access road. It is important to note that visual impacts are only experienced when there are receptors present to experience the impact, in this context there is one receptor present, thus the visual impact is considered low. Based on the field assessment, the undulating topography and dense vegetation associated with the Rietpoort Guest House obscures the view towards the Soyuz 1 Solar PV Park, therefore the visual impact for the Soyuz 1 Solar PV Park is considered low to negligible as the visual intrusion on the receiving environment will be minor if any. The proposed Soyuz 1 Solar PV Park is therefore likely to have an overall low visual impact on the receiving environment, therefore a Level 1 Assessment was undertaken versus a level 4 Assessment.

4.3 Description of the Receiving Environment

To holistically describe the receiving environment, this section of the report aims to determine the intrinsic value of the receiving landscape including aspects of the natural, cultural and scenic landscape, taking both tangible and intangible factors into consideration. The table below aims to briefly describe receiving environment associated with the Soyuz 1 Solar PV Park within its existing context. General views of the landscape associated with the Soyuz 1 Solar PV Park and surrounds with respect to the terrain, vegetation cover (shrubs and grasses) and isolated tree clumps utilised for grazing and overall character are indicated in the figures below.

Figure 6: General view of the Soyuz 1 Solar PV Park, indicating the short vegetation cover, bare ground associated with the sheep feeding pen (top left), mountainous backdrop (top right) and the sheep huddled under an isolated clump of trees (bottom).

Table 3: Summary of the visual assessment of the Soyuz 1 Solar PV Park and surrounds.

Climate (Appendix D)	As a result of climate variations throughout the year, the appearance and perception of the landscape within and surrounding the Soyuz 1 Solar PV Park changes with the seasons. The vegetation associated with the Soyuz 1 Solar PV Park is dominated by short shrubs and grasses, with some isolated tree clumps, thus seasonal variation in terms of vegetation, is unlikely to have a significant effect on the area from where project components would potentially be visible. Since the Soyuz 1 Solar PV Park falls within an arid region that is characterised by limited rainfall and relatively low vegetation, the visibility of the proposed solar panels is likely remain constant throughout the year. With the arid environment, atmospheric dust concentration is higher during the drier months due to drier soil conditions and lower rainfall, resulting in atmospheric haziness, which will somewhat affect the visibility of the proposed solar panels.	**Landscape Character and Quality**	The Soyuz 1 Solar PV Park is located in an arid rural area forming the landscape character of dwarf shrubveld with a colour palette of mostly brown with some shades of olive green. Due to the gently sloping terrain, one can see vastly across the landscape and into the mountainous backdrop. Even though the Soyuz 1 Solar PV Park is located within a rural area, the renewable energy facility (wind and solar) at the town of De Aar, is present in the greater landscape, thus this project will not set a precedent for renewable energy facilities in the region. The dwarf shrubveld is characteristic of this area and the greater karoo region, indicating that the landscape character is relatively common. Even though the landscape is considered homogenous in terms of vegetation and colour palette, the mountainous ranges, outcrops and hills in the landscape form topographical diversity and contributes to the scenic quality of the area, resulting in a moderately sensitive area.
Land Use and Visual Receptors (Appendix E, Figure 7)	The Soyuz 1 Solar PV Park is situated in open dwarf karoo shrub veld that is utilised for grazing, with bare patches (sheep feeding pens), on gently sloping terrain with a mountainous backdrop. Due to the arid nature of the climate restricting stocking densities which has led to relatively large farms across the landscape, resulting in the area being sparsely populated. Agricultural practices, mostly cattle and sheep grazing, dominate the land use of the area. The Rietpoort Guest House is the only visual receptor present within a 5 km radius of the Soyuz 1 Solar PV Park, while there are four farmsteads located within a 5 km radius of the proposed access road. The visual impact associated with the proposed access road will however be negligible as it will blend in with the already existing farm roads and the brown colour palette of the region. Due to the relative distance of the Rietpoort Guest House, and the low visual impact it may experience from the Soyuz 1 Solar PV Park, this receptor is considered a low sensitive receptor.	**Visual Absorption Capacity (VAC)**	The VAC of the area is considered moderate, indicating that the proposed PV structures will be absorbed in the area, to a degree. This is mainly attributed to the mountain ranges of the area and the relatively low height of the structures and angle thereof. With the agricultural practices taking place in the area there are regular intervals where bare ground and shades of brown are present in the landscape, therefore the bi-facial panels with the underlying ground may be lined with crushed stone will not be significantly contrasting in colour.

	According to SAPAD (2022) and SACAD (2022) the Soyuz 1 Solar PV Park is not located within a 10 km radius of any protected or conservation areas. Since the Soyuz 1 Solar PV Park is situated within a remote area, the only roads present within a 5 km radius are farm roads, which are utilised infrequently and predominantly by the farmers and workers. Due to their momentary views and experience of the receiving environment motorists are classified as low sensitive receptors. The R398 roadway is located approximately 5,6 km west of the Soyuz 1 Solar PV Park, while the N12 national road is located approximately 13,8 km west of the Soyuz 1 Solar PV Park and the N10 national road is located approximately 21,2 km to the northeast. With the national routes located quite a distance from the Soyuz 1 Solar PV Park, and the undulating topography of the area rendering no visibility of the Soyuz 1 Solar PV Park, these routes will not be affected by the proposed Soyuz 1 Solar PV Park, therefore the buffers applicable to national routes according to SEAs are not relevant to this project.	**Sense of Place**	Sense of place is the unique value that is allocated to a specific place or area through the cognitive experience of the user or viewer. It is created by the land use, character and quality of a landscape, as well as by the tangible and intangible value assigned thereto. The sense of place associated with the Soyuz 1 Solar PV Park is related to the landscape character type, defined as rural, relatively flat to gently sloping with very limited anthropogenic movement. The Soyuz 1 Solar PV Park can be described as calm, tranquil and peaceful, with limited development and movement, with the exception of the shepherds moving with the livestock. The sense of place is however not unique to the Soyuz 1 Solar PV Park as it extends to the larger region. During the construction phase of the Soyuz 1 Solar PV Park, the sense of place will however be affected, shifting the mood to busy and disturbed with construction vehicles and potential need for some earth moving equipment, however, once the panels are operational there will be limited additional vehicular movement in and out of the area, thus returning the area to a calm and tranquil landscape.
Topography	The local topography of the Soyuz 1 Solar PV Park is relatively flat to gently sloping with isolated hills and a mountainous backdrop. With the local topography of the Soyuz 1 Solar Park being relatively flat, it is unlikely to assist in absorbing and/ or screening the Soyuz 1 Solar PV Park. The mountainous backdrop will however somewhat assist in absorbing the Soyuz 1 Solar PV Park. The field assessment did however indicate from a distance, further than 1 km from the Soyuz 1 Solar PV Park, the gently sloping topography does have an effect on the visibility of the Soyuz 1 Solar PV Park. Please refer to Figures 7 and 8 for the elevation and slope models of the area.	**Night-Time Lighting (Appendix F)**	The Soyuz 1 Solar PV Park is located in a rural area where the only sources of lighting are the town of Britstown (located approximately 15,6 km to the north) and the scattered farmsteads. The lighting environment of the region is therefore considered intrinsically dark (Zone E1 [Natural]). Development of the Soyuz 1 Solar PV Park may potentially be a source of light pollution during the construction and operational phases, due to security lighting on the perimeter fence and at the buildings (substation, BESS and O&M Buildings). Overall, the impact significance of potential night-time lighting is expected to be moderately low and will be limited to a local area, as the Soyuz 1 Solar PV Park is not a development that requires a significant amount of lighting. This corresponds with Bortle's Scale – indicating that Soyuz 1 Solar PV Park falls within a Class 1 area (excellent dark sky) where the light pollution is so low only the airglow is apparent, and ground objects are only visible as silhouettes, in this case the distant farmsteads. As such the introduction of lighting sources in an intrinsically dark area results in the Soyuz 1 Solar PV Park to somewhat contribute to the effects of sky glow and artificial lighting in the region. It should however be noted that the mountain ranges and gently undulating topography will reduce the range of visibility of the proposed lighting from the Soyuz 1 Solar PV Park.
Vegetation Cover (Appendix D)	The Soyuz 1 Solar PV Park falls within the Nama Karoo biome and Upper Karoo bioregion according to the spatial data from 2018 Final Vegetation Map of South Africa, Lesotho and Swaziland. The Northern Upper Karoo vegetation type characterises the entire Soyuz 1 Solar Park and the majority of the proposed access road, with the small western portion of the access road characterised by the Upper Karoo Hardeveld (Appendix D). The field assessment indicated that the Soyuz 1 Solar PV Park is representative of the Northern Upper Karoo, with areas being subject to grazing (feeding pens), thus displaying degraded habitat and two small episodic drainage lines (STS, 2023). With the area dominated by dwarf karoo shrubs and grasses, the vegetative component of the Soyuz 1 Solar PV Park and immediate surrounds will not be able to assist in screening the Soyuz 1 Solar PV Park. The Rietpoort Guest House does however have existing dense tree lines which may obscure the view towards Soyuz 1 Solar PV Park.		

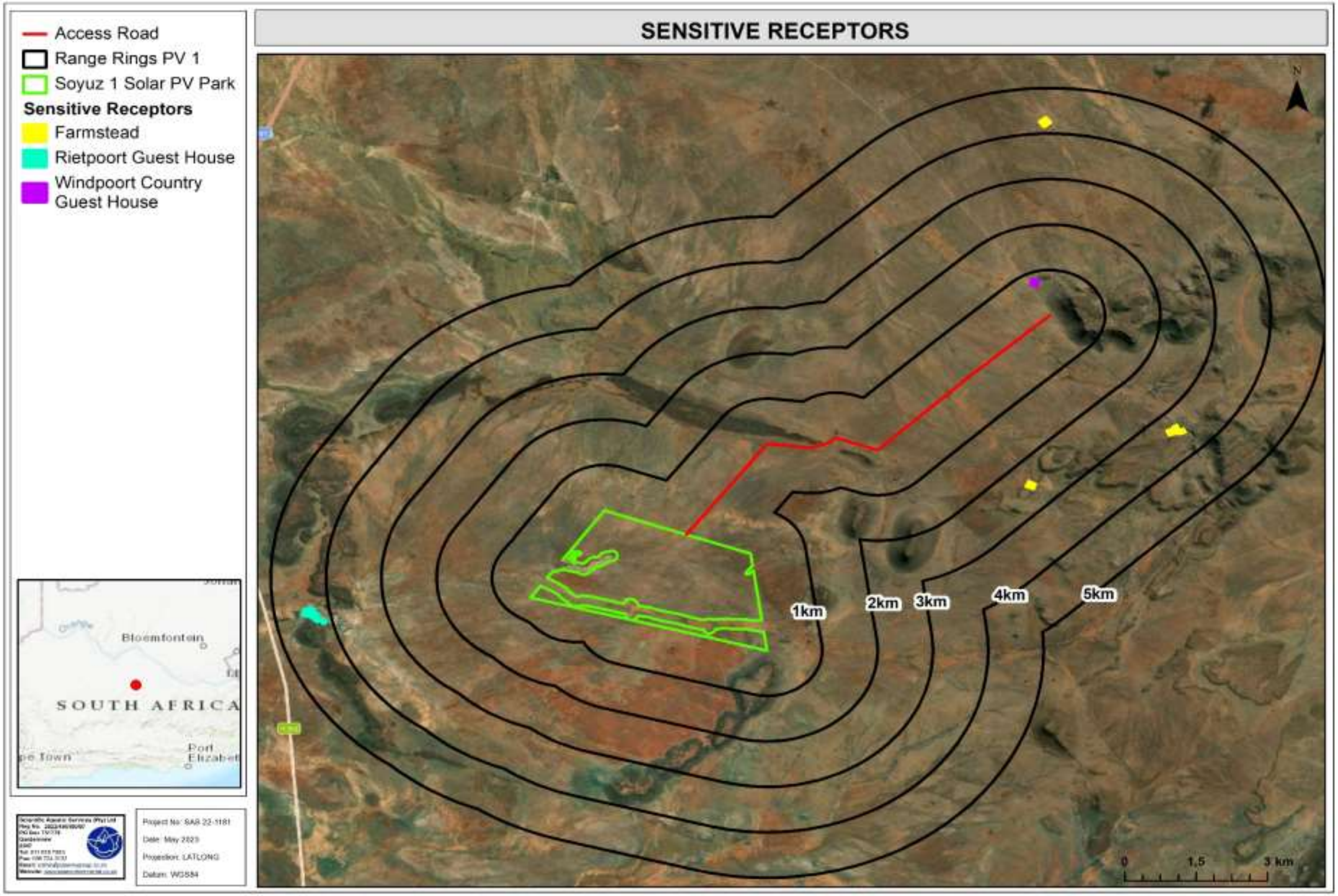


Figure 7: Map indicating the location of potential sensitive receptors within 5km of the Soyuz 1 Solar PV Park.

