DRAFT ENVIRONMENTAL IMPACT ASSESSMENT REPORT FOR THE PROPOSED DEVELOPMENT OF THE SOYUZ 4 SOLAR PV PARK NEAR BRITSTOWN, NORTHERN CAPE PROVINCE

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people. planet. prosperity.

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14 August 2023

APPLICABLE LEGISLATION	COMPETENT AUTHORITY REFERENCE NUMBER/S
National Environmental Management Act (NEMA) Environmental Impact Assessment (EIA) Regulations (2017) (as amended)	**Department of Forestry, Fisheries and the Environment (DFFE) REFERENCE NUMBER: 14/12/16/3/3/2/2336**
Water Use License Application (WULA) in terms of Section 21 of the National Water Act (NWA) (Act No. 39 of 1998)	**A Water Use Licence Application will be submitted to the Department of Water and Sanitation (DWS) for Section 21(c) and (i) water uses.**
National Heritage Resource Act (No. 25 of 1999)	**A Heritage Impact Assessment will be submitted the South African Heritage Resources Agency (SAHRA).**
Report Title	Draft Environmental Impact Assessment Report for public consultation for the proposed development of the Soyuz 4 Solar PV Park and associated infrastructure near Britstown, Northern Cape Province.
Author and Environmental Assessment Practitioner (EAP)	Natasha Williams (Terramanzi Group (Pty) Ltd) Kristen Shaw (Terramanzi Group (Pty) Ltd)
Specialist Sub-Consultants	Avifaunal Environmental Impact Assessment – Enviro-Insight cc (C/O Luke Verburgt) Terrestrial Biodiversity Impact Assessment - SAS Environmental Group of Companies (Pty) Ltd (C/O Charne Gouws) Climate Change Assessment – Airshed Planning Professionals (Pty) Ltd (C/O Hanlie Liebenberg-Enslin) Freshwater Ecological Assessment – SAS Environmental Group of Companies (Pty) Ltd (C/O Paul Da Cruz) Geotechnical Reconnaissance Study - GEOSS South Africa (Pty) Ltd (C/O Louis Jonk) Heritage Impact Assessment – ACO Associates cc (C/O John Gribble) Environmental Noise Impact Assessment – dBA Acoustics (C/O Barend van der Merwe) Social Impact Assessment - Tony Barbour Environmental Consulting (C/O Tony Barbour) Soil, Landuse and Land Capability Impact Assessment - SAS Environmental Group of Companies (Pty) Ltd (C/O Tshiamo Setsipane) Town Planning - Warren Petterson Planning (C/O Soné vd Merwe) Traffic Assessment - Innovative Transport Solutions (C/O Christoph Krogscheepers) Visual Impact Assessment - SAS Environmental Group of Companies (Pty) Ltd (C/O Sanja Erwee)
Client	Soyuz 4 Solar PV Park (Pty) Ltd C/O Matteo Giulio Luigi Brambilla
Report Version	Draft EIA Report for PPP
Submission Date	14 August 2023

Please use the following as a reference for this Report:

Terramanzi Group Project Number: 221101 - 04

Project Title: Draft Environmental Impact Assessment Report for public consultation for the proposed development of the Soyuz 4 Solar PV Park and associated infrastructure near Britstown, Northern Cape Province.

EXECUTIVE SUMMARY

A) PROJECT OVERVIEW

Red Rocket South Africa (Pty) Ltd intends to develop the **Soyuz Solar Photovoltaic (PV) Cluster 1-6** comprising of six (6) Photovoltaic Solar Energy Parks. It is proposed that this Soyuz Solar PV Cluster be situated approximately 14km South-east of Britstown in the Northern Cape Province (Figure i).

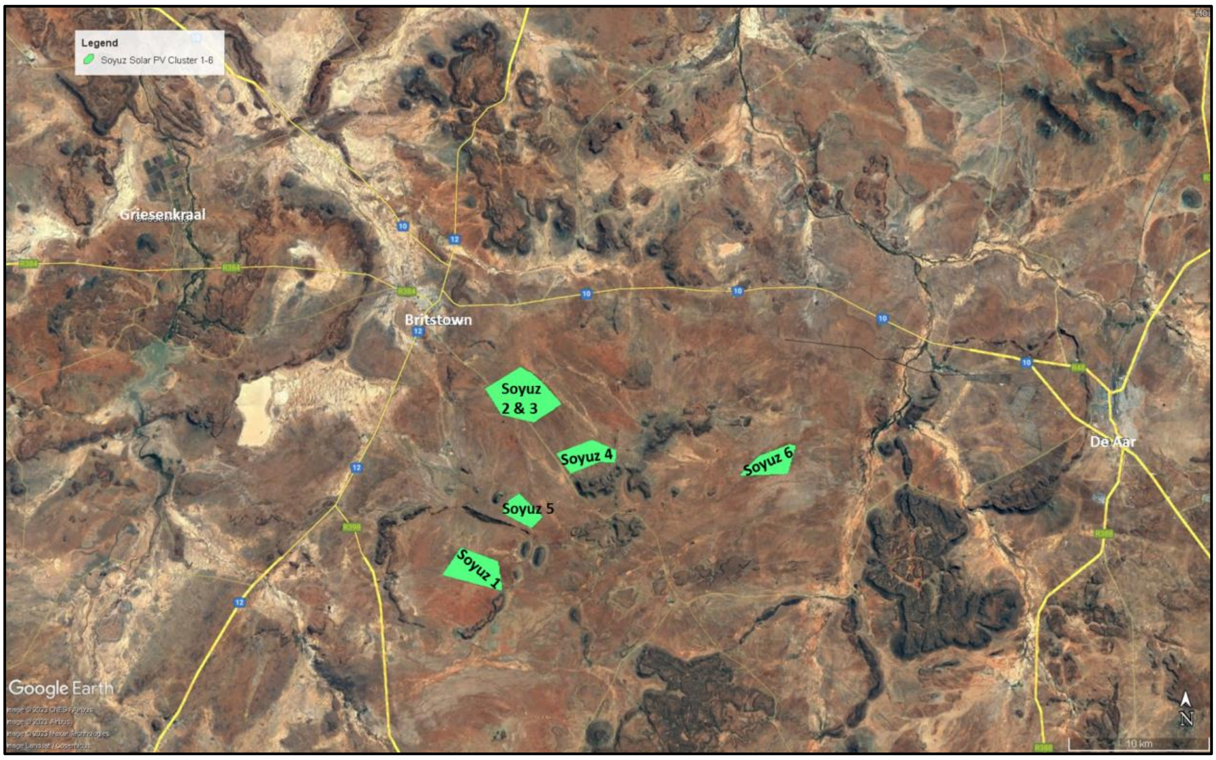

Figure i: Regional Location of the Soyuz Solar PV Cluster 1-6

All 6 Soyuz Solar PV Parks will require Environmental Authorisation. Due to commercial reasons, each of the Soyuz Solar PV Parks application for environmental authorisation are being applied for separately by different applicants but the application processes are being conducted simultaneously.

Soyuz 4 Solar PV Park (Pty) Ltd proposes the development of the Soyuz 4 Solar PV Park and associated infrastructure, near Britstown, Northern Cape Province. The proposed Soyuz 4 Solar PV Park will be located on Portion 5 of the Farm 127, Twyfelhoek. The Soyuz 4 Solar PV Park will have a generating capacity of up to 300MW and will include a Battery Energy Storage System (BESS) of up to 1200MWh. An on-site substation with a capacity of 33 – 132 kV, will enable the connection of the Solar PV Park to a 132kV Overhead Powerline (OHPL). (**Note:** the 132 kV OHPL does not form part of this Environmental Authorisation process). The purpose of the Project is to generate clean electricity from a renewable energy source (i.e., solar radiation) to contribute to the Eskom national energy grid and/or any Private off-takers (where applicable).

For the Soyuz 4 Solar PV Park to become operational, the Applicant is required to obtain Environmental Authorisation in terms of the National Environmental Management Act, Act 107 of 1998 (NEMA)). The Competent Authority for this Environmental Authorisation Application is the National Department of Forestry, Fisheries and the Environment (DFFE).

The Scoping Phase of the Environmental Impact Assessment (DFFE Reference No. **14/12/16/3/3/2/2336)** for this process was completed in April and included a Plan of Study for the EIA. The Scoping Report of the EIA process identified the additional detailed information and investigations that needed to be undertaken to accurately assess the current and future impacts of the proposed chemical refining operations on the receiving environment. A letter of acceptance of the Scoping Report and the Plan of Study for the EIA was received from DFFE on 12 June 2023.

This EIA report documents the findings of the detailed investigations, assesses the significance of the potential impacts and presents environmental mitigation measures to manage and minimise these potential impacts and constitutes the Environmental Impact Assessment Report (EIAR) to be submitted to DFFE as part of the Environmental Authorisation Process.

B) ENVIRONMENTAL LEGAL OVERVIEW

In terms of the requirements of the National Environmental Management Act (NEMA)(Act 107 of 1998) and its EIA Regulations (2014, as amended) environmental authorisation must be obtained for the construction and operation of the proposed Soyuz 4 Solar PV Park. The application for Environmental Authorisation must follow the Scoping and Environmental Impact Assessment (S&EIA) process. The proposed construction and operation of the Soyuz 4 Solar PV Park triggers the following Listed Activities under the EIA Regulations (2014, as amended) under NEMA (**Table i**) for which Environmental Authorisation is required.

Table i: Listed Activities Triggered in terms of NEMA EIA Regulations

GNR	LISTING ACTIVITY NO	DESCRIPTION	APPLICABILITY TO PROPOSAL
GNR 327 of 2017 Listing Notice 1	11	The development of facilities or infrastructure for the transmission and distribution of electricity - outside urban areas or industrial complexes with a capacity of more than 33 but less than 275 kilovolts;	The proposed development includes transformers, and underground and overhead cabling up to 33kV between project components. This activity is triggered due to the Back-to-Back Substations (Including the facility substation Eskom collector station with feeder bays) with a contracted capacity of up to 132kV based on Eskom requirements.
GNR 327 of 2017 Listing Notice 1	12	The development of— (i) infrastructure or structures with a physical footprint of 100 square metres or more; where such development occurs— (a) within a watercourse; (b) in front of a development setback; or (c) if no development setback exists, within 32 metres of a watercourse, measured from the edge of a watercourse;	The proposed development will require the establishment of infrastructure within a physical footprint exceeding 100 square metres within a watercourse or within 32 metres of a watercourse identified in the project area.
GNR 327 of 2017 Listing Notice 1	14	The development and related operation of facilities and infrastructure, for the storage,	The development of the Solar PV Park will require the construction and operation of facilities and

		or for the storage and handling, of a dangerous good, where such storage occurs in containers with a combined capacity of 80 cubic metres or more but not exceeding 500 cubic metres.	infrastructure for the storage and handling of dangerous goods (combustible and flammable liquids, such as oils, lubricants, solvents) associated with the onsite substation and PV trackers where such storage will occur inside containers with a combined capacity exceeding 80 cubic meters but not exceeding 500 cubic meters.
GNR 327 of 2017 Listing Notice 1	24	The development of a road— (i) with a reserve wider than 13,5 meters, or where no reserve exists where the road is wider than 8 metres;	Sections of the proposed access route from the public road to the proposed Soyuz 4 Solar PV Park development site will require development and it is likely that the road will be wider than 8 metres.
GNR 327 of 2017 Listing Notice 1	28	Residential, mixed, retail, commercial, industrial or institutional developments where such land was used for agriculture, game farming, equestrian purposes or afforestation on or after 01 April 1998 and where such development *(ii) will occur outside an urban area, where the total land to be developed is bigger than 1 hectare;*	The proposed Soyuz 4 Solar PV Park will occupy a development footprint exceeding 1 ha and occurs outside an urban area and within an area currently zoned for agriculture.
GNR 327 of 2017 Listing Notice 1	56	The widening of a road by more than 6 metre, or the lengthening of a road by more than 1 kilometre- (ii) where no reserve exists, where the existing road is wider than 8 metres.	The existing access road to the preferred Soyuz 4 Solar PV Park site will require upgrading that may trigger this requirement
GNR325 of 2017 Listing Notice 2	1	The development of facilities or infrastructure for the generation of electricity from a renewable resource where the electricity output is 20 megawatts or more,	The Applicant has proposed to establish a solar PV Park with a generating capacity of up to 300MW.
GNR325 of 2017 Listing Notice 2	15	The clearance of an area of 20 hectares or more of indigenous vegetation.	The proposed development of the Soyuz 4 Solar PV Park will require more than 20 hectares of indigenous vegetation to be cleared.
GNR 324 of 2017 Listing Notice 3	10	The development and related operation of facilities or infrastructure for the storage, or storage and handling of a dangerous good, where such storage occurs in containers with a combined capacity of 30 but not exceeding 80 cubic metres. g. Northern Cape	The development of the Solar PV Park will require the construction and operation of facilities and infrastructure for the storage and handling of dangerous goods (combustible and flammable liquids, such as oils, lubricants, solvents) associated with the onsite substation and PV trackers

		ii. Areas within a watercourse or wetland; or within 100 metres from the edge of a watercourse or wetland**;**	

C) NEED AND DESIRABILTIY

The requirement for renewable energy projects (solar, wind, hydrological to name a few) across the country has been steadily increasing over the last five to ten years. Renewable energy has been found to be a reliable source of alternative energy supply to the ever under equipped national grid

From a national perspective, there are several needs and desirability factors associated with the proposed development of Soyuz 4 Solar PV Park (and the associated Soyuz Solar PV Cluster):

- **Electricity supply:** The development of Soyuz 4 Solar PV Park can contribute to the electricity supply and help to meet the growing demand for energy. In addition, by diversifying the sources of power in the country, the surety of supply will improve.
- **Climate change mitigation:** The development of Soyuz 4 Solar PV Park can contribute help to mitigate climate change by reducing the country's reliance on fossil fuels and reducing greenhouse gas emissions.
- **Reduced energy losses:** The transmission of power from the power stations in Mpumalanga and Gauteng to the Northern Cape results in the high energy losses. By creating a substantial electrical feed from the Soyuz Solar PV Cluster into the grid in the Northern Cape will result in reduced energy losses in transmission.
- **Economic development:** The development of Soyuz 4 Solar PV Park will contribute to economic development by creating jobs and attracting investment.
- **Lower costs of alternative energy:** An increase in power supply by increasing the number of solar PV facilities, like the proposed Soyuz Solar PV Cluster, will eventually reduce the cost of power generated through solar facilities.
- **Environmental sustainability:** The development of Soyuz 4 Solar PV Park can contribute to environmental sustainability by reducing the negative impacts associated with the extraction and transportation of fossil fuels.
- **Renewable energy targets:** South Africa has set a target of generating 18 GW of renewable energy by 2030, with solar PV being a major component of this target. The development of the Soyuz 4 Solar PV Park, and the associated Soyuz Solar PV Cluster, can contribute to meeting this national target.