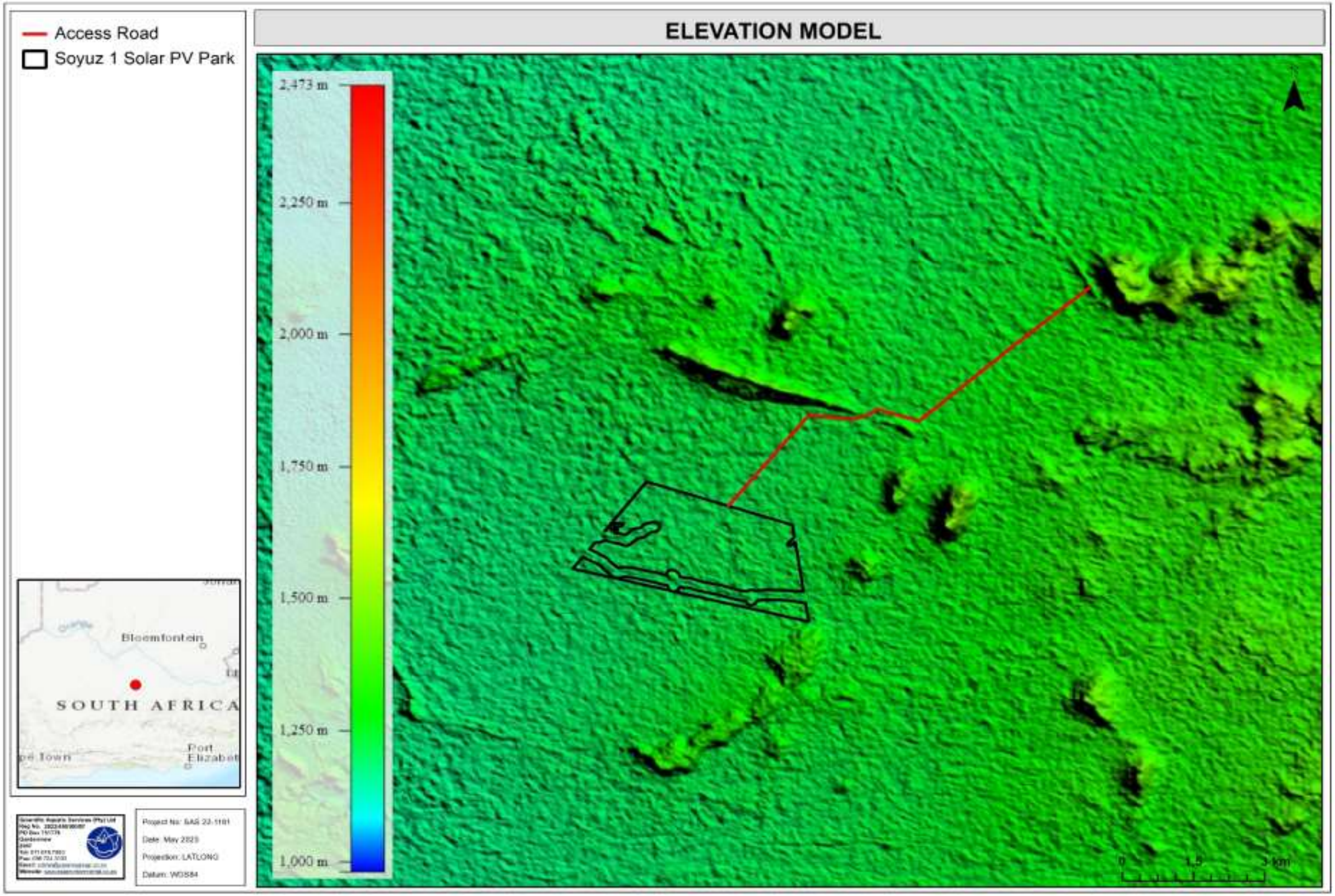


Figure 8: False colour elevation rendering depicting the topographical character of the Soyuz 1 Solar PV Park .

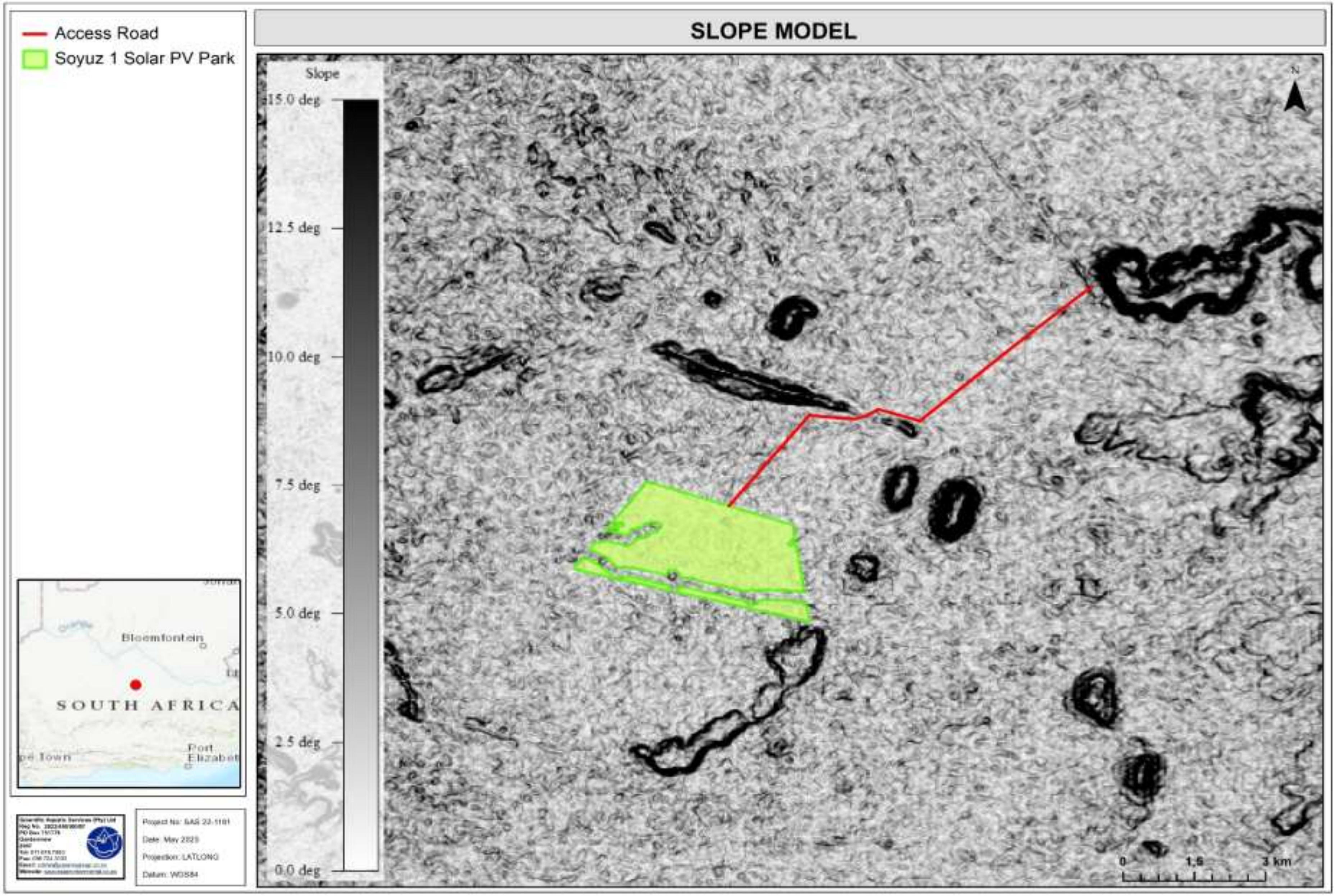


Figure 9: Monochromatic map indicating the general relief associated with the Soyuz 1 Solar PV Park.

5. IMPACT ASSESSMENT

Potential impacts on the visual environment in the region as a result of the proposed Soyuz 1 Solar PV Park facilities and based on available information, are discussed in the sections below, and according to the method outlined in Appendix C. This section presents an assessment of the significance of the impacts prior to mitigation and management measures being put in place and taking into consideration the available mitigatory measures, assuming that they are fully implemented.

The project life cycle for a new Solar PV Plant includes the following primary activities:

Feasibility phase: This phase includes confirming the feasibility of the Project by evaluating and addressing the following ➢ Solar resource assessment; ➢ Site selection; ➢ Project land allocation; ➢ Project yield assessment; ➢ Permitting and licensing; ➢ Legal agreements; ➢ Socio-economic development; ➢ Industrialisation and localisation; ➢ Project cost determination; ➢ Project financing; and ➢ Risk analysis.	**Design phase** ➢ Confirming key design features such as the type of PV module to be used, tilting angle, mounting and tracking systems, inverters, and module arrangement; ➢ Confirming specifications for the components of the Solar PV facilities ; ➢ Preparing detailed designs (layout, civil, electrical); ➢ Preparing construction plans; ➢ Preparing the Project schedule; and ➢ Preparing the commissioning plans.
Construction phase ➢ Establishing access roads; ➢ Preparing the site (fencing, clearing, levelling and grading, etc.); ➢ Establishing the site office; ➢ Establishing laydown areas and storage facilities; ➢ Transporting equipment to site; ➢ Undertaking civil, mechanical and electrical work; and ➢ Reinstating and rehabilitating working areas outside of permanent development footprint.	**Operational phase** Once the PV facilities are up and running the facility will be largely self-sufficient. Operational activities associated with the maintenance and control of the Solar PV facility will include the following ➢ Testing and commissioning the facility's components; ➢ Cleaning of PV modules; ➢ Controlling vegetation; ➢ Managing stormwater and waste; ➢ Conducting preventative and corrective maintenance; and ➢ Monitoring of the facility's performance.
Decommissioning Solar PV facilities are likely to have an operational lifetime of 20 to 30 years or more. The most likely scenario would be extension of the lifespan of the solar facilities by means of replacing individual components with newer more appropriate technology available at that time. The decommissioning phase will include measures for complying with the prevailing regulatory requirements, rehabilitation and managing environmental impacts in order to render the affected area suitable for future desirable use.	

After consideration of the findings of these assessments, recommendations and mitigation measures have been developed which will assist in minimising the proposed project's visual impact throughout the various development phases of the project. The mitigation measures outlined would serve to minimise the potential visual impacts identified to lower significance levels.

Glint and Glare Considerations

PV panels are designed to generate electricity by absorbing the rays of the sun and are therefore constructed of dark-coloured materials, and are covered by anti-reflective coatings. Indications are that as little as 2% of the incoming sunlight is reflected from the surface of modern PV panels especially where the incidence angle (angle of incoming light) is smaller i.e. the panel is facing the sun directly (LOGIS, 2021). This is particularly true for tracker arrays that are designed to track the sun and keep the incidence angle as low as possible (LOGIS, 2021).

Glint and glare occur when the sun reflects off surfaces with specular (mirror-like) properties, which include glass windows, water bodies and potentially some solar energy generation technologies (e.g. CSP heliostats and parabolic troughs). Glint is generally of shorter duration and can be described as “a momentary flash of bright light”, whilst glare is the reflection of bright light for a longer duration. Glint and glare may impair the visibility of observers and cause annoyance, discomfort, or loss in visual performance.

Literature review indicates glint and glare is only likely experienced when the observer is at a higher elevation than the proposed solar PV panels and depends on the degree to which is the panels are tilted. For example the glint and glare from tracking panels with back tracking towards ground-based receptors are most common when the panels are flat in the morning/evening (LOGIS, 2021). This is when the larger incidence angle (angle of incoming light) yields more reflected light.

The visual impact associated with glint and glare relates to the potential it has to negatively affect sensitive receptors in relative close proximity to the source, or aviation safety risk for pilots (especially where the source interferes with the approach angle to the runway). The Rietpoort Guest House is the only visual receptor present within a 5 km radius of the Soyuz 1 Solar PV Park. Based on elevation data, the Rietpoort Guest House is located at a lower elevation than the Soyuz 1 Solar PV Park, as such people visiting the Guest House would not experience a reflection due to the 0° tilt (lying flat) of the panels in the mornings. The observers would theoretically be looking at the base (underside) or edge of the panels.

The Federal Aviation Administration (FAA) of the United States of America have researched glare as a hazard for aviation pilots on final approach and may prescribe specific glint and glare studies for solar energy facilities in close proximity to aerodromes (airports, airfields, military airbases, etc.). It is generally possible to mitigate the potential glint and glare impacts through the design and careful placement of the infrastructure. The Kimberley Airport is located approximately 260 km north of the Soyuz 1 Solar PV Park, therefore the potential visual impact of glint and glare is considered limited. In the event that glint and glare are visible, the reflection experienced would be similar to other reflections produced from surfaces such as the reflection of windows, streets signs and still water associated with larger impoundments (PagerPower, 2014).

A local airstrip is located 8 km west of the Soyuz 1 Solar PV Park, which is likely used by farmers in the area. It is likely that the frequency of use is limited and limited to small aircrafts. Airstrips with the main runway situated on an east to west axis, and located at an angle of less than 30 degrees to the north and 20 degrees to the south in the southern hemisphere from a proposed PVSEF are invariably at a higher risk of experiencing glint and glare, due to the airstrip being orientated at an angle that would lead to reflection toward the runway. The abovementioned airstrip main runway axis is orientated at a west northwest to east southeast direction, which puts the airstrip at some risk to glint and glare impacts when landing and on take off from features in the landscape. The Soyuz 1 Solar PV Park is located at an angle between 24˚ and 36˚ to the main runway axis, depending on the position within the Soyuz 1 Solar PV Park. Figure 10 below provides an illustration of the bearings from the airstrip to the Soyuz 1 Solar PV Park. Line 4 is the direction of the airstrip which is at a bearing of 108.9480˚, the angle of incidence of line 1 is at a bearing of 72.28˚, indicating that the airstrip is at a 36.656˚ from the Soyuz 1 Solar PV Park. Line 2 is at bearing of 81.40˚, indicating that the airstrip is at an angle of 27.54˚ from the Soyuz 1 Solar PV Park, while line 3 is at a bearing of 84.85˚ indicating that the airstrip is at an angle of 24.09˚ from the Soyuz 1 Solar PV Park. From the above, the southern portions of the Soyuz 1 Solar PV Park pose some risk to generate glint and glare from the PVSEF, due to the angle thereof in relation to the runway. The risk is most significant in the mornings and most likely will be more significant in winter months when the sun rises further to the north. Should glint and glare be experienced, this could be mitigated with a simple go-around of the aircraft and landing in the opposite direction which should be possible in the early morning when winds are generally at a lower speed and direction of landing is not a significant factor. A mitigatory measure that should be implemented by the proponent that is recommended is that the PV Panels are no longer managed as flat by the time the sun rises, and should ideally be facing east already, to lower the risk of reflection toward the airstrip. Solar PV systems can safely coexist in area where aerodromes are located, provided that mitigation measures are undertaken, such as utilising anti-reflection coating on the PV modules, texturing the PV module surface and/ or varying the alignment of the PV array (Sreenath *et al.*, 2020). Should additional mitigatory measures be deemed necessary solar panels with this technology can be utilised.

The intensity of the light reflected from the solar panels decrease with increasing distance, and is directly proportional to the size of the PV array, which in this case is a relatively big 240

MW installation. With Rietpoort Guest House being the only receptor within a 5 km radius, the possibility of experiencing glint and glare is relatively low.

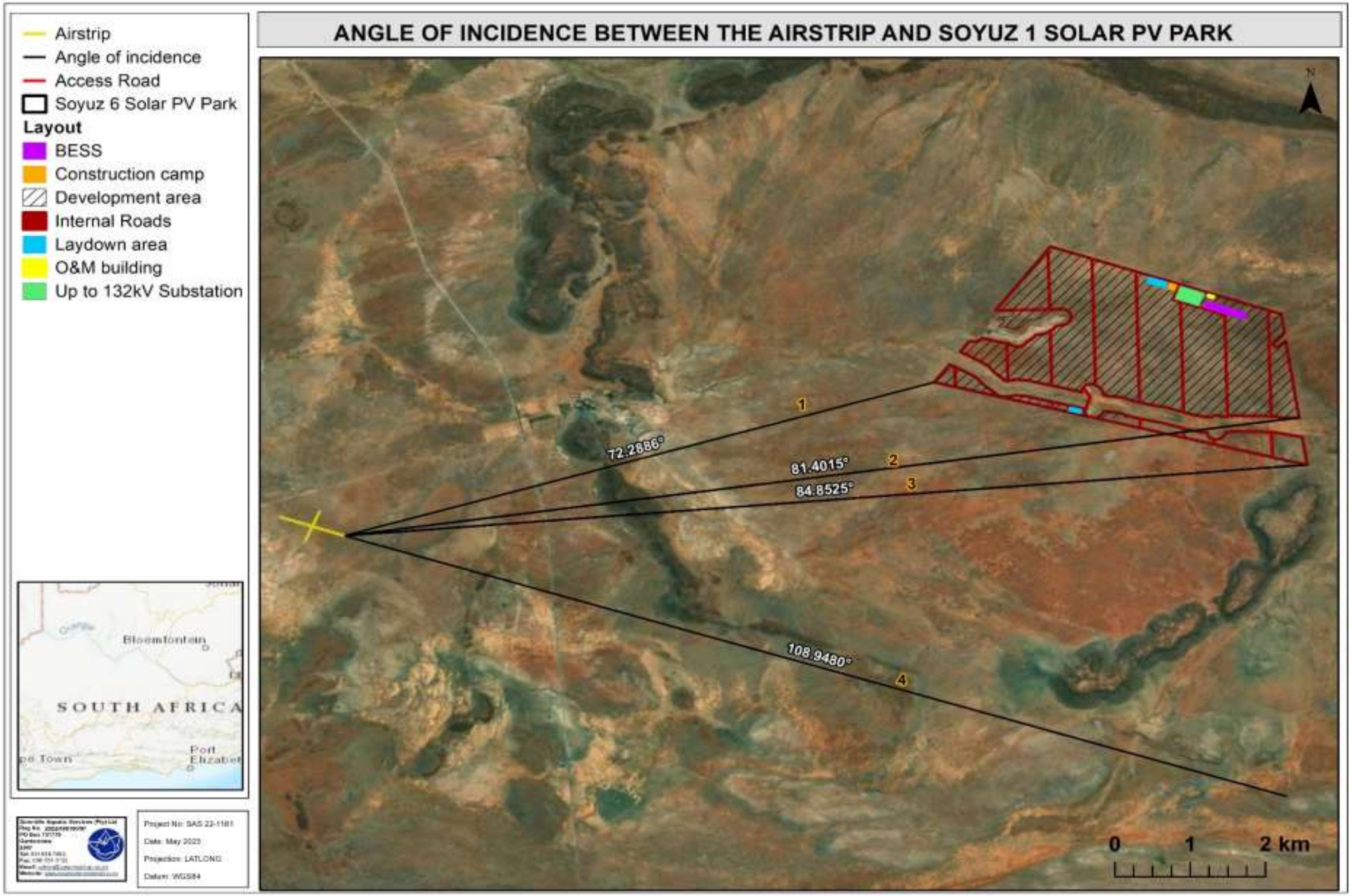


Figure 10: Map illustrating the angle of incidence between the airstrip and Soyuz 1 Solar PV Park, for illustrative purposes.

5.1 Impact Discussion

The table below identifies potential activities that might take place during the various phases of the proposed project, which could possibly have a visual impact on the surrounding landscape. It should be noted that the activities listed in the table below were utilised during the impact assessment as pre-mitigated impacts to ascertain the significance of the perceived impacts prior to mitigation measures. The sections below present the results of the findings for each potential impact identified.

Pre-Construction	Construction	Operational	Decommissioning
Planning and placement of PV Panels in such a way that it may cause glint and glare impacts at the Rietpoort Guest House	Site clearing, including the removal of topsoil and vegetation within the footprint.	Presence of the PVSEF within a 20 km radius where no renewable energy structures have been introduced. It should however be noted that Soyuz 1 Solar PV Park is part of the Britstown Cluster (six), and twenty one approved applications within a 50 km radius	Demolition and removal of infrastructure leading to dust generation, erosion and changes in the visual character of the project area
Placement of PVSEF in such a way that it leads to loss of natural visual resources such as freshwater ecosystems	Excavation of foundations for substation infrastructure	Potential increased proliferation of alien floral species and further transformation of habitat leading to a change in landscape character	Potential ineffective rehabilitation leading to poor vegetation cover and the bare areas remaining present
Failure to initiate a concurrent rehabilitation plan and alien floral species control plan may lead to further impacts on the landscape character during later development phases	Temporary soil stockpiles potentially leading to visual intrusion	Permanent loss of vegetation underneath the bi-facial single axis trackers, due to the ground lined with crushed stone at least to a degree, leading to visual contrast	Ongoing proliferation of alien vegetation
Planning of light placement and overall lighting strategy	Construction and placement of PV Panels	Potential of sunlight reflecting off the PV arrays potentially creating glint and glare impacts	Stationary and vehicle mounted lighting during the decommissioning phase
	Construction of general surface infrastructure including internal access roads	A small and periodic increase in human activity and operational vehicles	
	An increase in dust and vehicular movement due to construction activities	Exterior lighting around the perimeter of the Soyuz 1 Solar PV Park	
	Increased amount of human activity, traffic, construction vehicles, and other equipment such as excavators and cranes	Potential lighting at night from operational vehicles	
	Use of security lighting during the construction phase	Security and other lighting around and on support structures (BESS, substation and O&M Building) could also contribute to light pollution	
		Potential emergency maintenance activities conducted at night	

5.1.1 Impact on overall landscape, visual intrusion and exposure

With the Rietpoort Guest House being the only receptor within a 5 km radius, the impact is based on the view of the Rietpoort Guest House, which is located at a lower elevation, as such the proposed visual impact associated with the Soyuz 1 Solar PV Park is considered low. From a visual resource perspective there is no no-go alternative for this project, as the Soyuz 1 Solar PV Park is situated in an isolated area where there are no receptors located within 1 km which could have potentially triggered buffers suggested in Section 2. Therefore this impact assessment is only based on the layout provided by the proponent (preferred alternative).

Table 4: Impact Assessment Table for the potential visual impacts of the proposed PVSEF on the visual environment.

IMPACT NATURE	Potential impact on the overall landscape, visual intrusion and exposure of the landscape		STATUS	NEGATIVE
Impact Description	* Removal of vegetation leading to potential visual contrast, loss of visual intrusion on sensitive receptors. * Alteration of natural features, resulting in potential loss or alterations of natural vegetation (upper Karoo), leading to loss of visual quality and visual exposure.			
Impact Source(s)	Construction equipment and construction workforce			
Receptor(s)	Rietpoort Guest House			
PARAMETER	WITHOUT MITIGATION		WITH MITIGATION	
EXTENT (A)	Construction Phase	(local) 1	Construction Phase	(local) 1
	Operational Phase	(local) 1	Operational Phase	(local) 1
	Decommissioning Phase	(local) 1	Decommissioning Phase	(local) 1
DURATION (B)	Construction Phase	Short term (1)	Construction Phase	Short term (1)
	Operational Phase	Long term (3)	Operational Phase	Long term (3)
	Decommissioning Phase	Short term (1)	Decommissioning Phase	Short term (1)
PROBABILITY (C)	Construction Phase	Probable (2)	Construction Phase	Improbable (1)
	Operational Phase	Probable (2)	Operational Phase	Improbable (1)
	Decommissioning Phase	Probable (2)	Decommissioning Phase	Improbable (1)
INTENSITY OR MAGNITUDE (D)	Construction Phase	Medium (2)	Construction Phase	Low (1)
	Operational Phase	Medium (2)	Operational Phase	Low (1)
	Decommissioning Phase	Medium (2)	Decommissioning Phase	Low (1)
SIGNIFICANCE RATING (F) = (A*B*D)*C	Construction Phase	**-4 (Low)**	Construction Phase	**-1 (Low)**
	Operational Phase	**-12 (Low)**	Operational Phase	**-3 (Low)**
	Decommissioning Phase	**-4 (Low)**	Decommissioning Phase	**-1 (Low)**
CUMULATIVE IMPACTS	Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time. Cumulative visual impacts may be: ➢ Combined - where the PV arrays of several PVSEFs are within the observer's arc view concurrently;			

	➢ Successive - where the observer has to turn his / her head to see the various PVSEF's arrays; and ➢ Sequential - when the observer has to move to another viewpoint to see the various solar projects or different views of the same project development (such as when travelling along a route). The cumulative impact of PVSEFs on the landscape and visual amenity is a product of: ➢ The distance between individual PVSEFs; ➢ The distance over which the PV arrays are visible; ➢ The overall character of the landscape and its sensitivity to the infrastructures; ➢ The siting and design of the PVSEFs themselves; and ➢ The way in which the landscape is experienced. Cumulative visual impacts resulting from landscape modifications as a result of the proposed project in conjunction Soyuz 2 – 6 Solar PV Parks and the twenty one approved applications of renewable energy projects within a 50 km radius, as well as any future renewable energy facilities (wind and solar facilities) in the area, must be considered. Renewable energy facilities have the potential to cause large scale visual impacts and the location of several such developments in close proximity to each other could significantly alter the sense of place and visual character in the broader region. With the Britstown Cluster PVs situated so far apart, the cumulative impact is considered sequential. Furthermore, with the very low viewer incidence, the cumulative visual impacted is expected to be of low significance. The cumulative impact of additional traffic in the area on the local and regional roads as well as combined impacts from night-time lighting of the substations will affect the sense of place of the larger region. No cumulative impacts are anticipated from the proposed project and other future projects in the area which are of unacceptably high significance.
CONFIDENCE	Medium
MITIGATION MEASURES	➢ All construction areas must be kept in a neat and orderly condition at all times; ➢ Construction boundaries should be clearly demarcated to minimise areas of surface disturbance; ➢ Site offices and temporary structures should be limited to single storey and situated at such a location so as to reduce visual intrusion; Any areas for temporary material storage and other potentially intrusive activities must be screened from view as far as possible; ➢ An efficient removal system of waste and rubble must be ensured during the construction phase; ➢ The duration of the construction phase should be reduced as far as possible through careful planning, to reduce the exposure of bare ground; ➢ The development footprint and disturbed areas associated with the construction phase of the project should be kept as small as possible, with as little indigenous vegetation being cleared as possible; ➢ The height of any temporary structures such as soil stockpiles should be kept as low as possible; ➢ Excavation and earthmoving activities are to be kept to a minimum and limited to foundation areas for substations and support structures of the PV panels; ➢ Direct loss of or damage to valuable natural visual resources such as the freshwater ecosystems in the area should be actively avoided; ➢ As far as possible, existing roads are to be utilised for construction and maintenance purpose, to limit cumulative impacts from roads, as well as to limit the extent of the vegetation cleared for the purpose of the project; ➢ A transparent fence, such as a clear VU fence or equally approved, should be muted in colour and located as close as possible around the PVSEF, to avoid impeding visibility and ensure that it is visually pleasing to observers; ➢ The use of highly reflective material for storage, BESS and security facilities should be avoided. Lighter tones attract an observer while darker shades recede from the viewer, therefore pure whites and bright colours should be avoided;

	➢ It must be ensured that all buildings / containers and other structures fit its surroundings through the appropriate use of colour and material selection in order to lower the visibility of the proposed infrastructure; ➢ The use of permanent signage and project construction signs should be minimised and visually unobtrusive; ➢ Recent studies indicated that an extra layer of anti-reflective material on the outer surface of the glass can further limit sunlight reflection (Sreenath *et. al.,* 2019); ➢ Another design feature to limit glint and glare is to roughen the protective glass surface, reducing specular reflection (Sreenath *et. al.,* 2019); ➢ A possible mitigatory technique that can be employed is possible adjustment in the tilt and orientation angle of PV modules. These changes can alter the direction of solar reflection and hence the degree of glare impact. The Solar Glare Hazard Analysis Tool (SGHAT) can be used to check the glare potential for the proposed PV system design values. SGHAT has the capability to identify PV configurations that produce no glare and the design with maximum energy production can be selected (Sreenath *et. al.,* 2019); ➢ Erosion, which may lead to high levels of visual contrast and further detract from the visual environment, must be prevented throughout the lifetime of the project by means of putting soil stabilisation measures in place where required and through concurrent rehabilitation; ➢ During the construction phase all dirt and access roads, as well as other areas cleared of vegetation for construction purposes will require effective dust suppression such as regular watering; ➢ Internal access roads must be suitably maintained to limit erosion and dust pollution. To reduce the dust accumulation on the solar PV panels, and hence the more regular cleaning thereof, it is recommended that the internal roads be surfaced; ➢ Vehicle speed on unpaved roads must be reduced to limit dust creation. The following speed is recommended: 40km/h for normal vehicles and 30km/h for heavy vehicles; ➢ Concurrent/ progressive rehabilitation of temporary cleared areas, including reshaping and revegetation, must be implemented as soon as possible; ➢ Upon completion of construction, the project area should be left in a condition that protects the soil surface against erosion and instability; ➢ Indigenous and locally occurring plant species selected for use in re-vegetation should be selected taking quick growth rates into consideration in order to cover bare areas and prevent soil erosion; and ➢ Upon decommissioning, it is important that vegetation be reinstated to blend with the natural environment.

5.1.2 Impact on overall landscape, visual intrusion and exposure for the local airstrip

A local airstrip is located 8 km west of the Soyuz 1 Solar PV Park, which is likely used by farmers in the area. It is likely that the frequency of use is limited and limited to small aircrafts. Airstrips with the main runway situated on an east to west axis, and located at an angle of less than 30 degrees to the north and 20 degrees to the south in the southern hemisphere from a proposed PVSEF are invariably at a higher risk of experiencing glint and glare, due to the airstrip being orientated at an angle that would lead to reflection toward the runway. The abovementioned airstrip main runway axis is orientated at a west northwest to east southeast direction, which puts the airstrip at some risk to glint and glare impacts when landing and on take off from features in the landscape. The Soyuz 1 Solar PV Park is located at an angle between 24˚ and 36˚ to the main runway axis, depending on the position within the Soyuz 1

Solar PV Park. From the above, the southern portions of the Soyuz 1 Solar PV Park pose some risk to generate glint and glare from the PVSEF, due to the angle thereof in relation to the runway. The risk is most significant in the mornings and most likely will be more significant in winter months when the sun rises further to the north. Should glint and glare be experienced, this could be mitigated with a simple go-around of the aircraft and landing in the opposite direction which should be possible in the early morning when winds are generally at a lower speed and direction of landing is not a significant factor. Since there will be no glint and glare experienced during construction and decommissioning phases of the project, only the operational phase was assessed in the table below.

Table 5: Impact Assessment Table for the potential visual impacts of the proposed PVSEF on the visual environment during the operational phase.