From a regional perspective in the Northern Cape province of South Africa, there are several needs and desirability factors associated with the development of the Soyuz 4 Solar PV Park and the associated Soyuz Solar PV Cluster:

- **Economic development:** The Northern Cape is a region with significant potential for economic development, but it is also one of the poorest provinces in South Africa. The development of the

Soyuz 4 Solar PV Park can contribute to economic development by creating jobs and attracting investment. The construction and operation of a solar PV park requires skilled labour, which can create employment opportunities in the local community. In addition, the development of a solar PV park can attract domestic and foreign investment, which can contribute to economic growth.

- **Social development:** The Northern Cape is a region with many rural and remote communities that lack access to electricity. The development of the Soyuz 4 Solar PV Park can provide a reliable source of electricity to these communities, which can support social development and improve living standards.

- **Resource availability:** The Northern Cape is a region with abundant solar radiation, which makes it an ideal location for the development of the Soyuz 4 Solar PV Park. The high levels of solar radiation in the region can support the generation of large amounts of electricity from solar PV, which can help to meet the energy needs of the region.

The proposed Soyuz 4 Solar PV Park development site is highly desirable due to its unique site-specific benefits. The area offers ample open space that is suitable for solar facility development, along with an amply high solar resource to generate renewable energy.

The proposed development site is located in an area where environmental sensitivities to such a development are low, ensuring that it is a responsible and sustainable project that will have nominal negative impacts on the surrounding environment but significantly contribute to socio-economic development locally and regionally.

The proposed development and operation of the Soyuz 4 Solar PV Park will create employment opportunities for the local community, providing a much-needed boost to the local economy. In addition, the skills development that will be provided to employees and contractors involved in the construction and operation of the facility will have a lasting impact on the community.

The proposed development of the Soyuz 4 Solar PV Park (and the association Soyuz Solar PV Cluster) will generate alternative land use income through the rental for the facility. This will provide the farming enterprises with increased cash flow and rural livelihood and thereby improve the financial sustainability of the landowner and employees and the “run-on” benefits to the local economy.

The environmental impact assessment, inclusive of input from specialists on the local direct impacts and the cumulative impacts has assessed that the potential negative environmental impacts associated with the development of the Soyuz 4 Solar PV Park on the preferred site are low.

D) ENVIRONMENTAL IMPACT STATEMENT

Based on consideration of the information contained in this Draft EIA Report and the impact assessment undertaken with specialist input, the following is relevant:

- The proposed site is environmentally and socially suitable for the development and operation of the Soyuz 4 Solar PV Park.

- The proposed development and operation of the Soyuz 4 Solar PV Park is not expected to have any significant **direct** negative social or environmental impacts on the receiving environment that cannot be avoided or suitably mitigated.

- The proposed development and operation of the Soyuz 4 Solar PV Park is not expected to have any significant **cumulative** negative social or environmental impacts on the receiving environment that cannot be avoided or suitably mitigated.

The following key **negative** social and environmental impacts have been identified:

- Loss of terrestrial and aquatic biodiversity due to the potential for the development to encroach physically into these sensitive environments.
- Impact on the mating behaviours (lekking) of a Species of Conservation Concern (Ludwig's Bustard) due the potential location of the solar PV park in areas where these activities could occur.
- Negative social impacts on family life due to the potential ingress of migrant workers.

The following key **positive** social and environmental impacts have been identified:

- Creation of local employment and business opportunities
- Economic and technical support to the local agricultural community
- Positive contribution towards the South African renewable energy goals
- Contribution to reduction of greenhouse gas at a national and global scale
- Improved local and regional energy supply security

E) RECOMMENDATION OF THE EAP

The EAP therefore recommends that **t**he proposed development and operation of the Soyuz 4 Solar PV Park, as per the preferred site layout presented in this EIA and on the preferred development site (Portion 5 of the Farm Twyfelhoek) near Britstown in the Northern Cape, should be authorised by the competent authority.

E) PUBLIC PARTICIPATION

Comment is invited from registered interested and affected parties on this final proposal as presented.

This Draft EIA Report will be available for comment for the statutory 30 calendar day commenting period from **Monday, 14 August 2023** up to and including **Tuesday, 12 September 2023**. All comments received during the stakeholder engagement will be recorded in a Comments and Responses Report and addressed as part of the environmental authorisation process.

The report is available for download via the following link:
https://terramanzi.egnyte.com/fl/IvwDMilNit

Comments must be submitted directly to Terramanzi Group (Pty) Ltd, as follows:
- Electronic mail: comments@terramanzi.co.za; or
- Facsimile: 086 558 1213; or

- Post: Postnet Suite 211, Private Bag X26, Tokai, Cape Town
- For Attention: **Natasha Williams**
- Terramanzi Project Reference Number: 221101-01
- Visit us at www.terramanzi.co.za

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1 INTRODUCTION AND BACKGROUND

Red Rocket South Africa (Pty) Ltd is proposing to develop the **Soyuz Solar Photovoltaic (PV) Cluster 1-6** comprising of six (6) Photovoltaic Solar Energy Parks. It is proposed that this Soyuz Solar PV Cluster be situated approximately 14km South-east of Britstown in the Northern Cape Province (**Figure 1**).

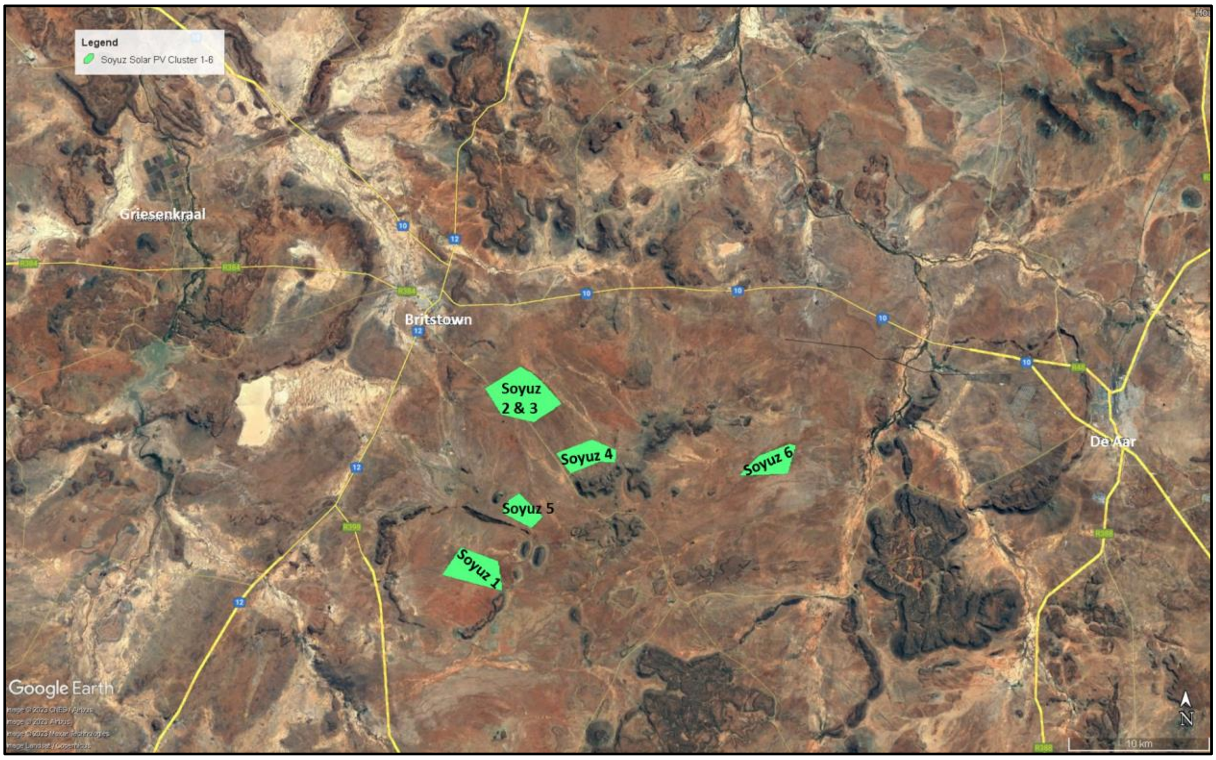

Figure 1: Regional Location of the Soyuz Solar PV Cluster 1-6

The proposed positional layout of the Soyuz Solar PV Cluster (Soyuz Solar PV Parks 1-6) is shown in Error! Reference source not found.. All 6 Soyuz Solar PV Parks will require Environmental Authorisation. Due to commercial reasons, each of the Soyuz Solar PV Parks application for environmental authorisation is being applied for separately by different applicants but the application processes are being conducted simultaneously. The Solar PV Park name, the properties on which the preferred sites are located and the associated generating capacities are presented in as follows:

Table 1: Details of the proposed Soyuz Solar PV Cluster

Solar Park Name	Property Description/s of preferred site	Property Size (ha)	Development Footprint (ha)	Generating Capacity (MW)
Soyuz 1 Solar PV Park	Portion 3 of The Farm 145	736.92	±628	240
Soyuz 2 Solar PV Park	Portion 2 of The Farm 97, Pettspot	2123.94	±552	300
Soyuz 3 Solar PV Park			±519	240
Soyuz 4 Solar PV Park	**Portion 5 of the The Farm 127, Twyfelhoek**	**2123.94**	**±567**	**300**
Soyuz 5 Solar PV Park	Portion 1 of the Farm 127, Twyfelhoek	1086.14	±355	150

Soyuz 6 Solar PV	Portion 1 of the Farm 91	1902.03	±493	240
Total for Soyuz Solar PV Cluster		**7972.93**	**±3114**	**1470**

This Draft Environmental Impact Assessment Report (EIAr) forms part of the environmental authorisation process for the **Soyuz 4 Solar PV Park** under the applicant name, **Soyuz 4 Solar PV Park (Pty) Ltd**.

Figure 2: Positional localities of the Soyuz Solar PV Cluster 1-6

Soyuz 4 Solar PV Park (Pty) Ltd proposes the development of the Soyuz 4 Solar PV Park and associated infrastructure, near Britstown, Northern Cape Province. The Project will be located on <u>Portion 5 of the Farm 127, Twyfelhoek</u>. The Soyuz 4 Solar PV Park will have a generating capacity of up to 300MW and will include a Battery Energy Storage System (BESS) of up to 1200MWh. An on-site substation with a capacity of 33-132 kV, will enable the connection of the Solar PV Park to a 132kV Overhead Powerline (OHPL). (**Note:** the 132 kV OHPL does not form part of this Environmental Authorisation process). The purpose of the Project is to generate clean electricity from a renewable energy source (i.e., solar radiation) to contribute to the Eskom national energy grid and/or any Private off-takers (where applicable).

For the Soyuz 4 Solar PV Park to become operational, the Applicant is required to obtain Environmental Authorisation in terms of the National Environmental Management Act, Act 107 of 1998 (NEMA)). Terramanzi Group (Pty) Ltd (hereafter referred to as TMG) has been appointed by the Applicant as the independent Environmental Assessment Practitioner (EAP) to facilitate the Scoping and Environmental Impact Assessment (S&EIA) process to obtain Environmental Authorisation in terms of the NEMA Environmental Impact Assessment (EIA) Regulations, 2014 (as amended).

This Draft Environmental Impact Assessment (EIA) Report forms part of the application for Environmental Authorisation. This Draft EIA Report is distributed as part of the stakeholder engagement to provide Interested and Affected Parties (hereinafter referred to as "I&APs") and commenting authorities to participate in the environmental authorisation process, to share their comments, concerns and suggestions with the Applicant, Professional Team, the EAP and Competent Authority. This consultation process will ensure that any aspects not already raised by the Scoping and EIA process to date, can be recorded and considered. The Competent Authority for this Environmental Authorisation Application is the National Department of Forestry, Fisheries and the Environment (DFFE).

To date, a Scoping Phase Assessment has been undertaken and subjected to public consultation whereafter it was submitted to DFFE, for Decision. The DFFE approved the Scoping Phase of the Project on 12 June 2023 (Appendix E).

2 OVERVIEW OF THE ENVIRONMENTAL APPLICATION PROCESS

The National Environmental Management Act, 107 of 1998 (NEMA) is the key legislation in South Africa governing environmental authorisation. The listed activities in Section 24 of NEMA are associated with the Environmental Impact Assessment (EIA) regulations published in Government Notices R327, R325 and R324 (as amended) in Government Gazette 40772.

An EIA is a systematic process of evaluating the potential environmental effects of a proposed project or development. The purpose of an EIA is to identify, predict, and evaluate the likely environmental impacts of a project, and to propose measures to mitigate or manage those impacts. The main function of an EIA is to inform the decision-making process by clearly presenting pertinent information.