IMPACT NATURE	**Potential visual intrusion and exposure of the landscape**	**STATUS**	**NEGATIVE**
Impact Description	* Potential glint and glare experienced		
Impact Source(s)	* Operation of PVSEF		
Receptor(s)	Local airstrip		
PARAMETER	**WITHOUT MITIGATION**	**WITH MITIGATION**	
EXTENT (A)	(regional) 2	(local) 1	
DURATION (B)	(short term) 1	(short term) 1	
PROBABILITY (C)	(probable) 2	Improbable (1)	
INTENSITY OR MAGNITUDE (D)	(medium) 2	(low) 1	
SIGNIFICANCE RATING (F) = (A*B*D)*C	**-8 (Low)**	**-1 (Low)**	
CUMULATIVE IMPACTS	The cumulative visual impacts of PVSEFs on airfields can vary depending on several factors: **1. Scale and size:** Large PVSEFs can cover significant land areas and may be visible from the airfield or surrounding areas. The size and scale of the solar panels can create a noticeable change in the landscape. The size of the Soyuz 1 Solar PV Park is relative, therefore there will be a noticeable change in the surrounding cultivated landscape. **2. Glare and reflection:** Glare from solar panels can potentially create visibility issues for pilots during critical phases of flight, such as take-off and landing. Proper panel orientation and glare-reducing measures can help mitigate this impact. Due to the axis of the airstrip and the angle of Soyuz 1 Solar PV Park, the likelihood of pilots experiencing glint and glare is considered low. Should glint and glare be experienced, this could be mitigated with a simple go-around of the aircraft and landing in the opposite direction which should be possible in the early morning when winds are generally at a lower speed and direction of landing is not a significant factor. **3. Contrast and aesthetics:** The contrast between a PVSEF and the surrounding landscape can affect the visual perception of the area. Some people may find the visual contrast appealing, while others may consider it visually intrusive or detracting from the natural or built environment. With the Britstown Solar Cluster the landscape will become accustomed to energy generation facilities, and hence pilots will be able to plan their flights accordingly. **4. Screen age:** In some cases, visual screening or vegetation buffers may be installed around solar farms to minimize their visual impact. These buffers can consist of trees, shrubs, or other natural elements that help blend the solar farm into the surrounding environment.		

	It's important to note that authorities responsible for airfield operations and land use planning typically have specific guidelines and procedures in place to assess and manage the potential visual impacts of PVSEFs in proximity to airfields. With the Britstown Solar Cluster and twenty one other approved solar facilities within a 50 km radius, the cumulative visual impact on civil aviation may be considered moderate, depending on the located of the other PVSEFs in relation to the airstrip. It is important to note that it is a local airstrip, as such it is small aircrafts that utilize the airstrip.
CONFIDENCE	Medium
MITIGATION MEASURES	➢ A mitigatory measure that could be implemented is that the PV Panels are no longer managed as flat by the time the sun rises, and should ideally be facing east already, to lower the risk of reflection toward the airstrip. ➢ Recent studies indicated that an extra layer of anti-reflective material on the outer surface of the glass can further limit sunlight reflection (Sreenath *et. al.,* 2019). This should be helpful to reduce the potential glint and glare experienced especially where the gravel road is slightly elevated above the PVSEF; ➢ Another design feature to limit glint and glare is to roughen the protective glass surface, reducing specular reflection (Sreenath *et. al.,* 2019); and ➢ A possible mitigatory technique that can be employed is possible adjustment in the tilt and orientation angle of PV modules. These changes can alter the direction of solar reflection and hence the degree of glare impact. The Solar Glare Hazard Analysis Tool (SGHAT) can be used to check the glare potential for the proposed PV system design values. SGHAT has the capability to identify PV configurations that produce no glare and the design with maximum energy production can be selected (Sreenath *et. al.,* 2019).

5.1.3 Impacts due to Night time Lighting

The Soyuz 1 Solar PV Park in its current state contains no infrastructure and thus no lighting. With the surrounding farmsteads being scattered across the landscape, the night time lighting in the area is limited, thus the Soyuz 1 Solar PV Park is intrinsically dark. Development of the proposed PVSEF may potentially be a source of light pollution during the construction and operational phases, to a degree, due to security lighting on the perimeter fence and especially at the buildings (substation, BESS and O&M Buildings). Due to the nature of a PVSEF which would primarily be operational during sunlit (daylight) hours, lighting at night is not a major operational component of such facilities. Possible maintenance activities conducted at night, such as mirror or panel washing or replacement might require vehicle-mounted lights, which could contribute to light pollution. Overall, the impact significance of potential night time lighting is expected to be low, and will be limited to a local area. Security lights associated with the BESS, Substation and O&M Buildings may potentially contribute somewhat to the effects of skyglow and artificial lighting in the region. This can, however be easily mitigated by installing security lighting no higher than 5 meters above the ground and through appropriate planning of illumination direction.

Table 6: Impact Assessment Table for the potential visual impacts of the proposed PVSEF on the visual environment.

IMPACT NATURE	Potential impact of night-time lighting on the visual environment		STATUS	NEGATIVE
Impact Description	* Night time security lighting at the temporary construction camps, office area, workshop/store and plant area impacting the sensitive receptors in the area; * Night-time security lighting at the BESS, O&M Buildings and substation; and *Additional lighting that may be required during decommissioning phase.			
Impact Source(s)	Light sources either temporarily or permanently installed.			
Receptor(s)	Rietpoort Guest House			
PARAMETER	WITHOUT MITIGATION		WITH MITIGATION	
EXTENT (A)	Construction Phase	(local) 1	Construction Phase	(local) 1
	Operational Phase	(local) 1	Operational Phase	(local) 1
	Decommissioning Phase	(local) 1	Decommissioning Phase	(local) 1
DURATION (B)	Construction Phase	Short term (1)	Construction Phase	Short term (1)
	Operational Phase	Long term (3)	Operational Phase	Long term (3)
	Decommissioning Phase	Short term (1)	Decommissioning Phase	Short term (1)
PROBABILITY (C)	Construction Phase	Probable (2)	Construction Phase	Improbable (1)
	Operational Phase	Probable (2)	Operational Phase	Improbable (1)
	Decommissioning Phase	Probable (2)	Decommissioning Phase	Improbable (1)
INTENSITY OR MAGNITUDE (D)	Construction Phase	Medium (2)	Construction Phase	Low (1)
	Operational Phase	Medium (2)	Operational Phase	Low (1)
	Decommissioning Phase	Medium (2)	Decommissioning Phase	Low (1)
SIGNIFICANCE RATING (F) = (A*B*D)*C	Construction Phase	**-4 (Low)**	Construction Phase	**-1 (Low)**
	Operational Phase	**-12 (Low)**	Operational Phase	**-3 (Low)**
	Decommissioning Phase	**-4 (Low)**	Decommissioning Phase	**-1 (Low)**
CUMULATIVE IMPACTS	Cumulative visual impacts resulting from landscape modifications as a result of the proposed project in conjunction Soyuz 2 – 6 Solar PV Parks and the twenty one approved applications of renewable energy projects within a 50 km radius, as well as any future renewable energy facilities (wind and solar facilities) in the area, must be considered. Renewable energy facilities have the potential to cause large scale visual impacts and the location of several such developments in close proximity to each other could significantly alter the sense of place and visual character in the broader region. With the Britstown Cluster PVs situated so far apart, the cumulative impact is considered sequential. Furthermore, with the very low viewer incidence, the cumulative visual impacted is expected to be of low significance. Furthermore, the limited lighting required for a PVSEF will not significantly increase sky glow, even when considering all proposed renewable energy projects within a 50 km radius. The cumulative impact of additional traffic in the area on the local and regional roads as well as combined impacts from night-time lighting of the substations will affect the sense of place of the larger region. No cumulative impacts are anticipated from the proposed project and other future projects in the area which are of unacceptably high significance.			
CONFIDENCE	Medium			
MITIGATION MEASURES	➢ As far as possible, construction activities should be restricted to daylight hours, in order to limit the need of bright floodlighting and the potential for skyglow and to avoid the use of additional night-time lighting for security purposes;			

	➢ Night lighting of construction sites and camps, the BESS, substation and O&M Building should be minimised as far as possible, taking into consideration that due to safety requirements a certain level of lighting may be necessary; ➢ It must be ensured that routine maintenance and cleaning of PV modules, especially after a rainfall event, should occur during the daylight hours, to reduce the potential of night lighting and potential temporary contribution to skyglow; ➢ Where security lighting is used during the construction phase and operational phase, the following management measures should be implemented: • Making use of motion detectors on security lighting, at the substation, BESS and O&M Building, ensures that the site will remain in relative darkness, until lighting is required for security and maintenance purposes; • Placement of lights should consider the location of surrounding receptors and as far as possible be screened from view; • The use of high light masts and high pole top security lighting should be avoided. Any high lighting masts should be covered to reduce glow; • Up-lighting of structures must be avoided, with lighting installed at downward angles that provide precisely directed illumination beyond the immediate surroundings of the infrastructure, thereby minimising the light spill and trespass; • Care should be taken when selecting luminaries to ensure that appropriate units are chosen and that their location will reduce spill light and glare to a minimum; • Minimum wattage light fixtures should be used, with the minimum intensity necessary to accomplish the light's purpose; • The use of low-pressure sodium lamps, yellow LED lighting, or an equivalent should be considered to reduce skyglow (BLM, 2013). ➢ Upon decommissioning, it is recommended that no activities occur at night, to reduce the use of bright floodlighting; ➢ Recent studies indicated that an extra layer of anti-reflective material on the outer surface of the glass can further limit sunlight reflection (Sreenath *et. al.,* 2019); ➢ Another design feature to limit glint and glare is to roughen the protective glass surface, reducing specular reflection (Sreenath *et. al.,* 2019); and ➢ A possible mitigatory technique that can be employed is possible adjustment in the tilt and orientation angle of PV modules. These changes can alter the direction of solar reflection and hence the degree of glare impact. The Solar Glare Hazard Analysis Tool (SGHAT) can be used to check the glare potential for the proposed PV system design values. SGHAT has the capability to identify PV configurations that produce no glare and the design with maximum energy production can be selected (Sreenath *et. al.,* 2019).

With improved technology and design techniques, most PV facilities are no longer associated with glare, however PV Panels can create increased visibility and contrast through the creation of geometric patterns of reflected light caused by simultaneous reflection of sunlight from regularly-spaced metal surfaces in the collector array. The reflected light may not necessarily cause discomfort to the viewer, during the daytime, and may change dramatically as the observer moves (Royal Haskoning DHV, 2015). It should be noted that the PV panels will not contribute to night time light pollution in the area, since no reflection of the sun occurs at night.

6. CONCLUSION

The proposed Soyuz 1 Solar PV Park is situated in a rural area and due to the arid nature of the climate it restricts stocking densities which has led to relatively large farms across the landscape, resulting in the area being sparsely populated. As such, there is only one receptor located within 5 km of the Soyuz 1 Solar PV Park, namely the Rietpoort Guest House, located approximately 4,6 km west and four farmsteads located within the 5 km visual assessment zone of the proposed access road. Visual impacts are only experienced when there are receptors present to experience the impact, in this context there is one receptor present, thus the visual impact is considered low. Based on the field assessment, the undulating topography and dense vegetation associated with the Rietpoort Guest House obscures the view towards the Soyuz 1 Solar PV Park, therefore the visual impact for the Soyuz 1 Solar PV Park is considered low to negligible as the visual intrusion on the receiving environment will be minor if any.

According to the Strategic Environmental Assessment (SEA) Project (2019) the Soyuz 1 Solar PV Park does not fall within any REDZ, however it is located within the central corridor for EGI. According to the South African Renewable Energy EIA Application Database (REEA, 2022) there are twenty two applications for renewable energy facilities (wind and solar) within a 50 km radius of the Soyuz 1 Solar PV Park, of which twenty one are approved and one is still in process. This indicates that the larger region has been earmarked for renewable energy facilities, which may alter the landscape character.

With the Soyuz 1 Solar PV Park and surroundings being dominated by dwarf karoo shrubs and grasses, the vegetative component will not be able to assist in screening the Soyuz 1 Solar PV Park. The Rietpoort Guest House does however have existing dense tree lines which may obscure the view towards Soyuz 1 Solar PV Park. The local topography of the Soyuz 1 Solar PV Park is relatively flat to gently sloping with isolated hills and a mountainous backdrop. With the local topography of the Soyuz 1 Solar Park being relatively flat, it is unlikely to assist in absorbing and/ or screening the Soyuz 1 Solar PV Park. The mountainous backdrop will however somewhat assist in absorbing the Soyuz 1 Solar PV Park. The field assessment did however indicate from a distance further than 1 km from the Soyuz 1 Solar PV Park, the gently sloping topography does have an effect on the visibility of the Soyuz 1 Solar PV Park.

The VAC of the area is considered moderate, indicating that the proposed PV structures will be absorbed in the area, to a degree. This is mainly attributed to the mountain ranges of the area and the relatively low height of the structures and angle thereof.

The sense of place associated with the Soyuz 1 Solar PV Park can be described as calm, tranquil and peaceful, no development and limited movement, with the exception of the shepherds moving with the livestock. The sense of place is however not unique to the Soyuz 1 Solar PV Park as it extends to the larger region. During the construction phase of the Soyuz 1 Solar PV Park, the sense of place will however be affected, shifting the mood to busy and disturbed with construction vehicles and potential need for some earth moving equipment, however, once the panels are operational there will be limited additional vehicular movement in and out of the area, thus returning the area to a calm and tranquil landscape.

The Soyuz 1 Solar PV Park being located in a rural area, results in limited sources of night-time lighting (Britstown and the five farmsteads), as such the lighting environment is considered intrinsically dark. Development of the Soyuz 1 Solar PV Park may potentially be a source of light pollution during the construction and operational phases, due to security lighting on the perimeter fence and at the buildings (substation, BESS and O&M Buildings). Overall, the impact significance of potential night-time lighting is expected to be moderately low and will be limited to a local area, as the Soyuz 1 Solar PV Park is not a development that requires a significant amount of lighting. As such the introduction of lighting sources in an intrinsically dark area results in the Soyuz 1 Solar PV Park to somewhat contribute to the effects of sky glow and artificial lighting in the region.

With limited vantage points within the landscape toward the Soyuz 1 Solar PV Park, the visual impact is considered low, as summarised in the table below.

Summary table of overall significance:

DESCRIPTION OF IMPACT	Overall Significance	
	Without mitigation	With mitigation
Construction Phase		
Potential impact on the overall landscape, visual intrusion and exposure of the landscape	Low	Low
Impact on overall landscape, visual intrusion and exposure for the local airstrip	NA	NA
Potential impacts due to night time lighting	Low	Low
Operation Phase		
Potential impact on the overall landscape, visual intrusion and exposure of the landscape	Low	Low
Impact on overall landscape, visual intrusion and exposure for the local airstrip	Low	Low
Potential impacts due to night time lighting	Low	Low
Decommissioning Phase		
Potential impact on the overall landscape, visual intrusion and exposure of the landscape	Low	Low
Impact on overall landscape, visual intrusion and exposure for the local airstrip	NA	NA
Potential impacts due to night time lighting	Low	Low

From a visual resource aspect, there are no fatal flaws associated with the Soyuz 1 Solar PV Park. Hence, it is the professional opinion of the visual specialist that he development of the Soyuz 1 Solar PV Park can be considered for authorisation.