The first step is for the applicant to engage with the relevant authorities, stakeholders and affected communities to determine if an EIA is required and what information is needed to apply. Once the applicant has determined that an EIA is required, they must appoint an EAP to conduct the application procedure for the Environmental Authorisation (EA).

There are two categories of prescribed processes namely the Scoping and Environmental Impact (S&EIA) process and the Basic Assessment (BA) process. The Government Notices in Government Gazette 40772 include the listed activities of the NEMA EIA Regulations that instruct if a BA or S&EIA process is required.

The EAP must complete and submit the application form to the competent authority (CA) indicating that either a BA or a S&EIA process is to be followed. The CA reviews the application and within 10 days of the receiving application the competent authority must acknowledge if the application is permitted and if it is rejected or accepted.

After the acknowledgment that the application is permitted and accepted for a S&EIA process, the scoping report is compiled by the EAP with inputs from specialists and subject matter experts. A draft version of the scoping report is made available to I&APs for review and comment for 30 days as part of the PPP.

A Comments and Responses Report (CRR) is developed as a record of the stakeholder comments and corresponding responses. The scoping report is updated to a final version taking into consideration the I&APs comments and concerns and submitted to the CA for deliberation. The final scoping report must be submitted to the CA within 44 days following the submission of the application form.

The CA has 43 days after receipt of the final scoping report and supporting documentation to accept or decline the report and the Plan of Study for the EIA. A new application must be submitted if the scoping report is rejected.

The impact assessment phase involves the preparation of an environmental impact report, which assesses the potential impacts of the proposed activity on the environment and identifies mitigation measures to reduce or avoid these impacts. The draft EIA report must be issued for public consultation for no less than 30 days and an Environmental Management Programme (EMPr) must be linked with an EIA report. The CRR will be updated with the impact assessment phase stakeholder comments and responses. The EIA report is revised to include the changes as per the PPP and the final report is submitted together with the EMPr and supporting documentation to the CA for decision. The final report must be issued to the CA within 106 days of the scoping report decision.

The CA must recognise the receipt of the report in less than 10 days and has 107 days to review the documentation and make a decision to approve or reject the application, or approve it subject to certain conditions. This decision is communicated to the applicant and all I&APs.

If the application is approved, the applicant must implement the project according to the conditions set out by the CA. The competent authority will monitor the implementation of the project and its impacts on the environment and may take enforcement action if necessary.

It is important to note that the EIA process in South Africa is designed to be inclusive and participatory and provides opportunities for I&APs to participate and provide input throughout the process. The S&EIA Process for the Soyuz 4 Solar PV Park is presented in **Figure 3**. The phases highlighted in blue illustrate phases completed and underway. The phases highlighted in green are pending.

Figure 3: Overview of the S&EIA Process

2.1 OBJECTIVES OF THE EIA PROCESS

In accordance with the Appendix 3 Regulation 2 of GN No. R. 326 of the NEMA EIA Regulations (2014 as amended) the objective of the environmental impact assessment process is to, through a consultative process-

a) ***determine the policy and legislative context within which the activity is located and document how the proposed activity complies with and responds to the policy and legislative context;***

b) ***describe the need and desirability of the proposed activity, including the need and desirability of the activity in the context of the development footprint on the approved site as contemplated in the accepted scoping report;***

c) ***identify the location of the development footprint within the approved site as contemplated in the accepted scoping report based on an impact and risk assessment process inclusive of cumulative impacts and a ranking process of all the identified development footprint alternatives focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects of the environment;***

d) ***determine the—***

i. ***nature, significance, consequence, extent, duration and probability of the impacts occurring to inform identified preferred alternatives; and***

ii. ***degree to which these impacts-***

(aa) can be reversed;

(bb) may cause irreplaceable loss of resources, and

(cc) can be avoided, managed or mitigated;

e) ***identify the most ideal location for the activity within the development footprint of the approved site as contemplated in the accepted scoping report based on the lowest level of environmental sensitivity identified during the assessment;***

f) ***identify, assess, and rank the impacts the activity will impose on the development footprint on the approved site as contemplated in the accepted scoping report through the life of the activity;***

g) ***identify suitable measures to avoid, manage or mitigate identified impacts; and***

h) ***identify residual risks that need to be managed and monitored.***

2.2 CONTENT OF THIS EIA REPORT

This Draft EIA Report for public consultation contains the necessary information for an appropriate understanding of the Project and associated Environmental Application Process. The document describes the site, alternatives considered, the scope of the assessment, the consultation process to be followed and any findings and recommendations at this stage of the Environmental Application Process.

Table 2 lists the minimum criteria to be satisfied by and EIA Report as guided by the NEMA EIA Regulations (2014 as amended in April 2017). The location of this content in this Draft EIA Report is provided alongside the requirements for ease of reference.

Table 2: Minimum Criteria to be Satisfied by an EIA Report

Regulation	Appendix 3. (1) Scope of Assessment and Content of Environmental Impact Assessment Reports	Relevant Section of this Report
3. (1)	An environmental impact assessment report must contain the information that is necessary for the competent authority to consider and come to a decision on the application, and must include—	
(a)	Details of:	
(i)	The EAP who prepared the report; and	Section 3
(ii)	The expertise of the EAP, including a curriculum vita	Section 3 & Appendix G
(b)	The location of the activity, including:	
(i)	The 21-digit Surveyor General code of each cadastral land parcel;	Section 4
(ii)	Where available, the physical address and farm name; and	Section 4
(iii)	Where the required information in items (i) and (ii) is not available, the coordinates of the boundary of the property or properties.	Section 4
(c)	A plan which locates the proposed activity or activities applied for at an appropriate scale, or, if it is-	Section 5
(i)	A linear activity, a description and coordinates of the corridor in which the proposed activity or activities is to be undertaken; or	NA
(ii)	On land where the property has not been defined, the coordinates within which the activity is to be undertaken;	Section 4
d	A description of the scope of the proposed activity, including:	
(i)	All listed and specified activities triggered and being applied for; and	Section 6.4
(ii)	A description of the associated structures and infrastructure related to the development;	Section 6
(e)	A description of the policy and legislative context within which the development is located and an explanation of how the proposed development complies with and responds to the legislation and policy context;	Section 7
(f)	A motivation for the need and desirability for the proposed development, including the need and desirability of the activity in the context of the preferred development footprint within the approved site as contemplated in the accepted scoping report;	Section 8
(g)	A motivation for the preferred development footprint within the approved site as contemplated in the accepted scoping report;	Section 5
(h)	A full description of the process followed to reach the proposed development footprint within the approved site as contemplated in the accepted scoping report, including:	Section 5
(i)	Details of the development footprint alternatives considered;	Section 5
(ii)	Details of the public participation process undertaken in terms of regulation 41 of the Regulations, including copies of the supporting documents and inputs;	Section 22
(iii)	A summary of the issues raised by interested and affected parties, and an indication of the manner in which the issues were incorporated, or the reasons for not including them;	Section 22
(iv)	The environmental attributes associated with the development footprint alternatives focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects;	Sections 9 - 21
(v)	The impacts and risks identified including the nature, significance, consequence, extent, duration and probability of the impacts, including the degree to which these impacts— (aa) can be reversed; (bb) may cause irreplaceable loss of resources; and (cc) can be avoided, managed or mitigated;	Section 24 - 25
(vi)	The methodology used in determining and ranking the nature, significance, consequences, extent, duration and probability of potential environmental impacts and risks;	Section 23

Regulation	Appendix 3. (1) Scope of Assessment and Content of Environmental Impact Assessment Reports	Relevant Section of this Report
(vii)	Positive and negative impacts that the proposed activity and alternatives will have on the environment and on the community that may be affected focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects;	Section 24 - 25
(viii)	The possible mitigation measures that could be applied and level of residual risk;	Section 24 - 25
(ix)	If no alternative development footprints for the activity were investigated, the motivation for not considering such; and	Section 5
(xi)	A concluding statement indicating the preferred alternative including preferred location of the activity.	Section 5
(x)	A concluding statement indicating the location of the preferred alternative development footprint within the approved site as contemplated in the accepted scoping report;	Section 5
(i)	A full description of the process undertaken to identify, assess and rank the impacts the activity and associated structures and infrastructure will impose on the preferred development footprint on the approved site as contemplated in the accepted scoping report through the life of the activity, including—	Section 23
(i)	A description of all environmental issues and risks that were identified during the environmental impact assessment process; and	Section 24 - 25
(ii)	An assessment of the significance of each issue and risk and an indication of the extent to which the issue and risk could be avoided or addressed by the adoption of mitigation measures;	Section 24 - 25
(j)	an assessment of each identified potentially significant impact and risk, including—	Section 24 - 25
(i)	cumulative impacts;	Section 24 - 25
(ii)	the nature, significance and consequences of the impact and risk;	Section 24 - 25
(iii)	the extent and duration of the impact and risk;	Section 24 - 25
(iv)	the probability of the impact and risk occurring;	Section 24 - 25
(v)	the degree to which the impact and risk can be reversed;	Section 24 - 25
(vi)	the degree to which the impact and risk may cause irreplaceable loss of resources; and	Section 24 - 25
(vii)	the degree to which the impact and risk can be mitigated;	Section 24 - 25
(k)	where applicable, a summary of the findings and recommendations of any specialist report complying with Appendix 6 to these Regulations and an indication as to how these findings and recommendations have been included in the final assessment report;	Section 9 – 21 and Section 25
(l)	an environmental impact statement which contains—	Section 27
(i)	a summary of the key findings of the environmental impact assessment:	Section 27
(ii)	a map at an appropriate scale which superimposes the proposed activity and its associated structures and infrastructure on the environmental sensitivities of the preferred development footprint on the approved site as contemplated in the accepted scoping report indicating any areas that should be avoided, including buffers; and	Section 5 & Appendix A
(iii)	a summary of the positive and negative impacts and risks of the proposed activit and identified alternatives;	Section 27
(m)	based on the assessment, and where applicable, recommendations from specialist reports, the recording of proposed impact management outcomes for the development for inclusion in the EMPr as well as for inclusion as conditions of authorisation;	Section 25
(n)	the final proposed alternatives which respond to the impact management measures, avoidance, and mitigation measures identified through the assessment;	Section 5
(o)	any aspects which were conditional to the findings of the assessment either by the EAP or specialist which are to be included as conditions of authorisation;	NA

Regulation	Appendix 3. (1) Scope of Assessment and Content of Environmental Impact Assessment Reports	Relevant Section of this Report
(p)	a description of any assumptions, uncertainties and gaps in knowledge which relate to the assessment and mitigation measures proposed;	Section 26
(q)	a reasoned opinion as to whether the proposed activity should or should not be authorised, and if the opinion is that it should be authorised, any conditions that should be made in respect of that authorisation;	Section 27
(r)	where the proposed activity does not include operational aspects, the period for which the environmental authorisation is required and the date on which the activity will be concluded and the post construction monitoring requirements finalised;	NA
(s)	an undertaking under oath or affirmation by the EAP in relation to—	Section 28
(i)	the correctness of the information provided in the reports;	
(ii)	the inclusion of comments and inputs from stakeholders and I&APs;	
(iii)	the inclusion of inputs and recommendations from the specialist reports where relevant; and	
(iv)	any information provided by the EAP to interested and affected parties and any responses by the EAP to comments or inputs made by interested or affected parties;	
(t)	where applicable, details of any financial provision for the rehabilitation, closure, and ongoing post decommissioning management of negative environmental impacts;	NA
(u)	an indication of any deviation from the approved scoping report, including the plan of study, including–	NA
(i)	any deviation from the methodology used in determining the significance of potential environmental impacts and risks; and	NA
(ii)	a motivation for the deviation;	NA
(v)	any specific information that may be required by the competent authority; an	NA
(w)	any other matters required in terms of section 24(4)(a) and (b) of the Act.	NA

3 PROJECT TEAM DETAILS

3.1 ENTITY RESPONSIBLE FOR THE DEVELOPMENT

Red Rocket South Africa (Pty) Ltd is proposing the development of the Soyuz 4 Solar PV Park under the legal entity Soyuz 4 Solar PV Park (Pty) Ltd (Applicant). The names and contact details are provided on **Table 3**.

Table 3: Entity Responsible for the Development of the proposed Soyuz 4 Solar PV Park

DEVELOPMENT ENTITY	
Applicant Name	Soyuz 4 Solar PV Park (Pty) Ltd
Responsible Person	Mr Matteo Giulio Luigi Brambilla
Address	14th Floor Pier Place Heerengracht Street Foreshore Cape Town 8001
Contact Details	+27 (0)72 212 1531 (C) Email: m.logan@redrocket.energy

3.2 ENVIRONMENTAL ASSESSMENT PRACTITIONER (EAP)

Terramanzi Group (Pty) Ltd ("TMG") has appointed to undertake this Application for Environmental Authorisation (EA) on behalf of the Applicant.

Wendy Mey was the independent EAP responsible for conducting the Environmental Scoping Phase of the EIA process and for the compilation the Environmental Scoping report. Wendy also managed the specialists appointed for the EIA phase of the environmental authorisation process. Wendy is an environmental consultant with more than 18 years of experience. She is a registered EAP with the Environmental Assessment Practitioners Association of South Africa (EAPASA) (2021/3684). Wendy holds a BSc in Chemical Engineering from the University of KwaZulu Natal and is a senior member of the Environmental Services Team at TMG.

Natasha Williams is the independent EAP responsible for assessing the environmental impacts (based on the specialist input) and compiling this Draft EIA Report. Natasha is an environmental consultant with 29 years of environmental management and EIA experience. She is a registered EAP with the Environmental Assessment Practitioners Association of South Africa (EAPASA) (2019/1458). Natasha holds a BSc Honours from the University of KwaZulu Natal.

Please refer to Appendix G for the EAP's Curriculum Vitae

This report was reviewed by Fabio Venturi whose career spans over 20 years in the industry, across both the government and private sectors of the green economy. Fabio's entrepreneurial drive to innovate and influence has resulted in multiple industry firsts and awards. Fabio is an Accredited Professional with the Green Building Council of South Africa (GBCSA), a Certified Environmental Scientist, served on the South Africa Environmental Industry Body, that being the Western Cape Committee Branch of the South African Affiliate of the International Association for Impact Assessment (IAIAsa), and sat on the National Executive Committee (NEC) of IAIAsa, and is a Certified Carbon Footprint Analyst and Energy Efficiency Auditor.

TMG hereby declares that they have no conflicts of interest related to the work of this report. Specifically, TMG declares that they have no personal financial interests in the property and/or activity being assessed in this report, and that they have no personal or financial connections to the relevant property owners, developers, planners, financiers or consultants of the property or activity, other than fair remuneration for professional services rendered for this report to the Competent Authority. TMG declares that the opinions expressed in this report are independent and a true reflection of their professional expertise.

TMG is a **Level 4 Broad Based Black Economic Empowerment Company** and is **professionally accredited** with several relevant industry bodies, in line with the Preferential Procurement Policy Framework Act No. 5 of 2000 (PPPFA)

4 PROJECT LOCATION

The proposed Soyuz 4 Solar PV Park is located within the Emthanjeni Local Municipality (ELM) which forms part of the Pixley ka Seme District Municipality (PKSDM). The regional location of the proposed site is shown on

Figure 4 and the location of the PKSDM is shown in red in **Figure 5**.

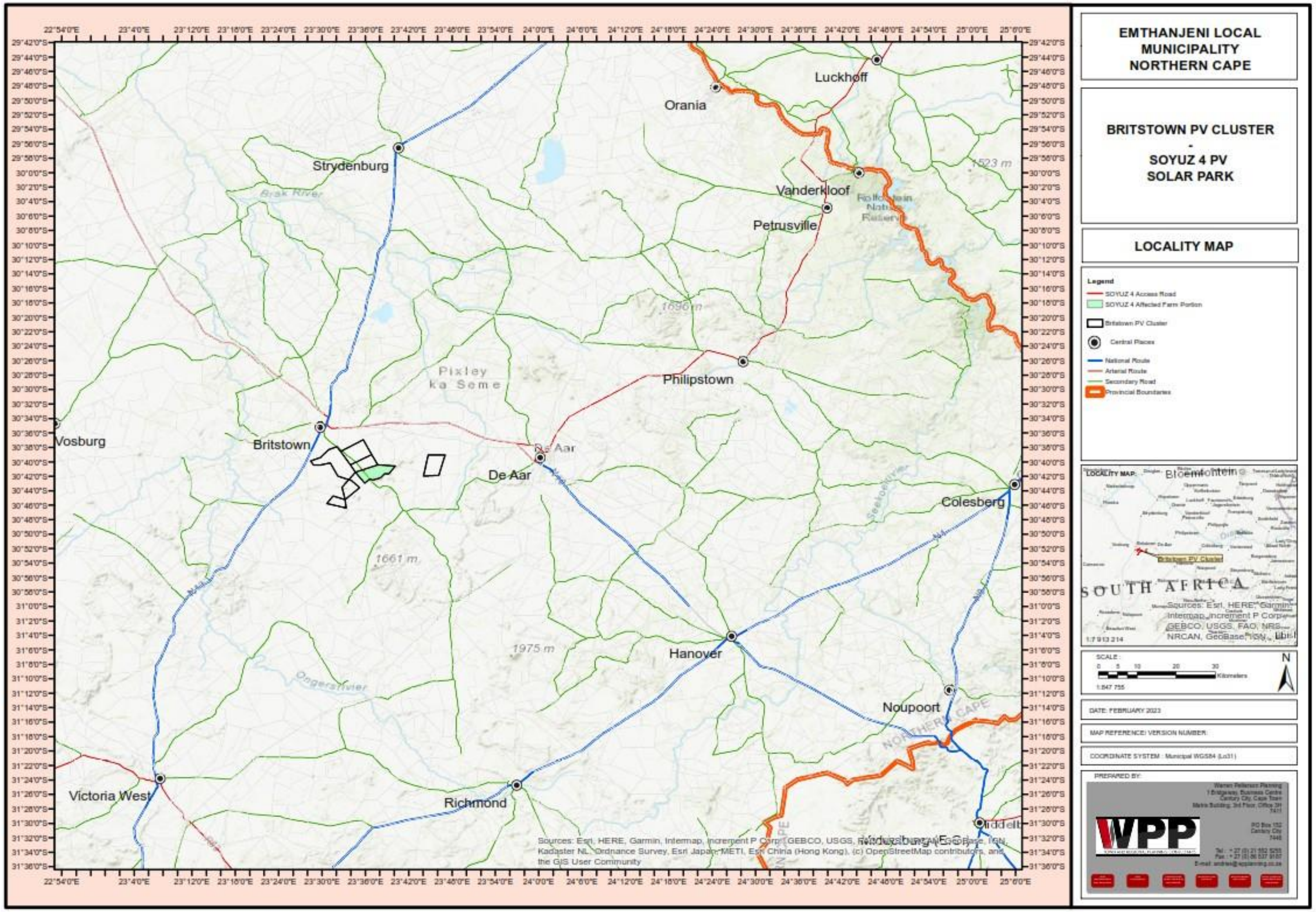

Figure 4: Regional Locality Map

Figure 5: Regional location of the Pixley ka Seme District Municipality

[1]The PKSDM is situated in the south-east of the Northern Cape Province and covers an area of 103 222km^2. It shares its borders with three other provinces, namely the Free State to the east, the Eastern Cape to the south-east, and the Western Cape to the south-west. It is the second-largest district of the five in the province and makes up almost a third of its geographical area.

The main economic sectors comprise of community services (26.6%), agriculture (16.6%), transport (15.1%), trade (12.9%), finance (12.8%), electricity (7.0%), construction (3.3%), manufacturing (3.2%), mining (2.6%).

The PKSDM is made up of eight local municipalities which include Emthanjeni, Kareeberg, Thembelihle, Siyathemba, Renosterberg, Ubuntu, Siyancuma and Umsobomvu municipalities. These are shown in **Figure 6**. De Aar is the administrative seat of the EML and PKSDM.

Figure 6: Local Municipalities within PKSDM

The proposed Soyuz 4 Solar PV Park is situated approximately 14km South-east of Britstown and 38 km west of the town of De Aar. The proposed development will be located on Portion 5 of Farm 127 Twyfelhoek with an area of 2 214ha. The details of the cadastral unit making up the Soyuz 4 Solar PV Park are provided in **Table 4** and the area is shown in **Figure 7**

.

Table 4: Cadastral Land Parcel Details

CADASTRAL LAND PARCEL	SG21 DIGITAL CODE	GPS CO-ORDINATES
Farm Twyfelhoek 5/127	C0I200000000012700005	Eastern corner: 30°40'35.26"S, 23°40'7.81"E
		Northwestern corner: 30°41'27.44"S, 23°34'39.35"E
		Middle point: 30°41'28.57"S, 23°37'17.12"E
		Southwestern corner: 30°42'56.38"S, 23°35'54.27"E
		Eastern corner: 30°40'35.26"S, 23°40'7.81"E

[1] *Information sourced from* https://municipalities.co.za/overview/137/pixley-ka-seme-district-municipality

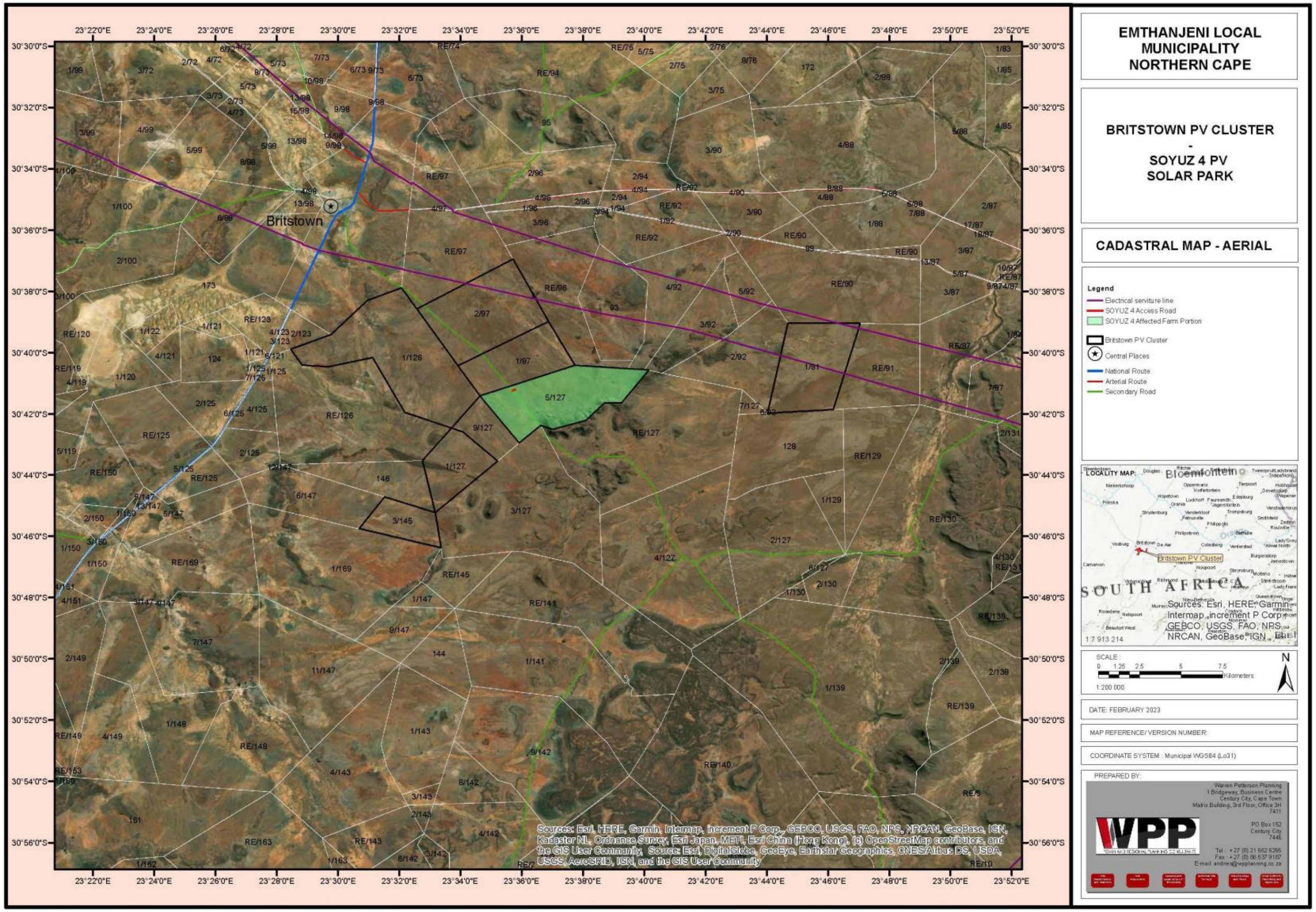

Figure 7: Cadastral Map

The climate for this area is classified as semi-desert with annual rainfall ranging from 100mm upwards. Temperatures in the area can reach up to 50°C. The PKSDM is one of the hottest and driest districts in South Africa, making it an ideal location for solar-energy projects. The PKSDM falls within the Solar Development Corridor identified by the Northern Cape Provincial Spatial Development Framework (SDF). This solar development corridor extends from Kakamas to Upington and down to De Aar in the south-east (Yellow Corridor in **Figure 8**).

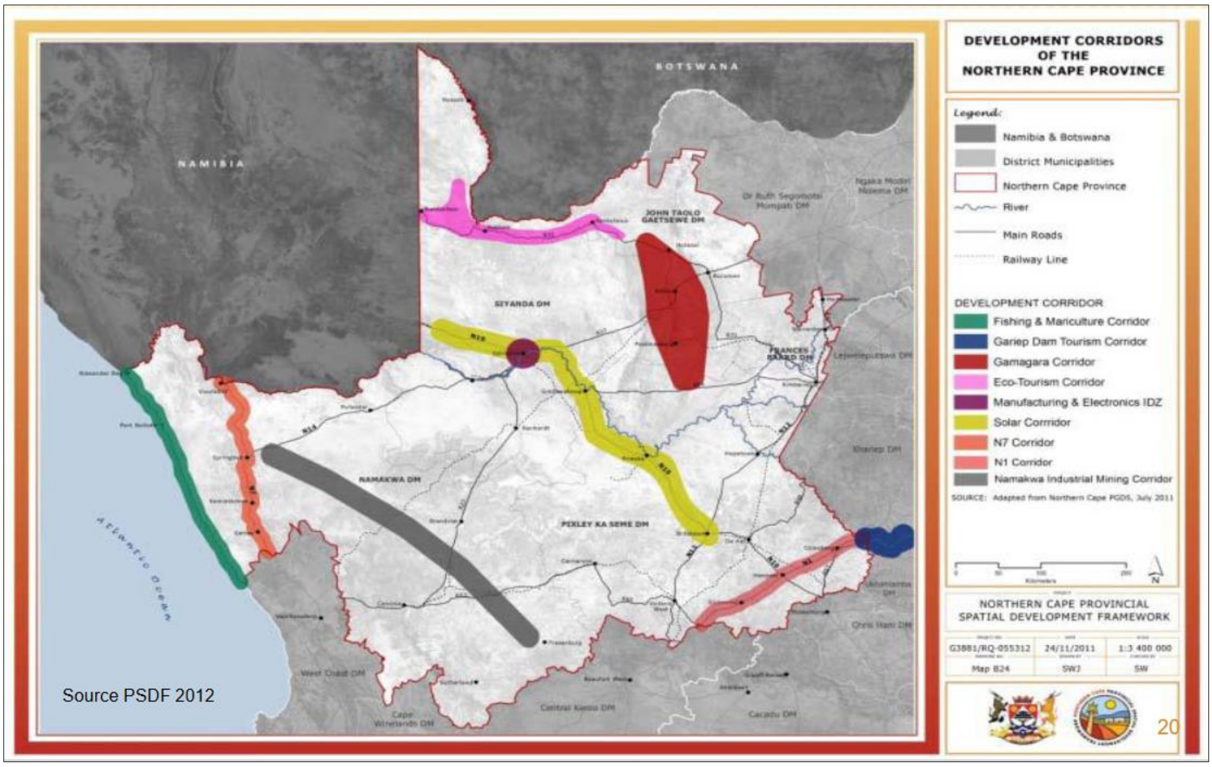

Figure 8: Northern Cape Development Solar Corridor

The proposed Soyuz 4 Solar PV Park development site is located in an area that is primarily undeveloped farmland and is well suited for solar installations as it comprises an extensive flat area with little agricultural or natural potential together with a very high solar theme sensitivity.