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APPENDIX A – IFC STANDARDS

International Finance Corporation (IFC) Performance Standards on Environmental and Social Sustainability

The IFC Sustainability Framework articulates the Corporation's strategic commitment to sustainable development, and is an integral part of IFC's approach to risk management. The sustainability framework comprises IFC's Policy and Performance standards on Environmental and Social Sustainability, and IFC's Access to Information Policy. The Performance Standards (PS) are directed towards clients, providing guidance on how to identify risks and impacts, and are designed to help avoid, mitigate and manage risks and impacts as a wat of doing business in a sustainable manner.

There are eight (8) Performance Standards which has to be implemented throughout the life of an investment by IFC. These Performance Standards include:

1 Assessment and Management of Environmental and Social Risk and Impacts;
2 Labor and Working Conditions;
3 Resource Efficiency and Pollution Prevention;
4 Community Health, Safety, and Security;
5 Land Acquisition and Involuntary Resettlement;
6 Biodiversity Conservation and Sustainable Management of Living Natural Resources;
7 Indigenous Peoples; and
8 Cultural Heritage.

The applicant deemed it necessary that the environmental assessment process must fully consider Equator Principles and IFC Performance Standards (PS) as follows:

- **PS 1:** the product must meet the requirements of a bankable IFC environmental and social impact assessment as they relate to the terms of reference;
- **PS3**: must be considered where relevant in terms of water consumption, pollution prevention, wastes, hazardous material management and pesticide use and management;
- **PS4:** must be considered, if applicable, in terms of ecosystem services;
- **PS6:** must be included in terms of protection and conservation of biodiversity and habitat (modified, natural and critical), legally protected and internationally recognised areas, invasive alien species, and management of ecosystem services; and
- **PS 8:** must be included, for the protection of cultural heritage as it relates to the terms of reference.

PS 1 establishes the importance of:

I. Integrated assessment to identify the environmental and social impacts, risks, and opportunities of the project;
II. Effective community engagement through disclosure of project-related information and consultation with local communities on matters that directly affect them; and
III. The client's management of environmental and social performance throughout the life of the project.

The objectives of PS1 are to identify and evaluate environmental and social risks and impact of the project as well as to adopt a mitigation hierarchy to anticipate and avoid, or where avoidance is not possible ,minimize, and, where residual impacts remain, compensate/offset for risks and impacts to workers, affected communities, and the environment.

PS 3 recognizes that increased economic activity and urbanisation often generate increased levels of pollution to air, water, and land, and consume finite resources in a manner that may threaten people and the environment at the local, regional, and global levels. The objectives of PS 3 is to:

IV. Avoid or minimize adverse impacts on human health and the environment by avoiding or minimizing pollution from project activities;
V. To promote more sustainable use of resources, including energy and water; and
VI. To reduce project-related greenhouse gases (GHG) emissions.

PS 4 recognizes that project activities, equipment, and infrastructure can increase community exposure to risks and impacts. The objectives of PS 4 are to anticipate and avoid adverse impacts on the health and safety of the Affected Community during the project life from both routine and non-routine circumstances. As well as to ensure that the safeguarding of personnel and property is carried out in accordance with relevant human rights principles and in a manner that avoids or minimizes risks to the Affected Communities.

PS 6 recognizes that protecting and conserving biodiversity, maintaining ecosystem services, and sustainably managing living natural resources are fundamental to sustainable development. The objectives of PS 6 are to protect and conserve biodiversity, maintain the benefits from ecosystem services, and to promote the sustainable management of living natural resources through the adoption of practices that integrate conservation needs and development priorities.

In circumstances where a proposed project is located within a legally protected area or an internationally recognised area, the client will meet the requirement of paragraphs 16 through 19 of the PS, as applicable. In addition the client will:

- Demonstrate that the proposed development in such areas is legally permitted;
- Act in a manner consistent with any government recognised management plan for such areas;
- Consult protected area sponsors and managers, Affected Communities, Indigenous Peoples and other stakeholders on the proposed project, as appropriate; and
- Implement additional programs, as appropriate, to promote and enhance the conservation aims and effective management of the area.

According to the South African Protected Areas Database (SAPAD, 2022) and the National Protected Areas Expansion Strategy (NPAES, 2009) Dataset, there are no protected areas located within a 10 km radius of the Soyuz 1 Solar PV Park , therefore the PS 6 is currently not relevant to the proposed project.

PS 8 recognizes the importance of cultural heritage for current and future generations. Consistent with the Convention Concerning the Protection of the World Cultural and Natural Heritage, this Performance Standard aims to ensure that clients protect cultural heritage in the course of their project activities. In addition, the requirements of this Performance Standard on a project's use of cultural heritage are based in part on standards set by the Convention on Biological Diversity. The objectives of this PS is to protect cultural heritage from adverse impacts of project activities and support its preservation and to promote the equitable sharing of benefits from the use of cultural heritage.

The IFC habitat categories are defined as follows:

Modified Habitat

Modified habitats are areas that may contain a large proportion of plant and/or animal species of non-native origin, and/or where human activity has substantially modified an area's primary ecological functions and species composition. Modified habitats may include areas managed for agriculture, forest plantations, reclaimed coastal zones, and reclaimed wetlands.

This Performance Standard applies to those areas of modified habitat that include significant biodiversity value, as determined by the risks and impacts identification process required in PS 1. The client should minimize impacts on such biodiversity and implement mitigation measures as appropriate.

Natural Habitat

Natural habitats are areas composed of viable assemblages of plant and/or animal species of largely native origin, and/or where human activity has not essentially modified an area's primary ecological functions and species composition.

The client will not significantly convert or degrade natural habitats, unless all of the following are demonstrated:

- No other viable alternatives within the region exist for development of the project on modified habitat;
- Consultation has established the views of stakeholders, including Affected Communities, with respect to the extent of conversion and degradation; and
- Any conversion or degradation is mitigated according to the mitigation hierarchy.

In areas of natural habitat, mitigation measures will be designed to achieve no net loss of biodiversity where feasible. Appropriate actions include:

- Avoiding impacts on biodiversity through the identification and protection of set-asides;
- Implementing measures to minimize habitat fragmentation, such as biological corridors;
- Restoring habitats during operations and/or after operations; and
- Implementing biodiversity offsets.

Critical Habitat

Critical habitats are areas with high biodiversity value, including (i) habitat of significant importance to Critically Endangered and/or Endangered species; (ii) habitat of significant importance to endemic and/or restricted-range species; (iii) habitat supporting globally significant concentrations of migratory species and/or congregatory species; (iv) highly threatened and/or unique ecosystems; and/or (v) areas associated with key evolutionary processes.

In areas of critical habitat, the client will not implement any project activities unless all of the following are demonstrated:

- No other viable alternatives within the region exist for development of the project on modified or natural habitats that are not critical;
- The project does not lead to measurable adverse impacts on those biodiversity values for which the critical habitat was designated, and on the ecological processes supporting those biodiversity values;
- The project does not lead to a net reduction in the global and/or national/regional population of any Critically Endangered or Endangered species over a reasonable period of time; and
- A robust, appropriately designed, and long-term biodiversity monitoring and evaluation program is integrated into the client’s management program.

In such cases where a client is able to meet the requirements defined in paragraph 17, the project’s mitigation strategy will be described in a Biodiversity Action Plan and will be designed to achieve net gains of those biodiversity values for which the critical habitat was designated.

In instances where biodiversity offsets are proposed as part of the mitigation strategy, the client must demonstrate through an assessment that the project’s significant residual impacts on biodiversity will be adequately mitigated to meet the requirements of paragraph 17.

GN9. The requirements for the baseline study will vary depending on the nature and scale of the project. For sites with potentially significant impacts on natural and critical habitats and ecosystem services, the baseline should include field surveys over multiple seasons, to be undertaken by competent professionals and with the involvement of external experts, as necessary. Field surveys and assessments should be recent, and data should be acquired for the direct project footprint, including related and associated facilities, the project’s area of influence, and potentially beyond

GN22. For projects located in critical habitats (including legally protected and internationally recognized areas), clients must ensure that external experts with regional experience are involved in the biodiversity and/or critical habitat assessment. If habitat is critical due to the presence of critically endangered or endangered species, recognized species specialists must be involved (for example, including individuals from IUCN Species Survival Commission Specialist Groups). In areas of critical habitat, clients will benefit from establishing a mechanism for external review of the project’s risks and impacts identification process and proposed mitigation strategy. This is especially relevant where uncertainty is high, where potential impacts are complex and/or controversial, and/or where no precedent exists for proposed mitigations (such as some types of offsets). Such a mechanism would also promote the sharing of good international practice between projects and improve transparency in decision making

GN28. Both natural and modified habitats may contain high biodiversity values, thereby qualifying as critical habitat. Performance Standard 6 does not limit its definition of critical habitat to *critical natural* habitat. An area may just as well be *critical modified* habitat. The extent of human-induced modification of the habitat is therefore not necessarily an indicator of its biodiversity value or the presence of critical habitat.

GN36. Clients should endeavour to site the project in modified habitat rather than on natural or critical habitat and demonstrate this effort through a project alternatives analysis conducted during the risks and impacts identification process.

GN37. Performance Standard 6 requires that projects with significant biodiversity values in modified habitats minimize their impacts and implement mitigation and management measures as needed to conserve those values. Significant biodiversity values that might occur in modified habitat include species of conservation concern (for example, species that are threatened or otherwise identified as important by stakeholders) and remnant ecological features that persist in the modified landscape, especially those that perform important ecological functions. In some cases, significant biodiversity values may cause natural or critical habitat requirements to be applied, in which case they should be treated using the guidelines for those habitat designations.

GN58. *Relatively broad landscape and seascape units might qualify as critical habitat.* The scale of the critical habitat assessment depends on the biodiversity attributes particular to the habitat in question and the ecological patterns and processes required to maintain them. Even within a single site designated as critical habitat there might be areas or features of higher or lower biodiversity value. There also will be cases where a project is sited within a greater area recognized as critical habitat, but the project site itself has been highly modified. *A critical habitat assessment therefore must not focus solely on the project site.* The client should be prepared to conduct desktop assessments, consult with experts and other relevant stakeholders to obtain an understanding of the relative importance or uniqueness of the site with respect to the regional and even the global scale, and/or conduct field surveys beyond the boundaries of the project site. These considerations would form part of the landscape/seascape analyses as referred to in paragraph 6 of Performance Standard 6 and in paragraph GN17 of this note.

GN104. In many cases, invasive species will have already been established in the region in which the project is located. In these cases, the client has the responsibility to take measures to prevent the species from further spread into areas in which it has not already been established. For example, in the case of linear infrastructure, invasive weeds might be spread into forested habitats, especially if the forest canopy is not able to re-establish itself (due to maintenance of the right-of-way for operational purposes). This is exacerbated if opportunistic agricultural or logging activities further widen the right-of-way, thereby facilitating spread. In these cases, the client is expected to determine the severity of the threat and the mode of spread of that species. The situation should be monitored as part of the overall ESMS, and the client should seek effective mitigation measures in coordination with local and national authorities.

GN106. Performance Standard 6 defines ecosystem services as “the benefits that people, including businesses, obtain from ecosystems” (paragraph 2), which is in line with the definition provided by the Millennium Ecosystem Assessment (GN23). As described in paragraph 2 and footnote 1 of Performance Standard 6, ecosystem services are organized into four major categories:

- Provisioning ecosystem services, include, among others, (i) agricultural products, seafood and game, wild foods, and ethnobotanical plants; (ii) water for drinking, irrigation, and industrial purposes; and (iii) forest areas, which provide the basis for many biopharmaceuticals, construction materials, and biomass for renewable energy;
- Regulating ecosystem services, include, among others, (i) climate regulation and carbon;
- storage and sequestration; (ii) waste decomposition and detoxification; (iii) purification of water and air; (iv) control of pests, disease, and pollination; and (v) natural hazard mitigation;
- Cultural services, include, among others, (i) spiritual and sacred sites; (ii) recreational purposes such as sport, hunting, fishing, and ecotourism; and(iii) scientific exploration and education; and
- Supporting services, are the natural processes that maintain the other services, such as (i) nutrient capture and recycling, (ii) primary production, and (iii) pathways for genetic exchange.

APPENDIX B – METHOD OF ASSESSMENT

Level of Assessment

The following method of assessment for determining the level of detail of the assessment was utilised in this report (Oberholzer, 2005):

Table B1: Categories of development and impact severity.

Type of environment	Category 1 development	Category 2 development	Category 3 development	Category 4 development	Category 5 development
Protected/wild areas of international, national or regional significance	Moderate visual impact expected	High visual impact expected	High visual impact expected	Very high visual impact expected	Very high visual impact expected
Areas or routes of high scenic, cultural, historical significance	Minimal visual impact expected	Moderate visual impact expected	High visual impact expected	High visual impact expected	Very high visual impact expected
Areas or routes of medium scenic, cultural, historical significance	Little or no visual impact expected	Minimal visual impact expected	Moderate visual impact expected	High visual impact expected	High visual impact expected
Areas or routes of low scenic, cultural, historical significance/disturbed	Little or no visual impact expected, possible benefits	Little or no visual impact expected	Minimal visual impact expected	Moderate visual impact expected	High visual impact expected
Disturbed or degraded sites/run down areas/ wasteland	Little or no visual impact expected, possible benefits	Little or no visual impact expected, possible benefits	Little or no visual impact expected	Minimal visual impact expected	Moderate visual impact expected

The following key provides an explanation to the categories of development:

Category 1 development:
e.g., nature reserves, nature-related recreation, camping, picnicking, trails and minimal visitor facilities.

Category 2 development:
e.g., low-key recreation / resort / residential type development, small-scale agriculture / nurseries, narrow roads and small-scale infrastructure.

Category 3 development:
e.g., low-density resort / residential type development, golf or polo estates, low to medium-scale infrastructure.

Category 4 development:
e.g., medium density residential development, sports facilities, small-scale commercial facilities / office parks, one-stop petrol stations, light industry, medium-scale infrastructure.

Category 5 development:
e.g., high density township / residential development, retail and office complexes, industrial facilities, refineries, treatment plants, power stations, wind energy farms, power lines, freeways, toll roads, large scale infrastructure generally. Large-scale development of agricultural land and commercial tree plantations. Quarrying and mining activities with related processing plants.

The following box explains the nature of the impacts:

Very high visual impact expected:
Potentially significant effect on wilderness quality or scenic resources;
Fundamental change in the visual character of the area;
Establishes a major precedent for development in the area.

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

Moderate visual impact expected:
Potentially some effect on protected landscapes or scenic resources;
Some change in the visual character of the area;
Introduces new development or adds to existing development in the area.

Minimal visual impact expected:
Potentially low level of intrusion on landscapes or scenic resources;
Limited change in the visual character of the area;
Low-key development, similar in nature to existing development.