5 ALTERNATIVES CONSIDERED AND THE PREFERRED ALTERNATIVE

In accordance with ***Appendix 2 Regulation 2(1)(g) (i, x and v); of GN No. R. 326 of the NEMA EIA Regulations (2014 as amended)****, the following information is presented in this Section:*

> ***2(1)(g)*** *– A full description of the process followed to reach the proposed preferred activity, site and location of the development footprint within the site, including:*
>
> ***2(h) i*** *– Details of the alternatives considered*
>
> ***2(h) x****- If no alternatives, including alternatives location for the activity were investigated, the motivation for not considering such*
>
> ***2 (h) v*** *–the impacts and risks which have informed the identification of each alternative, including the nature, significance, consequence, extent, duration and probability of such identified impacts, including the degree to which these impacts:*
>
> ***(aa)*** *– can be reversed*
>
> ***(bb)*** *– May cause irreplaceable loss of resources; and*
>
> ***(cc)*** *– Can be avoided, managed or mitigated*

In terms of the NEMA EIA Regulations (2014, as amended) the Environmental Impact Report provide a description of the process followed to reach the proposed preferred activity, site and development footprint. In addition, the EIA must contain details **feasible** and **reasonable** alternatives that have been considered and assessed. However, the EIA Regulations also specify that if no alternatives were investigated as part of the environmental scoping or EIA, then a motivation for not considering alternatives must be provided.

Table 5 describes alternatives that could typically be considered during an EIA process relating to renewable energy development.

Table 5: Typical Alternatives Assessed in an EIA Process

TYPE OF ALTERNATIVE	EXPLANATION / EXAMPLES
Location	Refers both to alternative properties or alternative sites on the same property.
Activity	Generation of electricity versus use of the land for agricultural production.
Design or Layout	Design – Different architectural and/or engineering designs Layout – Consideration of different spatial configurations of an activity on a particular site (e.g. siting of a noisy plant away from residences)
Technological	Consideration of such alternatives is to include the option of achieving the same goal using a different method or process (e.g. 1000MW of energy using a coal-fired power station versus the using a Solar PV Park)
Scheduling and Timing	Where several measures might play a role in an overall program, but the order in which they are schedule will contribute to the overall effectiveness of the end result.
No-Go Option	This is the option of not implementing the activity.

In this EIA, only the 'No Go' alternative has been subjected to an environmental impact assessment. No other alternatives have been assessed in terms of environmental impact. However, alternatives were considered at a desk top level by applicant team during the feasibility phase of the Soyuz Solar PV Cluster Project. The consideration of alternatives during the feasibility and planning phase was an iterative process of feedback between the applicant, the EAP and the specialists which has culminated in a single preferred project proposal. The desk-top process considering the available alternatives and process followed to reach the preferred activity, site, and site development footprint is explained as follows:

5.1 PROCESS FOLLOWED TO REACH THE PREFERRED ALTERNATIVE

The following process to identify and define the preferred alternative was applied during the feasibility planning by the proponent and reevaluated during the environmental scoping phase of the environmental authorisation process:

5.1.1 Activity Alternatives

Renewable energy developments in this area of the Northern Cape typically include wind energy farms, solar PV parks and solar concentrators. The EIA process needs to consider if the development of the Soyuz 4 Solar PV Park would be an appropriate land use in the area and on the preferred site.

When considering renewable energy development in this region the planning team determined, during the feasibility stage that the Solar PV facilities in combination with wind energy farms would return the best generation rates of renewable energy based on the following:

- **Electricity generation from Solar PV technology:** Solar PV technology is a suitable activity in the area surrounding Britstown given High Global Horizontal Irradiance (GHI) in this region (**Figure 9**). The Solar PV technology entails comparatively low visual impacts (compared to wind farms and solar concentrators), requires minimal water usage and is a simple and reliable type of technology. At the end of life, the components can be recycles and the development site rehabilitated. In addition, the area where the Soyuz Solar PV Cluster is proposes consists of relatively flat land with suitable orientations to capture the best solar efficiencies. Hence, the proposed Soyuz 4 PV Park development site is best suited due to the gentle topography and slope orientation.

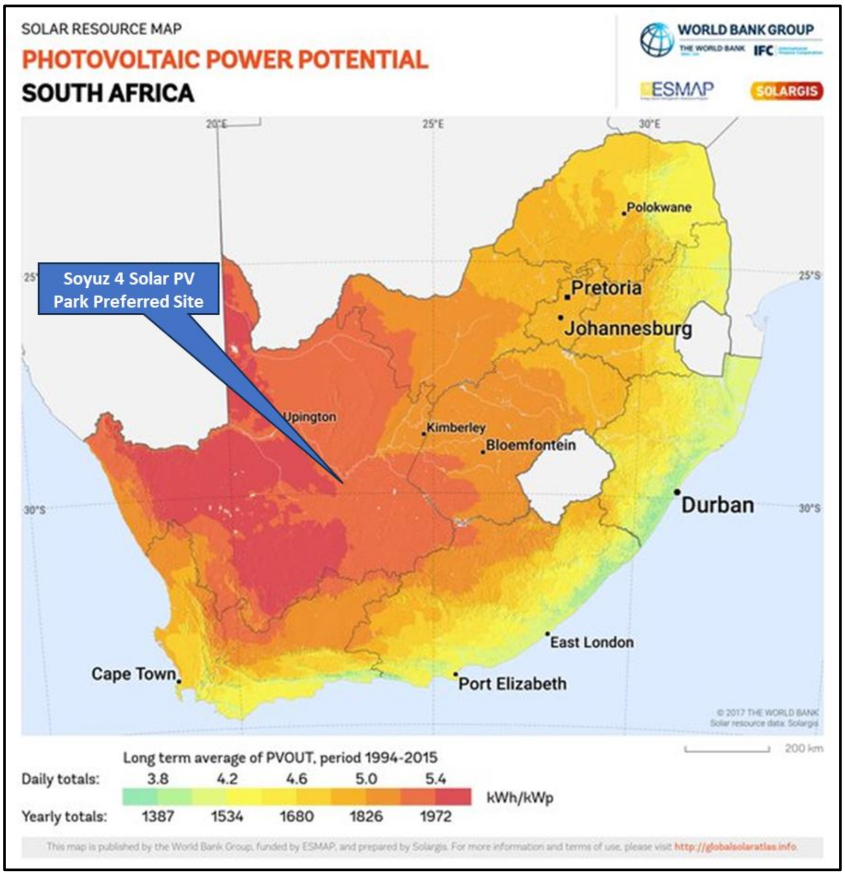

Figure 9: Photovoltaic Power Potential for South Africa (2017)

- **Electricity generation from wind:** Local climatic conditions on the higher elevations in the region also the establishment of wind generation facilities in the area. The proponents of Soyuz renewable energy projects in this region have selected the higher elevations for the wind farms and the lower, flatter land for the solar PV facilities.
- **Concentrated solar power (CSP) technology:** CSP technology requires large volumes of water and this is a major constraint for this type of technology considering the water challenges and limitation experienced in this region. While the irradiation values are high enough to generate sufficient solar power, the water constraints render this alternative not feasible.

In addition, the primary current landuse in this area is low density stock farming, in particular sheep farming. The proposed Soyuz 4 Solar PV Park site was selected on the basis that the land capability was expected to be low for agriculture and that stock farming could continue within the development area during the operational phase i.e. the development of the solar PV park would not exclude continued agricultural practices.

On this basis, the only activity alternatives considered by this EIA are the proposed Soyuz 4 PV Park and the 'No Go' option i.e. continued low density stock farming

5.1.2 The "Location" Alternative

This proposed site for the development of the Soyuz 4 Solar PV Park was selected as it was identified as particularly well suited for the proposed activity due to its suitable climatic conditions, topography (gradient and orientation), environmental conditions (i.e. agricultural potential, ecological sensitivity, visibility) in addition to the a willing landowner. The independent specialists confirmed during the environmental scoping phase assessments that the proposed development site did not have environmental 'fatal flaws' that would preclude the development of a solar PV park. As such no other site alternatives were considered by the EIA.

5.1.3 The "Technology" Alternative

The following Technology Alternatives have been considered:

5.1.3.1 Photovoltaic Solar Panels

There are several types of semiconductor technologies currently available and in use for PV solar panels. Two, however, have become the most widely adopted, namely crystalline silicon, thin film or bifacial PV panels. These technologies are discussed in more detail below:

- **Crystalline (high efficiency technology at higher cost):** Crystalline silicon panels are constructed by first putting a single slice of silicon through a series of processing steps, creating one solar cell. These cells are then assembled in multiples to make a solar panel. Crystalline silicon, also called wafer silicon, is the oldest and the most widely used material in commercial solar panels. Crystalline silicon modules represent 85-90% of the global annual market today. There are two main types of crystalline silicon panels that can be considered for the solar facility:

    - Mono-crystalline Silicon - mono-crystalline (also called single crystal) panels use solar cells that are cut from a piece of silicon grown from a single, uniform crystal. Mono-crystalline panels are among the most efficient yet most expensive on the market. They require the highest purity silicon and have the most involved manufacturing process.

    - Poly-crystalline Silicon – poly-crystalline panels use solar cells that are cut from multifaceted silicon crystals. They are less uniform in appearance than mono-crystalline cells, resembling pieces of shattered glass. These are the most common solar panels on the market, being less expensive than mono-crystalline silicon. They are also less efficient, though the performance gap has begun to close in recent years.

- **Thin film (low-cost technology with lower efficiency)** There are several types of semiconductor technologies currently available and in use for PV solar panels. Two, however, have become the most widely adopted, namely crystalline silicon, thin film or bifacial PV panels. These technologies are discussed in more detail below:

  - Cadmium Telluride (CdTe) - CdTe is a semiconductor compound formed from cadmium and tellurium. CdTe solar panels are manufactured on glass. They are the most common type of thin film solar panel on the market and the most cost-effective to manufacture. CdTe panels perform significantly better in high temperatures and in low-light conditions.

  - Amorphous Silicon - Amorphous silicon is the non-crystalline form of silicon and was the first thin film material to yield a commercial product, first used in consumer items such as calculators. It can be deposited in thin layers onto a variety of surfaces and offers lower costs than traditional crystalline silicon, though it is less efficient at converting sunlight into electricity.

  - Copper, Indium, Gallium, Selenide (CIGS) - CIGS is a compound semiconductor that can be deposited onto many different materials. CIGS has only recently become available for small commercial applications and is considered a developing PV technology (First Solar, 2011).

- **Bifacial panels:** s the name suggests, bifacial solar panels have two faces, or rather, they can absorb light from both sides of the panel. A lot of potential energy transfer is lost in traditional solar cells when the light hits the back of a solar panel. Most bifacial solar panels use monocrystalline cells, whereas traditional cells use polycrystalline materials. The monocrystalline materials, alongside the clear light pathway on both sides of the panel, enable the light to be absorbed from either side of the cell, and it is thought that, that the overall efficiency of these cells can be up to 30% greater in commercial applications. Although, the exact amount is variable depending on the surface that they are installed on. The front side of the solar panel still absorbs most of the solar light, but the back side of the solar panel can absorb between 5-90% of the light absorbed by the front of the solar panel.

  Traditional solar panels use an opaque back sheet. By comparison, bifacial solar panels either have a clear/reflective back sheet or have dual panes of glass. Most of these solar panels are frameless so any issues with potential-induced degradation (PID) are reduced. To efficiently convert light into electricity from both sides, bifacial solar cells have selective-area metallization schemes that enable light to pass between the metallized areas, rather than the conventional thick metal collectors as seen with monofacial solar panels.

The technology that currently (July 2023) proves to be most feasible and reasonable with respect to the proposed Soyuz 4 Solar PV Park is crystalline silicon panels, due to them being non-reflective, more efficient, and with a higher durability. In addition, bifacial panels for better efficiencies are the preferred alternative. However, **due to the rapid technological advances being made in the field of solar technology the exact type of technology to be used, such as bifacial panels, will only be confirmed at the onset of the project.**

5.1.3.2 BESS Battery alternatives

It is proposed that a nominal up to 1 200 MWh Battery Energy Storage Facility for grid storage would be housed in stacked containers, with a maximum height of 8m and a maximum volume of 1,740m3 of batteries and associated operational, safety and control infrastructure. Three types of battery technologies are being considered for the proposed project: Lithium-ion, Sodium-sulphur or Vanadium Redox flow battery. While there are various battery storage technologies available, the preferred alternative is the utility-scale Lithium-ion (Li-ion) battery energy storage. Li-ion batteries have emerged as the leading technology in utility-scale energy storage applications because they offer the best mix of performance specifications, such as high charge and discharge efficiency, low self-discharge, high energy density, and long cycle life**. However, due to the rapid technological advances being made in the field of energy storage the exact type of technology to be will only be confirmed at the onset of the project.**

Battery storage offers a wide range of advantages to South Africa including renewable energy time shift, renewable capacity firming, electricity supply reliability and quality improvement, voltage regulation, electricity reserve capacity improvement, transmission congestion relief, load following and time of use energy cost management. In essence, this technology allows renewable energy to enter the base load and peak power generation market and therefore can compete directly with fossil fuel sources of power generation and offer a truly sustainable electricity supply option.