Little or no visual impact expected:
Potentially little influence on scenic resources or visual character of the area;
Generally compatible with existing development in the area;
Possible scope for enhancement of the area.

From the above, the severity of the impact determines the level of the assessment:

Table B2: Impact assessment level of input determination.

Approach	Little or no visual impact expected	Minimal visual impact expected	Moderate visual impact expected	High visual impact expected	Very high visual impact expected
Level of visual input recommended	Level 1	Level 2	Level 3	Level 4	

The following box explains the inputs required at each level of assessment (Oberholzer, 2005).

Level 1 input:
Identification of issues, and site visit;
Brief comment on visual influence of the project and an indication of the expected impacts / benefits.

Level 2 input:
Identification of issues raised in scoping phase, and site visit;
Description of the receiving environment and the proposed project;
Establishment of Receptor Site area and receptors;
Brief indication of potential visual impacts, and possible mitigation measures.

Level 3 assessment:
Identification of issues raised in scoping phase, and site visit;
Description of the receiving environment and the proposed project;
Establishment of Receptor Site 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.
Review by independent, experienced visual specialist (if required).

Level 4 assessment:
As per Level 3 assessment, plus complete 3D modelling and simulations, with and without mitigation.
Review by independent, experienced visual specialist (if required).

SITE SENSITIVITY VERIFICATION REQUIREMENTS WHERE A SPECIALIST ASSESSMENT IS REQUIRED BUT NO SPECIFIC ASSESSMENT PROTOCOL HAS BEEN PRESCRIBED

Published in Government Notice No. 320 GOVERNMENT GAZETTE 43110 on 20 MARCH 2020.

1. Site Sensitivity Verification And Minimum Report Content Requirements

Prior to commencing with a specialist assessment, the current use of the land and the environmental sensitivity of the site under consideration identified by the national web-based environmental screening tool (screening tool), where determined, must be confirmed by undertaking a site sensitivity verification. The screening tool can be accessed at: https://screening.environment.gov.za/screeningtool

1.1. The site sensitivity verification must be undertaken by an environmental assessment practitioner or a specialist.

1.2. The site sensitivity verification must be undertaken through the use of:

(a) a desktop analysis, using satellite imagery;

(b) a preliminary on-site inspection; and

(c) any other available and relevant information.

1.3. The outcome of the site sensitivity verification must be recorded in the form of a report that--

(a) confirms or disputes the current use of the land and the environmental sensitivity as identified by the screening tool, such as new developments or infrastructure, the change in vegetation cover or status etc.;

(b) contains a motivation and evidence (e.g. photographs) of either the verified or different use of the land and environmental sensitivity; and

(c) is submitted together with the relevant assessment report prepared in accordance with the requirements of the Environmental Impact Assessment Regulations.

2. Specialist Assessment And Minimum Report Content Requirements

Where a specialist assessment is required and no specific environmental theme protocol has been prescribed, the required level of assessment must be based on the findings of the site sensitivity verification and must comply with Appendix 6 of the EIA Regulations.

The gazette is available online at www.gpwonline.co.za

APPENDIX C – IMPACT ASSESSMENT METHODOLOGY

The methods implemented within this report were provided by the proponent. The impact methodology is as follows:

1. Definitions of terminology

ITEM	DEFINITION
EXTENT	
Local	Extending only as far as the boundaries of the activity, limited to the site and its immediate surroundings
Regional	Impact on the broader region
National	Will have an impact on a national scale or across international borders
DURATION	
Short-term	0-5 years
Medium- Term	5-15 years
Long-Term	>15 years, where the impact will cease after the operational life of the activity
Permanent	Where mitigation, either by natural process or human intervention, will not occur in such a way or in such a time span that the impact can be considered transient.
MAGNITUDE OR INTENSITY	
Low	Where the receiving natural, cultural or social function/environment is negligibly affected or where the impact is so low that remedial action is not required.
Medium	Where the affected environment is altered, but not severely and the impact can be mitigated successfully and natural, cultural, or social functions and processes can continue, albeit in a modified way.
High	Where natural, cultural, or social functions or processes are substantially altered to a very large degree. If a negative impact, then this could lead to unacceptable consequences for the cultural and/or social functions and/or irreplaceable loss of biodiversity to the extent that natural, cultural or social functions could temporarily or permanently cease.
PROBABILITY	
Improbable	Where the possibility of the impact materialising is very low, either because of design or historic experience
Probable	Where there is a distinct possibility that the impact will occur
Highly Probable	Where it is most likely that the impact will occur
Definite	Where the impact will undoubtedly occur, regardless of any prevention measures
SIGNIFICANCE	
Low	Where a potential impact will have a negligible effect on natural, cultural, or social environments and the effect on the decision is negligible. This will not require special design considerations for the project
Medium	Where it would have, or there would be a moderate risk to natural, cultural, or social environments and should influence the decision. The project will require modification or mitigation measures to be included in the design
High	Where it would have, or there would be a high risk of, a large effect on natural, cultural, or social environments. These impacts should have a major influence on decision making.
Very High	Where it would have, or there would be a high risk of, an irreversible negative impact on biodiversity and irreplaceable loss of natural capital that could result in the project being environmentally unacceptable, even with mitigation. Alternatively, it could lead to a major positive effect. Impacts of this nature must be a central factor in decision making.
STATUS OF IMPACT	
Whether the impact is positive (a benefit), negative (a cost) or neutral (status quo maintained)	
DEGREE OF CONFIDENCE IN PREDICTIONS	
The degree of confidence in the predictions is based on the availability of information and specialist knowledge (e.g., low, medium, or high)	
MITIGATION	
Mechanisms used to control, minimise and or eliminate negative impacts on the environment and to enhance project benefits Mitigation measures should be considered in terms of the following hierarchy: (1) avoidance, (2) minimisation, (3) restoration and (4) off-sets.	

2. Scoring System for Impact Assessment Ratings

To comparatively rank the impacts, each impact has been assigned a score using the scoring system outlined in the Table below. This scoring system allows for a comparative, accountable assessment of the indicative cumulative positive or negative impacts of each aspect assessed.

IMPACT PARAMETER	SCORE	
Extent (A)	**Rating**	
Local	1	
Regional	2	
National	3	
Duration (B)	**Rating**	
Short term	1	
Medium Term	2	
Long Term	3	
Permanent	4	
Probability (C)	**Rating**	
Improbable	1	
Probable	2	
Highly Probable	3	
Definite	4	
IMPACT PARAMETER	**NEGATIVE IMPACT SCORE**	**POSITIVE IMPACT SCORE**
Magnitude/Intensity (D)	**Rating**	**Rating**
Low	-1	1
Medium	-2	2
High	-3	3
SIGNIFICANCE RATING (F) = (A*B*D) * C	**Rating**	**Rating**
Low	0 to - 40	0 to 40
Medium	- 41 to - 80	41 to 80
High	- 81 to - 120	81 to 120
Very High	> - 120	> 120

3. Please complete the following Tables for <u>EACH IDENTIFIED IMPACT</u>.

IMPACT NATURE	Impact – Nature of Impact e.g., Botanical Impact – Loss of natural vegetation		STATUS	POSITIVE/NEGATIVE
Impact Description				
Impact Source(s)				
Receptor(s)				
PARAMETER	**WITHOUT MITIGATION**	**SCORE**	**WITH MITIGATION**	**SCORE**
EXTENT (A)	Preferred Alternative:		Preferred Alternative:	
	No-Go Alternative:		No-Go Alternative:	
DURATION (B)	Preferred Alternative:		Preferred Alternative:	
	No-Go Alternative:		No-Go Alternative:	
PROBABILITY (C)	Preferred Alternative:		Preferred Alternative:	
	No-Go Alternative:		No-Go Alternative:	
INTENSITY OR MAGNITUDE (D)	Preferred Alternative:		Preferred Alternative:	
	No-Go Alternative:		No-Go Alternative:	
SIGNIFICANCE RATING (F) = (A*B*D) * C	Preferred Alternative:		Preferred Alternative:	
	No-Go Alternative:		No-Go Alternative:	
CUMULATIVE IMPACTS				
CONFIDENCE				

MITIGATION MEASURES	

4. Summary table of overall significance:

DESCRIPTION OF IMPACT	Overall Significance	
	No-Go Alternative	Preferred Alternative

Mitigation Measure Development

The following points present the key concepts considered in the development of mitigation measures for the proposed construction.

- Mitigation and performance improvement measures and actions that address the risks and impacts[1] are identified and described in as much detail as possible;
- Measures and actions to address negative impacts will favour avoidance and prevention over minimisation, mitigation or compensation; and
- Desired outcomes are defined, and have been developed in such a way as to be measurable events with performance indicators, targets and acceptable criteria that can be tracked over defined periods, with estimates of the resources (including human resource and training requirements) and responsibilities for implementation.

Recommendations were developed to address and mitigate impacts associated with the proposed development. These recommendations also include general management measures which apply to the proposed development as a whole. Mitigation measures have been developed to address issues during all project phases throughout the life of the operation from planning, through to construction and operation through to after care and maintenance.

[1] Mitigation measures should address both positive and negative impacts

APPENDIX D – VEGETATION TYPES

Table D1: Characteristics of the vegetation types associated with the Soyuz 1 Solar PV Park

<table>
<tr><th colspan="2">VEGETATION TYPES</th><th>NORTHERN UPPER KAROO (NKU3)</th><th>UPPER KAROO HARDEVELD (NKU2)</th></tr>
<tr><td colspan="2">ALTITUDE (M)</td><td>1000 – 1500</td><td>1000 – 1900</td></tr>
<tr><td colspan="2">CLIMATE</td><td>Rainfall peaks in autumn (March)</td><td>Summer and autumn rainfall with very dry winters</td></tr>
<tr><td rowspan="5">CLIMATE</td><td>MAP (mm)</td><td>275</td><td>254</td></tr>
<tr><td>MAT (°C)</td><td>16.5</td><td>14.7</td></tr>
<tr><td>MFD (Days)</td><td>37</td><td>46</td></tr>
<tr><td>MAPE (mm)</td><td>2615</td><td>2441</td></tr>
<tr><td>MASMS (%)</td><td>83</td><td>82</td></tr>
<tr><td colspan="2">DISTRIBUTION</td><td>Northern Cape and Free State Provinces</td><td>Northern, Western and Eastern Cape Provinces</td></tr>
<tr><td colspan="2">GEOLOGY AND SOILS</td><td>Shales of the Volksrust Formation and to a lesser extent the Prince Albert Formation (both of the Ecca Group) as well as Dwyka Group diamictites form the underlying geology. Jurassic Karoo Dolerite sills and sheets support this vegetation complex in places. Wide stretches of land are covered by superficial deposits including calcretes of the Kalahari Group. Soils are variable from shallow to deep, red-yellow, apedal, freely drained soils to very shallow Glenrosa and Mispah forms. Mainly Ae, Ag and Fc land types.</td><td>Primitive, skeletal soils in rocky areas developing over sedimentary rocks such as mudstones and arenites of the Adelaide Subgroup of the Karoo Supergroup and to a lesser extent also the Ecca Group (Waterford and Volksrust Formations) as well as Jurassic dolerite sills and dykes and subsummit positions of mesas and butts with dolerite boulder slopes. Almost entirely Ib land type</td></tr>
<tr><td colspan="2">CONSERVATION</td><td>Least threatened. Target 21%. None conserved in statutory conservation areas. About 4% has been cleared for cultivation (the highest proportion of any type in the Nama-Karoo) or irreversibly transformed by building of dams. Areas of human settlements are increasing in the northeastern part of this vegetation type (Hoffman et al. 1999). Erosion is moderate (46.2%), very low (32%) and low (20%).</td><td>Least threatened. Target 21%. Only about 3% statutorily conserved in Karoo National Park and Karoo Nature Reserve. Small percentage also protected in private reserves such as Rupert Game Farm. Erosion is moderate (64%) and high (2%).</td></tr>
<tr><td colspan="2">VEGETATION & LANDSCAPE FEATURES</td><td>Shrubland dominated by dwarf karoo shrubs, grasses and Acacia mellifera subsp. detinens and some other low trees (especially on sandy soils in the northern parts and vicinity of the Orange River). Flat to gently sloping, with isolated hills of Upper Karoo Hardeveld in the south and Vaalbos Rocky Shrubland in the northeast and with many interspersed pans.</td><td>Steep slopes of koppies, butts, mesas and parts of the Great Escarpment covered with large boulders and stones supporting sparse dwarf Karoo scrub with drought-tolerant grasses of genera such as Aristida, Eragrostis and Stipagrostis.</td></tr>
</table>

NKu2 Upper Karoo Hardeveld

Figure D1: NKu2 Upper Karoo Hardeveld: Dolerite koppies supporting grassy karoo shrublands south of Loxton (Northern Cape). Image source: Mucina and Rutherford (2006) Figure 7.9, page 340.

Table D2: Dominant and typical floristic species of Upper Karoo Hardeveld (Mucina & Rutherford, 2012). The table contains the important taxa associated with the vegetation type.

Woody Layer	
Tall Shrubs	*Lycium cinereum (d), Rhigozum obovatum (d), Cadaba aphylla, Diospyros austro-africana, Ehretia rigida subsp. rigida, Lycium oxycarpum, Melianthus comosus, Searsia burchellii*
Low Shrubs	*Chrysocoma ciliata* (d), *Eriocephalus ericoides* subsp. *ericoides* (d), *Euryops lateriflorus* (d), *Felicia muricata* (d), *Limeum aethiopicum* (d), *Pteronia glauca* (d), *Amphiglossa triflora*, *Aptosimum elongatum*, *A. spinescens*, *Asparagus mucronatus*, *A. retrofractus*, *A. striatus*, *A. suaveolens*, *Eriocephalus spinescens*, *Euryops annae*, *E. candollei, E. empetrifolium, E. nodosus, Felicia filifolia* subsp. *filifolia*, *Garuleum latifolium*, *Helichrysum lucilioides*, *H. zeyheri*, *Hermannia filifolia* var. *filifolia*, *H. multiflora*, *H. pulchella*, *H. vestita*, *Indigofera sessilifolia*, *Jamesbrittenia atropurpurea*, *Lessertia frutescens*, *Melolobium candicans*, *M. microphyllum*, *Microloma armatum*, *Monechma incanum*, *Nenax microphylla*, *Pegolettia retrofracta*, *Pelargonium abrotanifolium*, *P. ramosissimum*, *Pentzia globosa*, *P. spinescens*, *Plinthus karooicus*, *Polygala seminuda*, *Pteronia adenocarpa*, *P. sordida*, *Rosenia humilis*, *Selago albida*, *Solanum capense*, *Sutera halimifolia*, *Tetragonia arbuscula*, *Wahlenbergia tenella*
Succulent Shrubs	*Aloe broomii, Drosanthemum lique, Faucaria bosscheana, Kleinia longiflora, Pachypodium succulentum, Trichodiadema barbatum, Zygophyllum flexuosum. Semiparasitic Shrub: Thesium lineatum (d).*
Forb layer	
Herbs	*Troglophyton capillaceum subsp. capillaceum, Dianthus caespitosus subsp. caespitosus, Gazania krebsiana, Lepidium africanum subsp. africanum, Leysera tenella, Pelargonium minimum, Sutera pinnatifida, Tribulus terrestris.*
Geophytic Herbs	*Albuca setosa, Androcymbium albomarginatum, Asplenium cordatum, Boophone disticha, Cheilanthes bergiana, Drimia intricata, Oxalis depressa*
Grass layer	
Graminoids	*Aristida adscensionis* (d), *A. congesta* (d), *A. diffusa* (d), *Cenchrus ciliaris* (d), *Enneapogon desvauxii* (d), *Eragrostis lehmanniana* (d), *E. obtusa* (d), *Sporobolus fimbriatus* (d), *Stipagrostis obtusa* (d), *Cynodon incompletus*, *Digitaria eriantha*, *Ehrharta calycina*, *Enneapogon scaber*, *E. scoparius*, *Eragrostis curvula*, *E. nindensis, E. procumbens*, *Fingerhuthia africana*, *Heteropogon contortus*, *Merxmuellera disticha*, *Stipagrostis ciliata*, *Themeda triandra*, *Tragus berteronianus*, *T. koelerioides*
Endemic Taxa	
Succulent Shrubs	*Aloe chlorantha, Crassula barbata subsp. broomii, Delosperma robustum, Sceletium expansum, Stomatium suaveolens*
Low Shrubs	*Cineraria polycephala, Euryops petraeus, Lotononis azureoides, Selago magnakarooica*

Tall Shrub	*Anisodontea malvastroides*
Herbs	*Cineraria arctotidea, Vellereophyton niveum*
Succulent Herbs	*Adromischus fallax, A. humilis*
Geophytic Herbs	*Gethyllis longistyla, Lachenalia auriolae, Ornithogalum paucifolium subsp. karooparkense.*

(d) = dominant species

Additional Remarks: One of the richer floras of the Nama-Karoo Biome, this type also contains a substantial number of diagnostic species relative to the surrounding extensive flats (i.e. the Eastern, Northern and Western Upper Karoo vegetation units). Examples are the widespread occurrence of *Asparagus mucronatus, A. striatus*, *Cissampelos capensis*, *Pachypodium succulentum*, *Rhigozum obovatum* and *Cenchrus ciliaris* in this unit. Many of the endemic species listed are found along the Great Escarpment part of this vegetation type.

NKu3 Northern Upper Karoo

Table D3: Dominant and typical floristic species of Northern Upper Karoo (Mucina & Rutherford, 2012). The table contains the important taxa associated with the vegetation type.

Woody Layer	
Small Trees	*Vachellia mellifera subsp. detinens, Boscia albitrunca*
Tall Shrubs	*Lycium cinereum (d), L. horridum, L. oxycarpum, L. schizocalyx, Rhigozum trichotomum*
Low Shrubs	*Chrysocoma ciliata (d), Gnidia polycephala (d), Pentzia calcarea (d), P. globosa (d), P. incana (d), P. spinescens (d), Rosenia humilis (d), Amphiglossa triflora, Aptosimum marlothii, A. spinescens, Asparagus glaucus, Barleria rigida, Berkheya annectens, Eriocephalus ericoides subsp. ericoides, E. glandulosus, E. spinescens, Euryops asparagoides. Felicia muricata, Helichrysum lucilioides, Hermannia spinosa, Leucas capensis, Limeum aethiopicum, Melolobium candicans, Microloma armatum, Osteospermum leptolobum, O. spinescens, Pegolettia retrofracta, Pentzia lanata, Phyllanthus maderaspatensis, Plinthus karooicus, Pteronia glauca, P. sordida, Selago geniculata, S. saxatilis, Tetragonia arbuscula, Zygophyllum lichtensteinianum*
Succulent Shrubs	*Hertia pallens, Salsola calluna, S. glabrescens, S. rabieana, S. tuberculata, Zygophyllum flexuosum.*
Semiparasitic Shrub	*Thesium hystrix (d),*
Forb layer	
Herbs	*Chamaesyce inaequilatera, Convolvulus sagittatus, Dicoma capensis, Gazania krebsiana, Hermannia comosa, Indigofera alternans, Lessertia pauciflora, Radyera urens, Sesamum capense, Sutera pinnatifida, Tribulus terrestris, Vahlia capensis*
Succulent Herb	*Psilocaulon coriarium*
Geophytic Herb	*Moraea pallida*
Grass layer	
Graminoids	*Aristida adscensionis (d), A. congesta (d), A. diffusa (d), Enneapogon desvauxii (d), Eragrostis lehmanniana (d), E. obtusa (d), E. truncata (d), Sporobolus fimbriatus (d), Stipagrostis obtusa (d), Eragrostis bicolor, E. porosa, Fingerhuthia africana, Heteropogon contortus, Stipagrostis ciliata, Themeda triandra, Tragus berteronianus, T. koelerioides, T. racemosus.*
Biogeographically Important Taxon (Griqualand West endemics)	
Tall Shrub	*Gymnosporia szyszylowiczii subsp. namibiensis*
Herb	*Convolvulus boedeckerianus*
Endemic Taxa	
Succulent Shrub	*Lithops hookeri, Stomatium pluridens*
Low Shrubs	*Atriplex spongiosa, Galenia exigua.*
Herb	*Manulea deserticola*

(d) = dominant species

Additional Remarks: This Karoo unit is found on floristic and ecological gradients between the Nama-Karoo, arid Kalahari savanna and arid highveld grasslands.

APPENDIX E – VISUAL RECEPTORS

The number of observers and their perception of the proposed project will have an impact on the VIA and also on the perceived sensitivity of the landscape. The perception of viewers is difficult to determine as there are many variables to consider, such as cultural background, state of mind, the reason for the sighting and how often the project is viewed within a set period. It is therefore necessary to identify areas of high viewer incidence and to classify certain areas according to the observer's visual sensitivity towards the project. It is also necessary to generalise the viewer sensitivity to the proposed project to some degree (Oberholzer, 2005).

The IEMA (2002) identifies a number of potential sensitive receptors that may be affected by a proposed development, namely:

- Users of recreational landscapes/ public footpaths and bridleways, including tourists and visitors;
- Residents;
- Users of public sports grounds and amenity open space;
- Users of public roads and railways;
- Workers; and
- Views of or from within valued landscapes.

The sensitivity of visual receptors and views will depend on:

- The location and context of the viewpoint;
- The expectation and occupation or activity of the receptor; and
- The importance of the view.

The most sensitive receptors may include:

- Users of outdoor recreational facilities, including public rights of way, whose attention or interest may be focused on the landscape;
- Communities where the development results in changes in the landscape setting or valued views enjoyed by the community; and
- Occupiers of residential properties with views affected by the development.

Other receptors include:

- People engaged in outdoor sport or recreation (other than appreciation of the landscape, as in landscape of acknowledged importance or value);
- People travelling through or past the affected landscape in cars on trains or other transport routes;
- People at their place of work.

APPENDIX F – NIGHT TIME LIGHTING

In order to understand the potential visual impacts from night lighting, it is important to understand the existing lighting levels. The Institute of Lighting Engineers (ILP) (2011) identifies five environmental zones for exterior lighting control and with which to describe the existing lighting conditions within the landscape (Table I1). These environmental zones are supported by design guidance for the reduction of light pollution, which can then inform proposed mitigation measures and techniques. Where an area to be lit lies on the boundary of two zones the obtrusive light limitation values used should be those applicable to the most rigorous zone.

Table F1: Environmental zones for night-time lighting.

Environmental Zone	Surrounding	Lighting Environment	Examples
E0	Protected	Dark	UNESCO Starlight Reserves, IDA Dark Sky Parks
E1	Natural	Intrinsically Dark	National Parks, Areas of Outstanding Natural Beauty etc.
E2	Rural	Low District Brightness	Village or relatively dark outer suburban locations
E3	Suburban	Medium District Brightness	Small town centres or suburban locations
E4	Urban	High District Brightness	Town/city centres with high levels of night-time activity

Stationary lights facing upward are significant contributors to light pollution and causes sky glow and glare, while light facing in a horizontal direction can be visible for long distances, lead to light trespass (light falling outside the desired area of illumination) and be disturbing to viewers and vehicles. Sky glow refers to the night-time brightening of skies, caused by the scattering and redirecting of light in the atmosphere, by water droplets and dust in the air, back towards the ground. Such stray light mostly comes from poorly designed and improperly aimed light, and from light reflected from over-lit areas (ASSA, 2012). Lighting from vehicles within rural areas will generally be more intrusive than in urban settings and, therefore, will have a potentially greater impact due the general lack of existing ambient light within areas further away from the surface infrastructure area.

Sky glow refers to the night-time brightening of skies, caused by the scattering and redirecting of light in the atmosphere, by water droplets and dust in the air, back towards the ground. Such stray light mostly comes from poorly designed and improperly aimed light, and from light reflected from over-lit areas (ASSA, 2012). In addition, the impacts of vehicle mounted lighting sources in the area will generally be confined to the local and sub-regional setting (up to 10km) due to the effects of distance, intervening undulating topography and vegetation which restrict the potential impact on views from more distant regional points.

The ILP (2011) recommends that, in order to maintain the night-time setting, lighting within the identified zone should have minimal illumination into the sky as well as to adjacent viewpoints.

Bortle Dark Sky Scale

The Bortle Dark Sky Scale was developed by John Bortle "based on nearly 50 years of observing experience," to describe the amount of light pollution in a night sky. It was first published in a 2001 Sky & Telescope article. The reality behind the use of the scale is the enormous amount of artificial light pushed into the sky by human habitation, as documented on this map below. To facilitate learning and using the scale, Bortle's indicators of sky brightness have been adapted as a table (below), including the color codes used in available light pollution map.

For the amateur astronomer, the most robust and convenient relative measure of sky brightness is the naked eye or telescopic limiting magnitude. This is also a criterion that can be directly reported without recourse to the Bortle classification categories.

To calculate the sky darkness using these charts, simply canvas the entire area of the chart and mark as many stars as you can recognize that are near your averted vision threshold. Do not mark stars that you can identify with direct vision or that are easy with averted vision; try to select stars near your threshold. Identify in this way at least 10 faint stars. Later, tally the number of stars that fall within each magnitude bin shown in the key at bottom left, which identifies the half magnitude steps corresponding to the Bortle categories. The prevailing sky brightness is the average magnitude of the two faintest bins marked:

SB = (t1*m1 + t2*m2) / (t1+t2)

#t is a tally
*m is the fainter bracket magnitude that defines the magnitude interval bin.

For example, 7 stars of magnitude 5.0–5.49 and 9 stars of magnitude 5.5–5.99, so:

SB = (7*5.5+9*6.0)/(7+9) = (38.5+54)/16 = 5.78 = Bortle 5 (suburban)

The limit magnitude may differ from another observer's, but this difference in visual acuity will transfer to all other visual tasks. The Bortle scale inevitably combines differences in sky brightness and differences in individual detection capabilities.

Number Code	*Map Color Code*	*Label*	*Sky Mag.*	*Naked Eye Limit Mag.*	*320mm Limit Mag.*	*Triangulum Galaxy visible?*	*Andromeda Galaxy visible?*	*Central Galaxy visible?*	*Zodiacal light visible?*	*Light Pollution*	*Clouds*	*Ground Objects*
1		excellent dark sky	22.00–21.99	≥ 7.5	> 17	obvious	.	casts shadows	striking	airglow apparent	.	visible only as silhouettes
2		average dark sky	21.99–21.89	7.0–7.49	16.5	easy with direct vision	.	appears highly structured	bright, faint yellow color	airglow faint	dark everywhere	large near objects vague
3		rural sky	21.89–21.69	6.5–6.99	16.0	easy with averted vision	.	complex structure	obvious	LP on horizon	dark overhead	large distant objects vague
4		rural/suburban transition	21.69–20.49	6.0–6.49	15.5	difficult with averted vision	obvious	only large structures	halfway to zenith	low LP	lit in distance	distant large objects distinct
5		suburban	20.49–19.50	5.5–5.99	14.5–15.0	.	easy with direct vision	washed out	faint	encircling LP	brighter than sky	
6		bright suburban	19.50–18.94	5.0–5.49	14.0–14.5	.	easy with averted vision	visible only near zenith	.	LP to 35°	fairly bright	small close objects distinct
7		suburban/urban transition	18.94–18.38	4.5–4.99	14.0	.	difficult with averted vision	invisible	.	LP to zenith	brilliantly lit	.
8		city sky	< 18.38	4.0–4.49	13	.	.	.	.	bright to 35°	.	headlines legible
9		inner city sky	.	≤ 4.0		.	.	.	.	bright at zenith	.	.

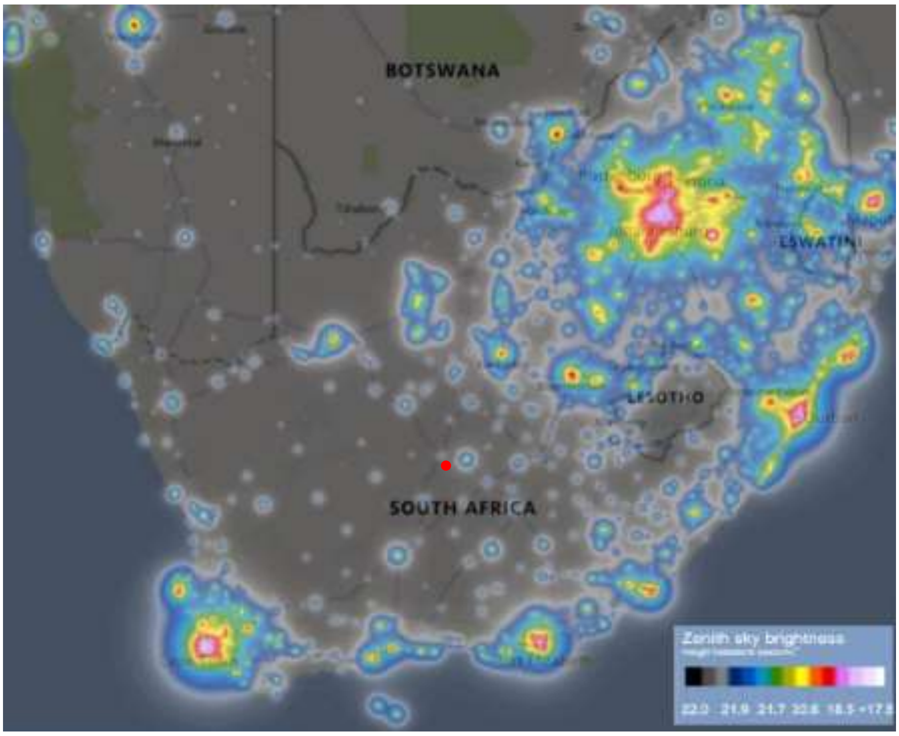

Figure F1: Light pollution map of South Africa (The World Atlas of the Artificial Night Sky Brightness). The red dot indicates where the Soyuz 1 Solar PV Park is situated.