5.1.4 The “Layout” Alternative

The EAP and Professional Team undertook an Opportunities and Constraints Analyses during the environmental scoping phase to determine ‘developable’ and ‘non developable’ areas within the proposed site.

This approach prioritises the consideration of the environmental attributes in the project development process and integrates them in the design and layout configuration process. The technical design requirements are matched upfront with ‘developable’ areas identified through this rigorous process. Within this acceptable development footprint, the preferred layout is the developed.

This methodology optimises the development footprint area instead of creating several design alternatives.

During the environmental scoping phase assessments, the specialists did identify areas within the proposed site that are considered environmentally sensitive and recommended that these areas must be considered ‘no go’ areas to avoid significant environmental impacts. These environmentally sensitive areas were mapped (

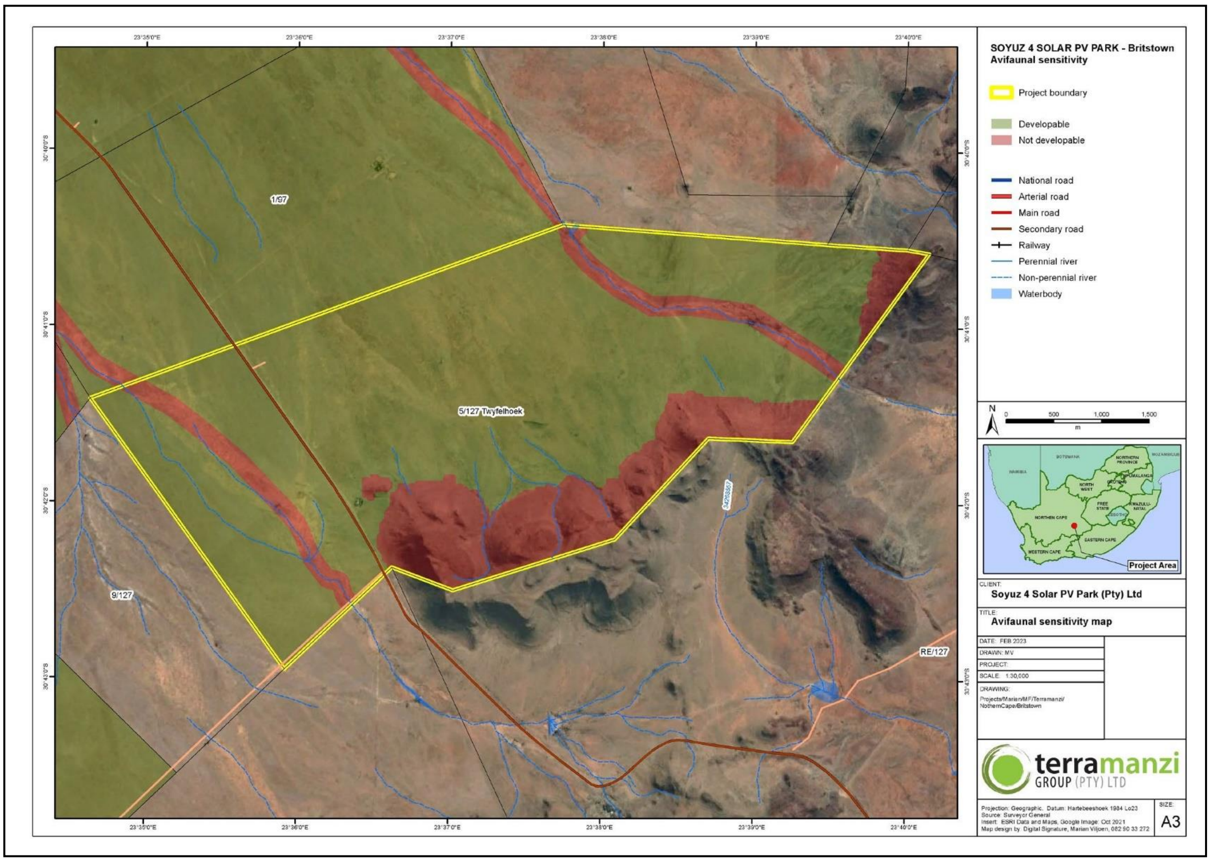
SOYUZ 4 SOLAR PV PARK - Britstown
Avifaunal sensitivity
Project boundary
Developable
Not developable
National road
Arterial road
Main road
Secondary road
Railway
Perennial river
Non-perennial river
Waterbody
1/97
5/127 Twyfelhoek
9/127
RE/127
N
0
500
1,000
1,500
m
Project Area
CLIENT:
Soyuz 4 Solar PV Park (Pty) Ltd
TITLE:
Avifaunal sensitivity map
DATE: FEB 2023
DRAWN: MV
PROJECT:
SCALE: 1:30,000
DRAWING:
Projects/Marian/MF/Terramanzi/NothernCape/Britstown
terramanzi GROUP (PTY) LTD
Projection: Geographic. Datum: Hartebeeshoek 1984 Lo23
Source: Surveyor General
Insert: ESRI Data and Maps, Google Image: Oct 2021
Map design by: Digital Signature, Marian Viljoen, 082 90 33 272
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Figure **10–**

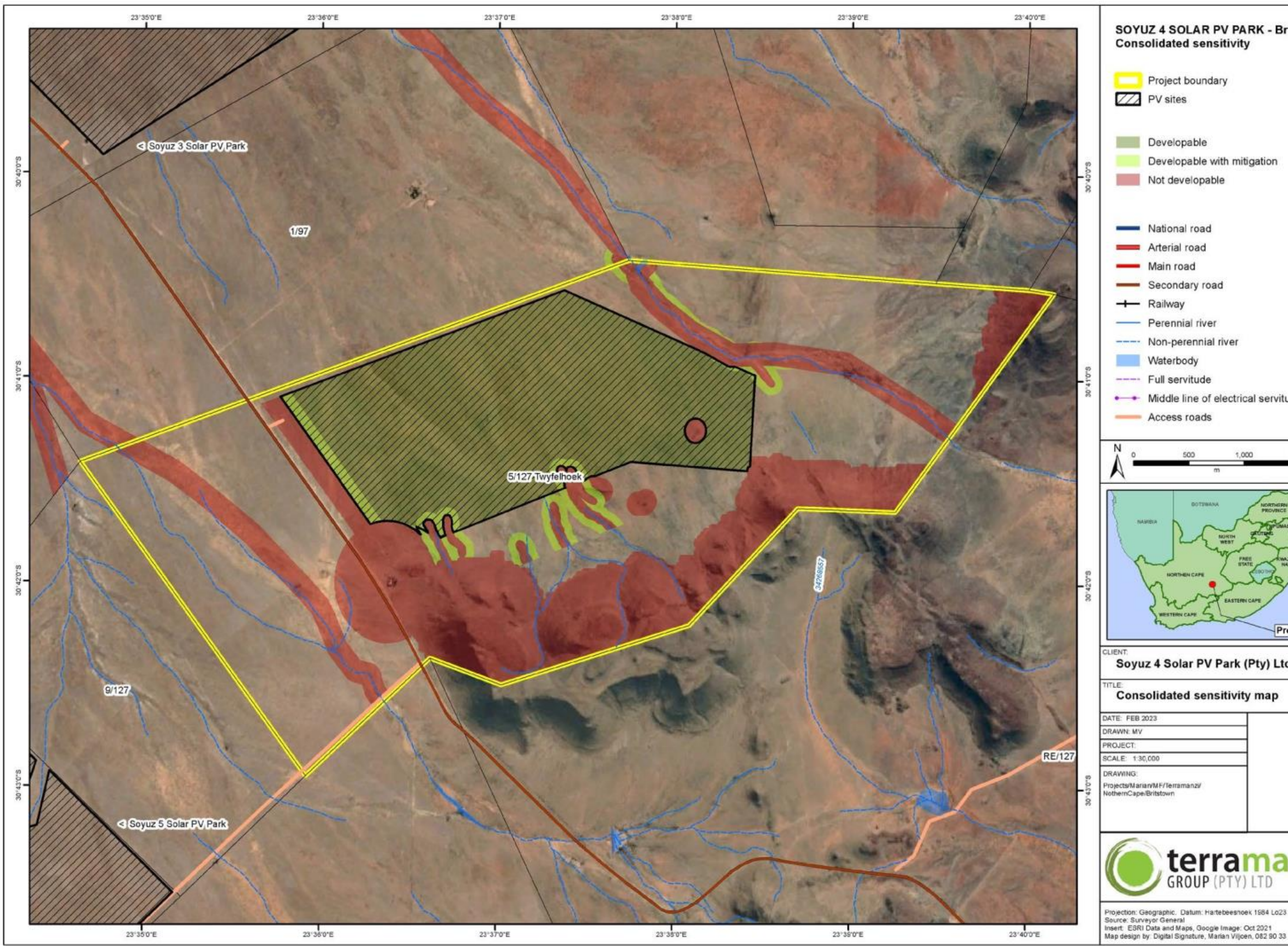

Figure 16**)** and the proposed Soyuz 4 Solar PV Park development layout was amended to avoid disturbance of these areas and the delineated buffer zones i.e. the Impact Management Hierarchy was applied (avoidance before mitigation). The final informed Soyuz 4 Solar PV Park development **preferred site layout plan** is presented in **Figure 17** and this preferred layout is assessed by this EIA.