APPENDIX G – INDEMNITY AND TERMS OF USE OF THIS REPORT

The findings, results, observations, conclusions and recommendations given in this report are based on the author's best scientific and professional knowledge as well as available information. The report is based on survey and assessment techniques which are limited by time and budgetary constraints relevant to the type and level of investigation undertaken and SAS (Pty) Ltd and its staff reserve the right, at their sole discretion, to modify aspects of the report including the recommendations if and when new information may become available from ongoing research or further work in this field or pertaining to this investigation.

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APPENDIX H – SPECIALIST INFORMATION

Details of the specialist who prepared the report

Stephen van Staden	MSc Environmental Management (University of Johannesburg)
Sanja Erwee	BSc Zoology (University of Pretoria)

The expertise of that specialist to compile a specialist report including a curriculum vitae

Company of Specialist:	Scientific Aquatic Services		
Name / Contact person:	Stephen van Staden		
Postal address:	29 Arterial Road West, Oriel, Bedfordview		
Postal code:	2007	Cell:	082 442 7637
Telephone:	011 616 7893	Fax:	011 615 6240/ 086 724 3132
E-mail:	stephen@sasenvgroup.co.za		
Qualifications	MSc (Environmental Management) (University of Johannesburg) BSc (Hons) Zoology (Aquatic Ecology) (University of Johannesburg) BSc (Zoology, Geography and Environmental Management) (University of Johannesburg)		
Registration / Associations	Registered Professional Scientist at South African Council for Natural Scientific Professions (SACNASP) Accredited River Health practitioner by the South African River Health Program (RHP) Member of the South African Soil Surveyors Association (SASSO) Member of the Gauteng Wetland Forum		

Specialist Declaration

I, Stephen van Staden, declare that -

- I act as an **independent specialist (reviewer)** in this assessment;
- 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 relevant legislation and any guidelines that have relevance to the proposed activity;
- I will comply with the applicable legislation;
- I have not, 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.

Signature of the Specialist

I, Sanja Erwee, declare that -

- I act as an **independent specialist** in this assessment;
- 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 relevant legislation and any guidelines that have relevance to the proposed activity;
- I will comply with the applicable legislation;
- I have not, 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.

Signature of the Specialist

SAS ENVIRONMENTAL GROUP OF COMPANIES – SPECIALIST CONSULTANT INFORMATION

CURRICULUM VITAE OF STEPHEN VAN STADEN

PERSONAL DETAILS

Position in Company	Group CEO, Water Resource discipline lead, Managing member, Ecologist, Aquatic Ecologist
Joined SAS Environmental Group of Companies	2003 (year of establishment)

MEMBERSHIP IN PROFESSIONAL SOCIETIES

Registered Professional Scientist at South African Council for Natural Scientific Professions (SACNASP)
Accredited River Health practitioner by the South African River Health Program (RHP)
Member of the South African Soil Surveyors Association (SASSO) Member of the Gauteng Wetland Forum
Member of the Gauteng Wetland Forum;
Member of International Association of Impact Assessors (IAIA) South Africa;
Member of the Land Rehabilitation Society of South Africa (LaRSSA)

EDUCATION

Qualifications

MSc Environmental Management (University of Johannesburg)	2003
BSc (Hons) Zoology (Aquatic Ecology) (University of Johannesburg)	2001
BSc (Zoology, Geography and Environmental Management) (University of Johannesburg)	2000
Tools for wetland assessment short course Rhodes University	2016
Legal liability training course (Legricon Pty Ltd)	2018
Hazard identification and risk assessment training course (Legricon Pty Ltd)	2013

Short Courses

Certificate – Department of Environmental Science in Legal context of Environmental Management, Compliance and Enforcement (UNISA)	2009
Introduction to Project Management - Online course by the University of Adelaide	2016
Integrated Water Resource Management, the National Water Act, and Water Use Authorisations, focusing on WULAs and IWWMPs	2017

AREAS OF WORK EXPERIENCE

South Africa – All Provinces
Southern Africa – Lesotho, Botswana, Mozambique, Zimbabwe Zambia
Eastern Africa – Tanzania Mauritius
West Africa – Ghana, Liberia, Angola, Guinea Bissau, Nigeria, Sierra Leona
Central Africa – Democratic Republic of the Congo

SELECTED PROJECT EXAMPLES OUT OF OVER 2000 PROJECTS WORKED ON

1. Mining: Coal, Chrome, PGM's, Mineral Sands, Gold, Phosphate, river sand, clay, fluorspar
2. Linear developments
3. Energy Transmission, telecommunication, pipelines, roads
4. Minerals beneficiation
5. Renewable energy (wind and solar)
6. Commercial development
7. Residential development
8. Agriculture
9. Industrial/chemical

KEY SPECIALIST DISCIPLINES

Biodiversity Assessments
- Floral Assessments
- Biodiversity Actions Plan (BAP)
- Biodiversity Management Plan (BMP)
- Alien and Invasive Control Plan (AICP)
- Ecological Scan
- Terrestrial Monitoring
- Protected Tree and Floral Marking and Reporting
- Biodiversity Offset Plan

Freshwater Assessments
- Desktop Freshwater Delineation
- Freshwater Verification Assessment
- Freshwater (wetland / riparian) Delineation and Assessment
- Freshwater Eco Service and Status Determination
- Rehabilitation Assessment / Planning
- Maintenance and Management Plans
- Plant species and Landscape Plan
- Freshwater Offset Plan
- Hydropedological Assessment
- Pit Closure Analysis

Aquatic Ecological Assessment and Water Quality Studies
- Habitat Assessment Indices (IHAS, HRC, IHIA & RHAM)
- Aquatic Macro-Invertebrates (SASS5 & MIRAI)
- Fish Assemblage Integrity Index (FRAI)
- Fish Health Assessments
- Riparian Vegetation Integrity (VEGRAI)
- Toxicological Analysis
- Water quality Monitoring
- Screening Test
- Riverine Rehabilitation Plans

Soil and Land Capability Assessment
- Soil and Land Capability Assessment
- Soil Monitoring
- Soil Mapping

Visual Impact Assessment
- Visual Baseline and Impact Assessments
- Visual Impact Peer Review Assessments
- View Shed Analyses
- Visual Modelling

Legislative Requirements, Processes and Assessments
- Water Use Applications (Water Use Licence Applications / General Authorisations)
- Environmental and Water Use Audits
- Freshwater Resource Management and Monitoring as part of EMPR and WUL conditions.

SAS ENVIRONMENTAL GROUP OF COMPANIES – SPECIALIST CONSULTANT INFORMATION CURRICULUM VITAE OF SANJA ERWEE

PERSONAL DETAILS

Position in Company	GIS Technician and Visual Specialist
Joined SAS Environmental Group of Companies	2014

EDUCATION

Qualifications

BSC Zoology (University of Pretoria)	2013

Short Courses

Global Mapper	2015
SANBI BGIS Course	2017
Global Mapper Lidar Course	2017
ESRI MOOC ARCGIS Cartography	2018

AREAS OF WORK EXPERIENCE

South Africa – Gauteng, Mpumalanga, North West, Limpopo, KwaZulu-Natal, Northern Cape, Western Cape Free State

KEY SPECIALIST DISCIPLINES

Freshwater Assessments

- Desktop Freshwater Delineation
- Plant species and Landscape Plan

Visual Impact Assessment

- Visual Baseline and Impact Assessments
- Visual Impact Peer Review Assessments
- View Shed Analyses
- Visual Modelling

GIS

- Mapping and GIS for various sectors and various disciplines (biodiversity, freshwater, aquatic, soil and land capability).

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APPENDIX I – SITE VERIFICATION

VISUAL (LANDSCAPE [SOLAR]) SITE SENSITIVITY VERIFICATION REPORT FOR THE PROPSOSED BRITSTOWN SOLAR PHOTOVOLTAIC (PV) FACILITY 1 AS PART OF THE BRITSTOWN SOLAR PV CLUSTER PROJECT NEAR BRITSTOWN, NORTHERN CAPE PROVINCE.

Introduction

According to the "Protocols for the Assessment and Minimum Criteria for Reporting on identified Environmental Themes ("the Protocols") published in Government Gazette No. 43110 on 20 March 2020 and Government Gazette No. 43855 on 30 October 2020, the Environmental Assessment Practitioner (EAP) must verify the current use of the site in question and its environmental sensitivity as identified by the Screening Tool to determine the need for specialist inputs in relation to the themes included in the Protocols. The Protocols are allowed for in terms of Sections 24(5)(a) and (h) and 44 of the National Environmental Management Act, 1998 (Act No. 107 of 1998) ("NEMA"). The Protocols must be complied with for every new application for Environmental Authorisation that is submitted after 9 May 2020.

This document serves as the Visual (Landscape [Solar]) Site Sensitivity Verification Report for the proposed Soyuz 1 Solar PV Park, near Britstown, Northern Cape Province. The proposed Soyuz 1 Solar PV Park requires environmental authorisation in terms of the NEMA EIA Regulations (2014), as amended and a Water Use Licence (WUL).

Study Area

The Soyuz 1 Solar PV Park is located within the Emthanjeni Local Municipality, an administration of the Pixley ka Seme District Municipality. Soyuz 1 Solar PV Park is located on Portion 3 of Farm 145 while the proposed access road is located on Farm 146, and Portions 1, 5, and 9 of farm Twyfelhoek 127, in the Northern Cape Province. The Soyuz 1 Solar PV Park is situated within a landscape that is associated with open shrub veld (often utilised for grazing).

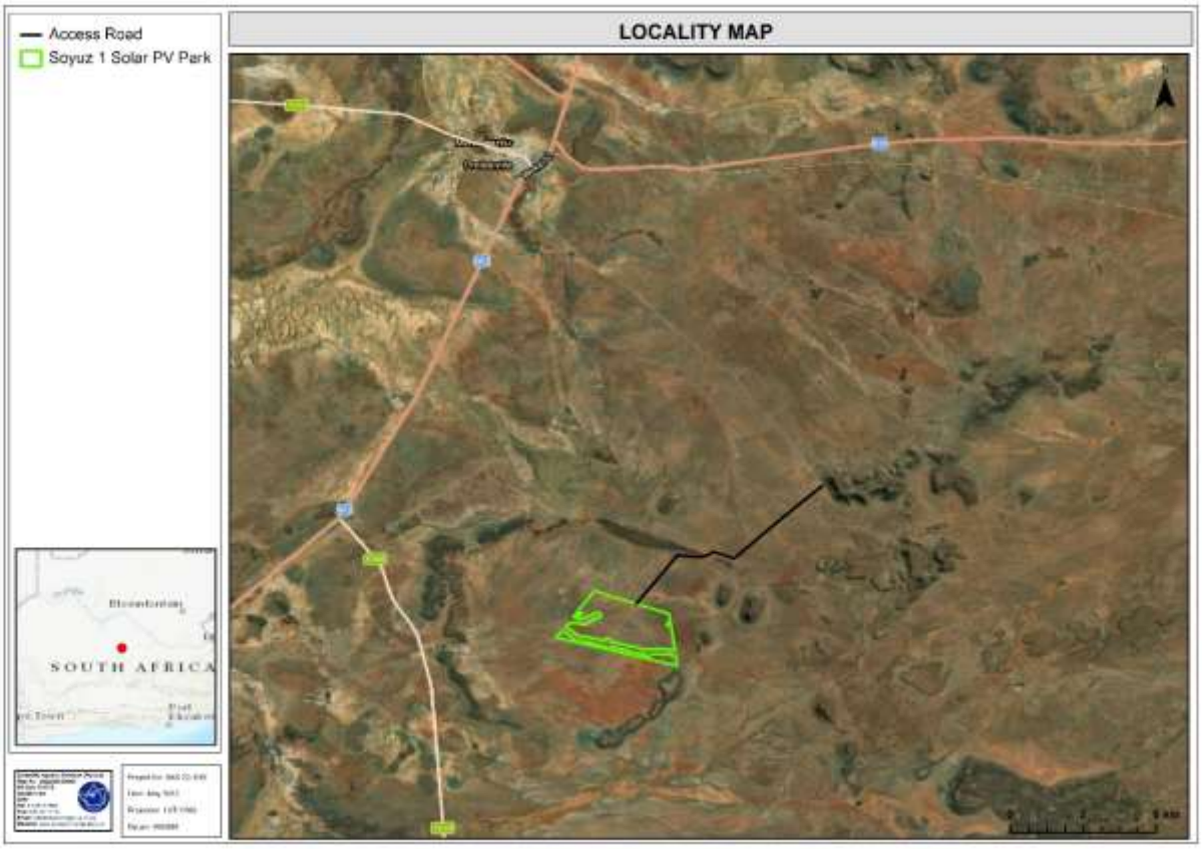

Figure N1: Digital satellite image depicting the location of the proposed Soyuz 1 Solar PV Park in relation to the surrounding area.

This Visual (Landscape [Solar]) site sensitivity verification report relates to a Screening Tool Report (STR) completed for the site in January 2023.

Site Verification Methodology

A site visit was conducted by the specialist to inform the specialist reports required for the proposed project.

Visual (Landscape) Site Verification

The table below provides information regarding the outcome of the Screening tool in terms of the landscape (Solar) theme sensitivity associated with the proposed project as well as a brief summary of the outcome of the Visual Impact Assessment report in response.

Table N1: Visual (Landscape [Solar]) Theme Sensitivity analysis for the proposed project.

Environmental Theme	Applicable Protocol	Response
Visual (Landscape [Solar]) Sensitivity Rating: There was no sensitivity rating, thus the landscape was deemed to have no sensitivity in terms of solar aesthetic impacts.	No specific protocol - consider general requirements (GG 45421 of 10/05/2019)_DRAFT)	A Visual Impact Assessment was conducted by Scientific Aquatic Services (SAS, 2023). During the site visit it was determined that the landscape associated with the Soyuz 1 Solar PV Park is similar to its surroundings and the larger region. No prominent outcrops or ridges were associated with the Soyuz 1 Solar PV Park and it was dominated by grazing practices. The study and associated comprehensive report provides a detailed description of the quality of the landscape prior to development taking place and then identifying possible visual impacts after development associated with the proposed project and provided suitable mitigation measures to best minimise the potential visual impact on the receiving environment. The report also guided the proposed project footprint to avoid potential sensitive receptors (which were buffered) and the visual impact they may experience with the proposed development (which was included in the proposed layout plan).