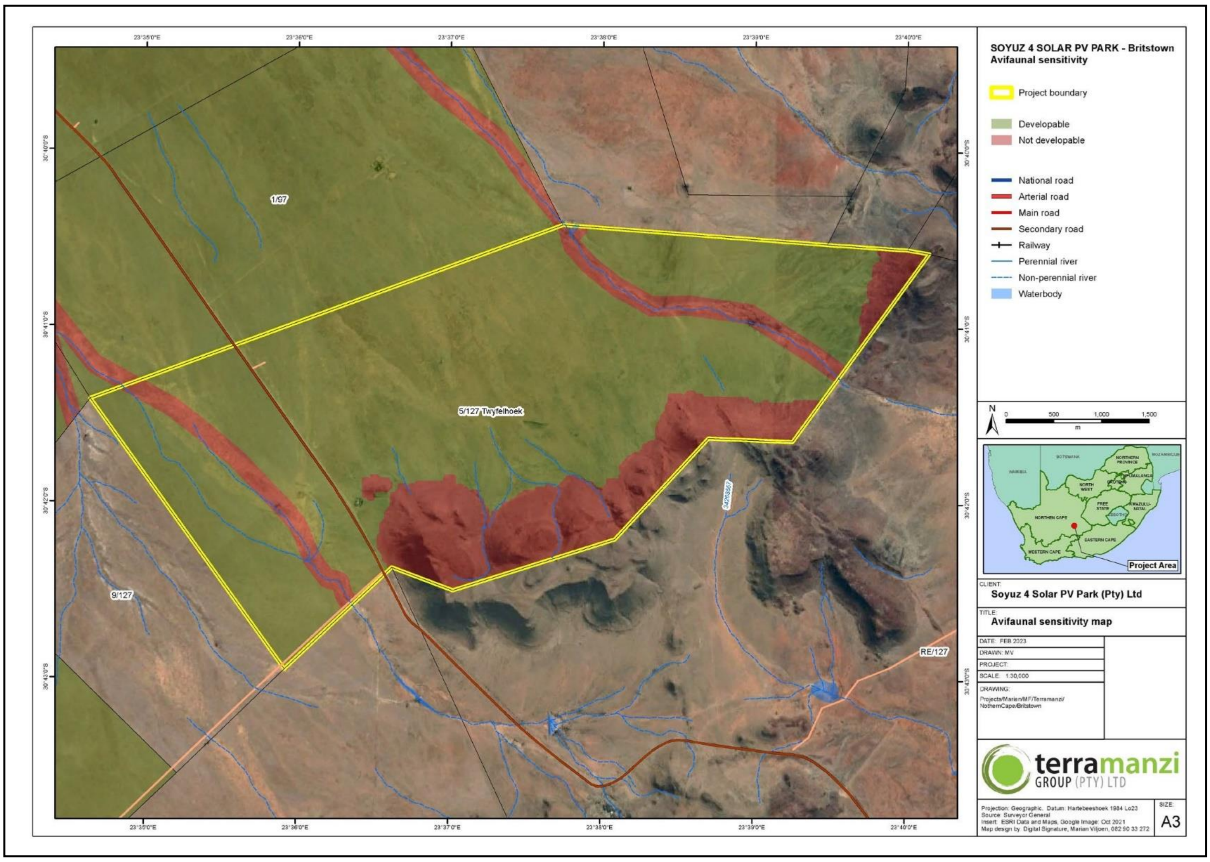

Figure 10: Avifauna Sensitivity Map

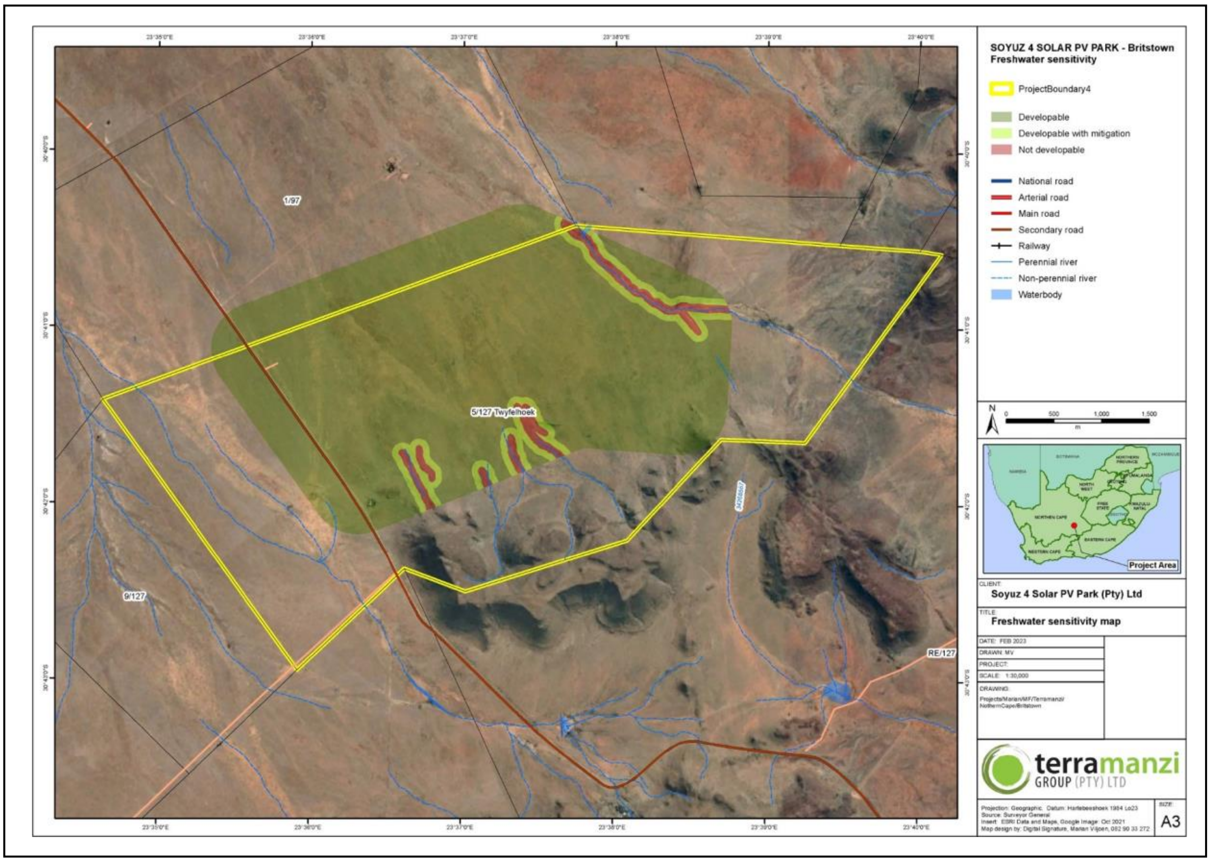

Figure 11: Freshwater Sensitivity Map

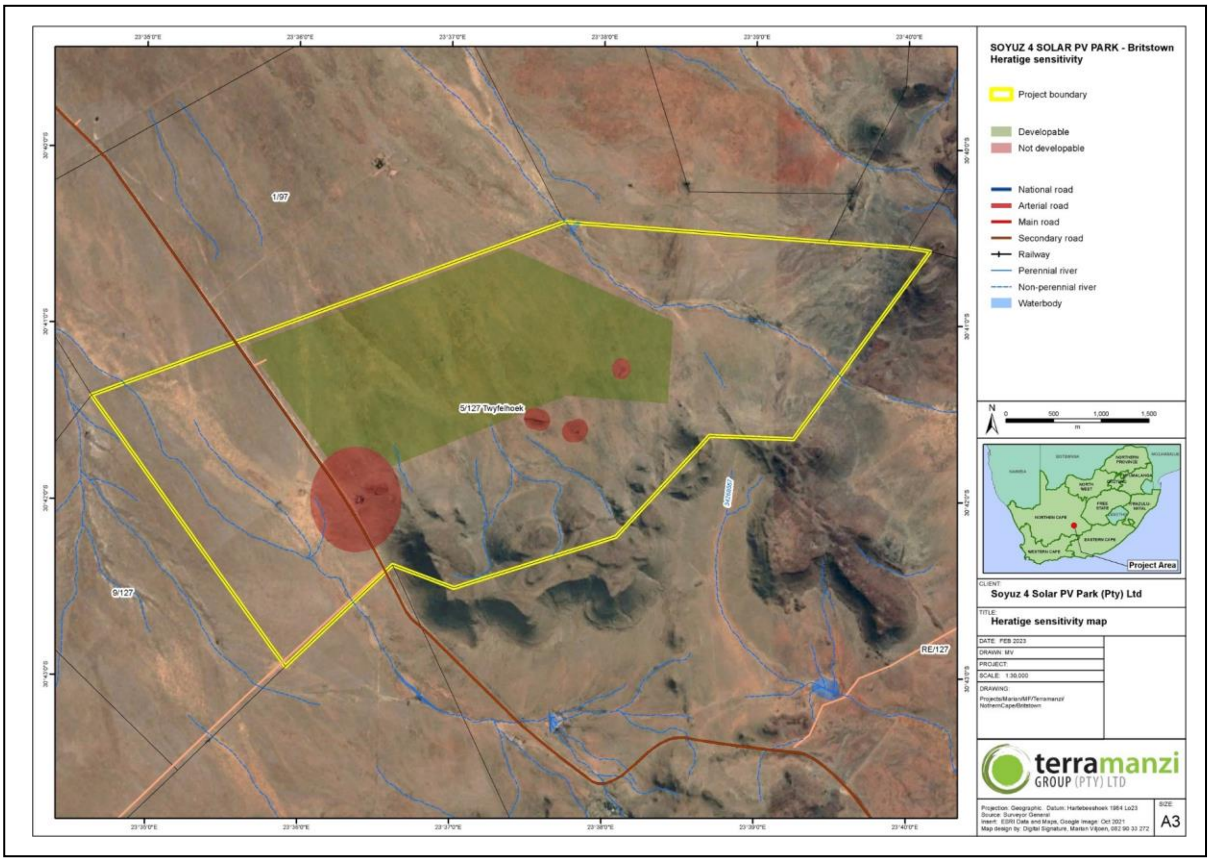

Figure 12: Heritage Sensitivity Map

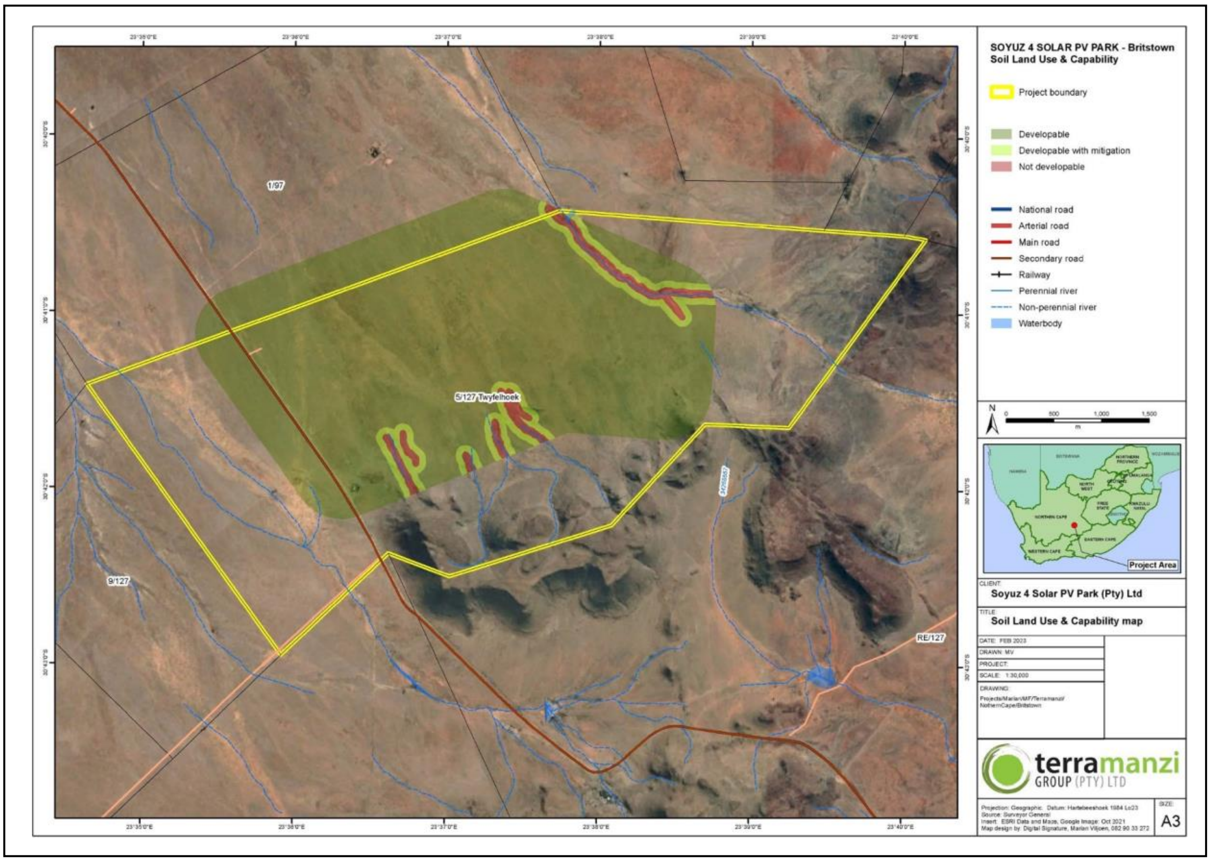

Figure 13: Soil, Land Use and Land Capability Sensitivity Map

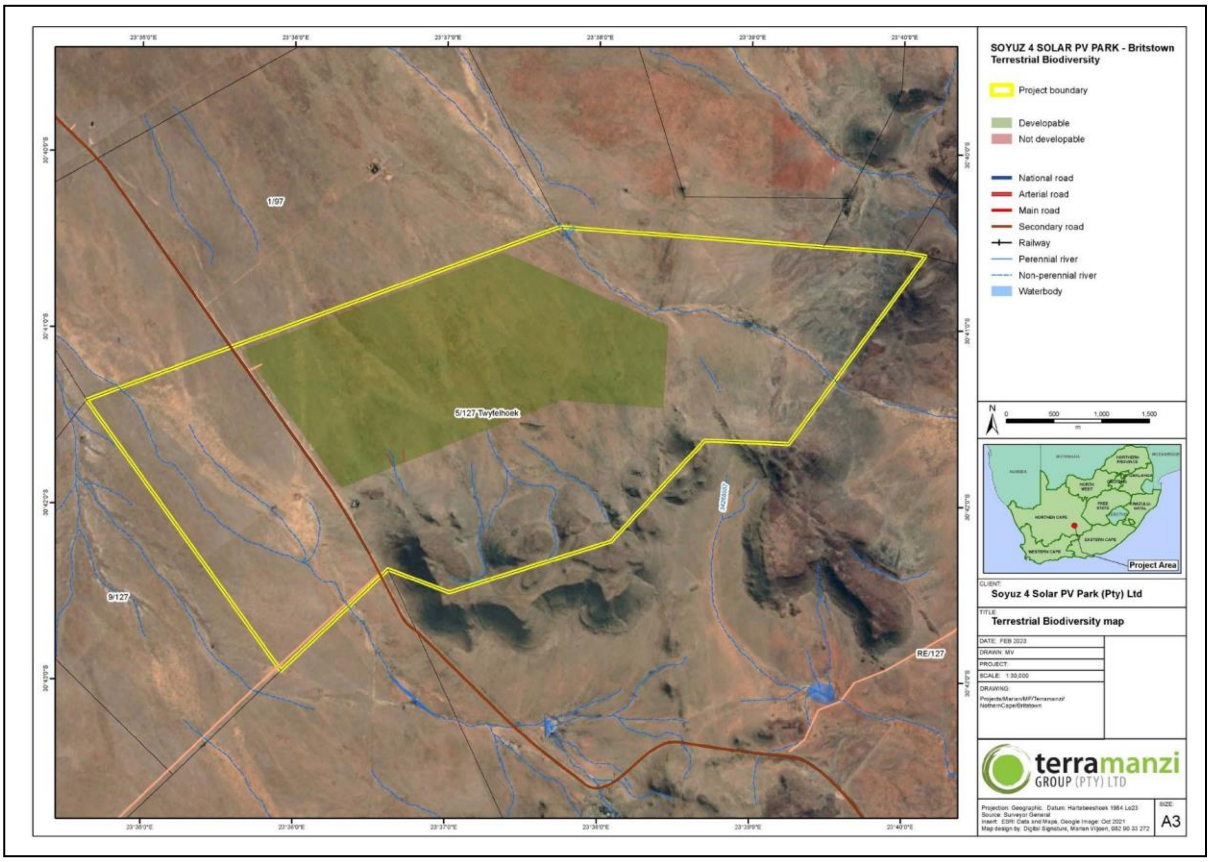

Figure 14: Biodiversity Sensitivity Map

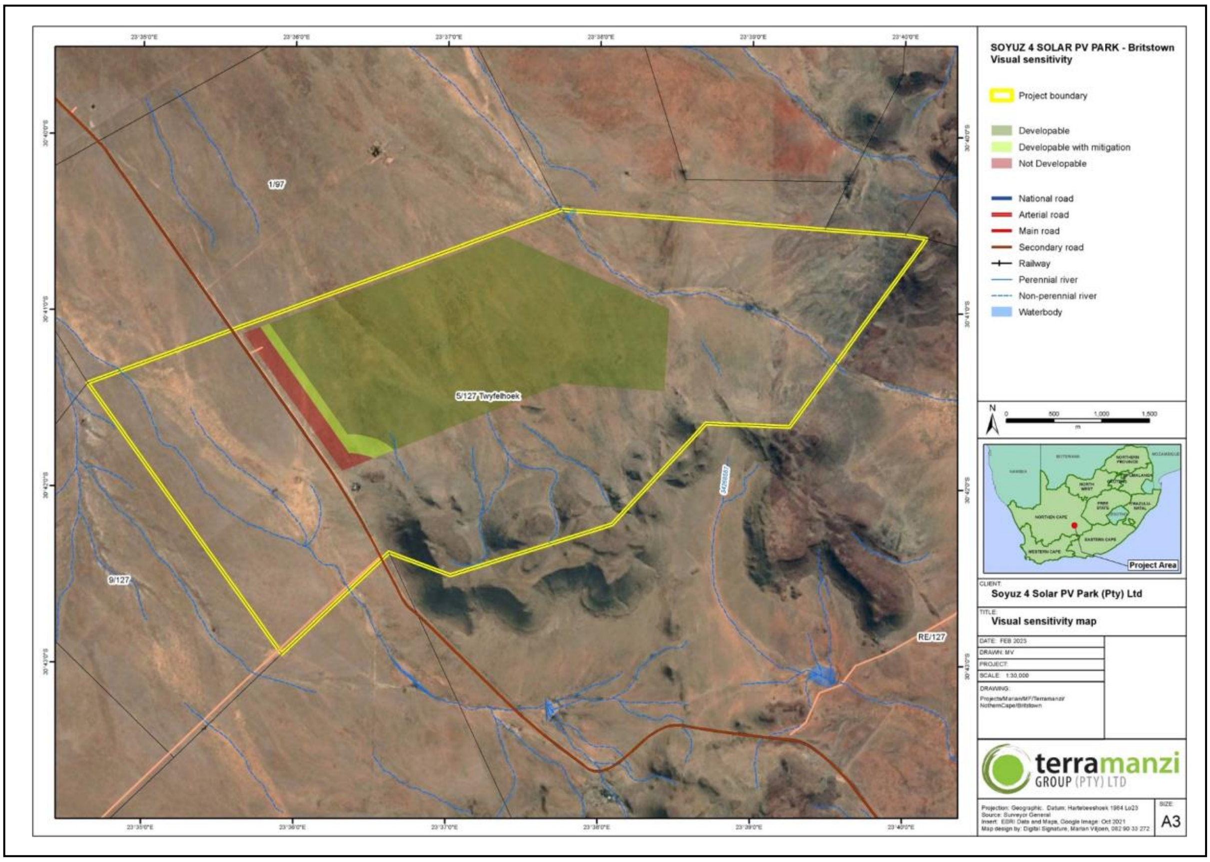

Figure 15: Visual Sensitivity Map

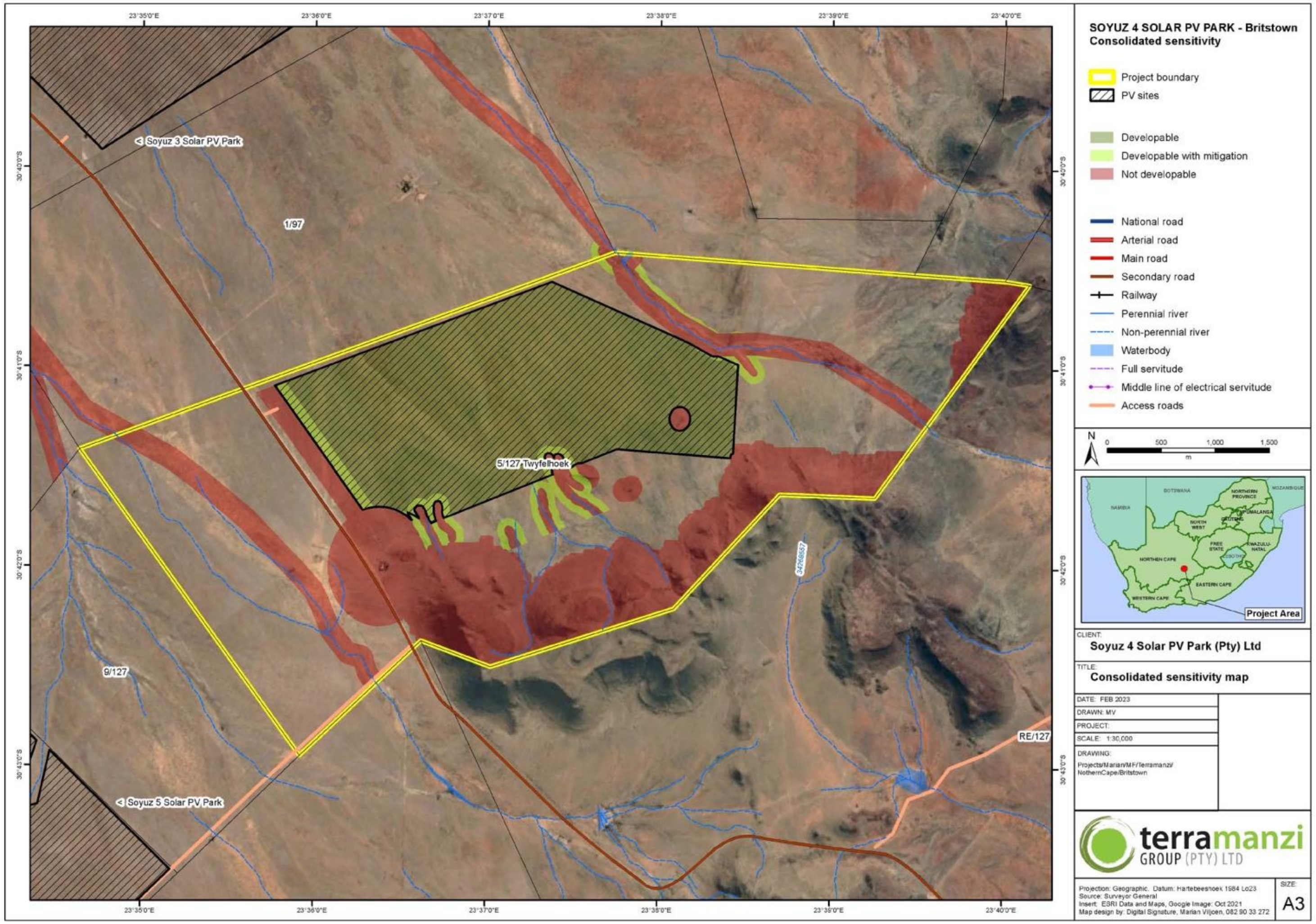

Figure 16: Consolidated Sensitivity Map

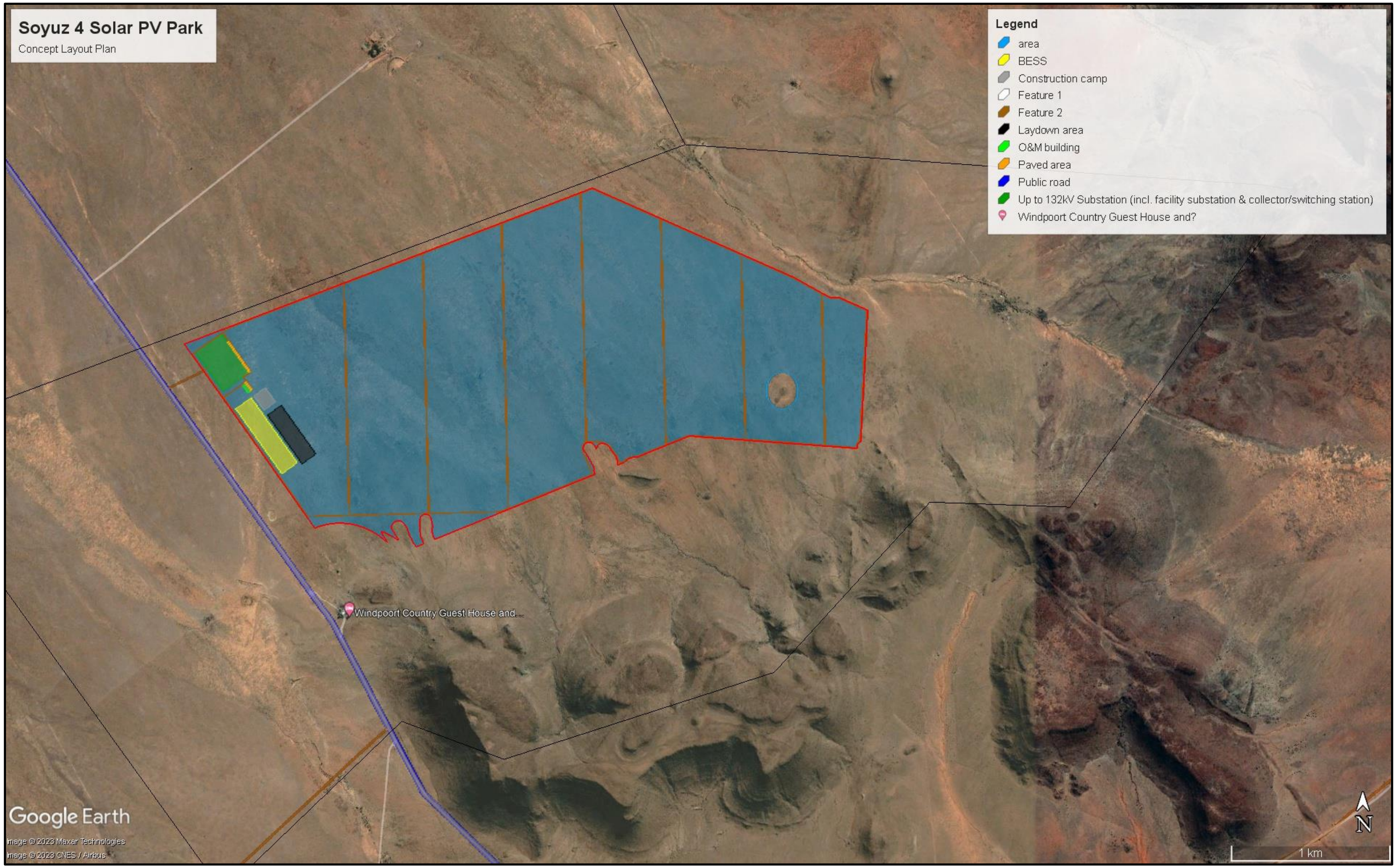

Figure 17: Preferred Conceptual Site Layout Plan

5.2 CONCLUDING STATEMENT INDICATING PREFERRED ALTERNATIVE (SITE, LAYOUT, LOCATION)

*In accordance with **Appendix 1 Regulation 3(g) and (h)(xi) of GN No. R. 326 of the NEMA EIA Regulations (2014, as amended)**:*

> ***3(g)** – A motivation for the **preferred development footprint** within the approved site.*
>
> ***3(h) xi** – A concluding statement indicating the **preferred alternative development location** within the approved site*

Based on the information contained in this section, the proposed development of the Soyuz 4 Solar PV Park on the proposed site applying the proposed conceptual layout is the only and preferred alternative assessed by the specialists and this environmental impact assessment. The environmental scoping phase concluded that the preferred site and the preferred layout are the most suitable alternatives from an environmental perspective and were not fatally flawed. The preferred alternative is assessed in this EIA along with the "No Go" alternative.

6 DETAILS OF THE PROPOSED PREFERRED DEVELOPMENT

The proposed Soyuz 4 Solar PV Park will be developed in a single phase and will have a contracted generating capacity of up to 300 megawatts (million watts – MW[2]). Bifacial solar photovoltaic (PV) modules installed on single axis tracker mounting structure at a height of up to 6 metres (m) above ground level will be utilised for the panels. The facility will include Battery Energy Storage Systems (BESS) of up to 1200 megawatt hour (MWh[3]) with a footprint of up to 6 ha. An on-site substation with a capacity of 33 – 132 kV, will enable the connection of a 132 kilovolt (kV[4]) Overhead Powerline (OHPL). This will be configured as a 6 ha back-to-back substation, including facility substation, and Eskom collector/switching station with feeder bays. The final interconnection solution will be dependent on the requirements of Eskom, which are still to be defined and will form part of an Environmental Authorisation separate to this application process. The proposed conceptual layout of the Soyuz 4 Solar PV Park is shown in **Figure 18** and the conceptual design details are summarised in **Table 6**.

Table 6: Soyuz 4 Solar PV Park Conceptual Design Details

INFRASTRUCTURE	DESIGN DETAILS
Contracted Generating Capacity	Up to 300MW
Total extent of Affected Property	2124 ha
Extent of Development Footprint	567 ha
PV Panel Type	Bifacial solar PV modules installed on single axis tracker mounting structure
Height of PV Panels	6 m
Capacity of on-site substation	32 to 132 kV
Substation footprint	Up to 6 ha
BESS	1200 MWh
BESS footprint	Up to 6 ha
Site Access Road	Up to 8m in width (existing gravel road)

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[2] *One megawatt (MW) = 1,000 kilowatts = 1,000,000 watts and is a unit of measure power*
[3] *One megawatt hour (MWh) = 1,000 kilowatts of electricity generated per hour and is used to measure electric output*
[4] *One kilovolt = 1,000 volts and is a unit of electromotive force*

INFRASTRUCTURE	DESIGN DETAILS
Internal Access Roads	Up to 4m in width
Paved Areas	Footprint of up to 0.25 ha
Fencing	Around the development area
Operations and Maintenance Building	Footprint of up to .0.15
Temporary Construction Camp and laydown area	Footprint of up to 4 ha
Powerline	Not part of this application

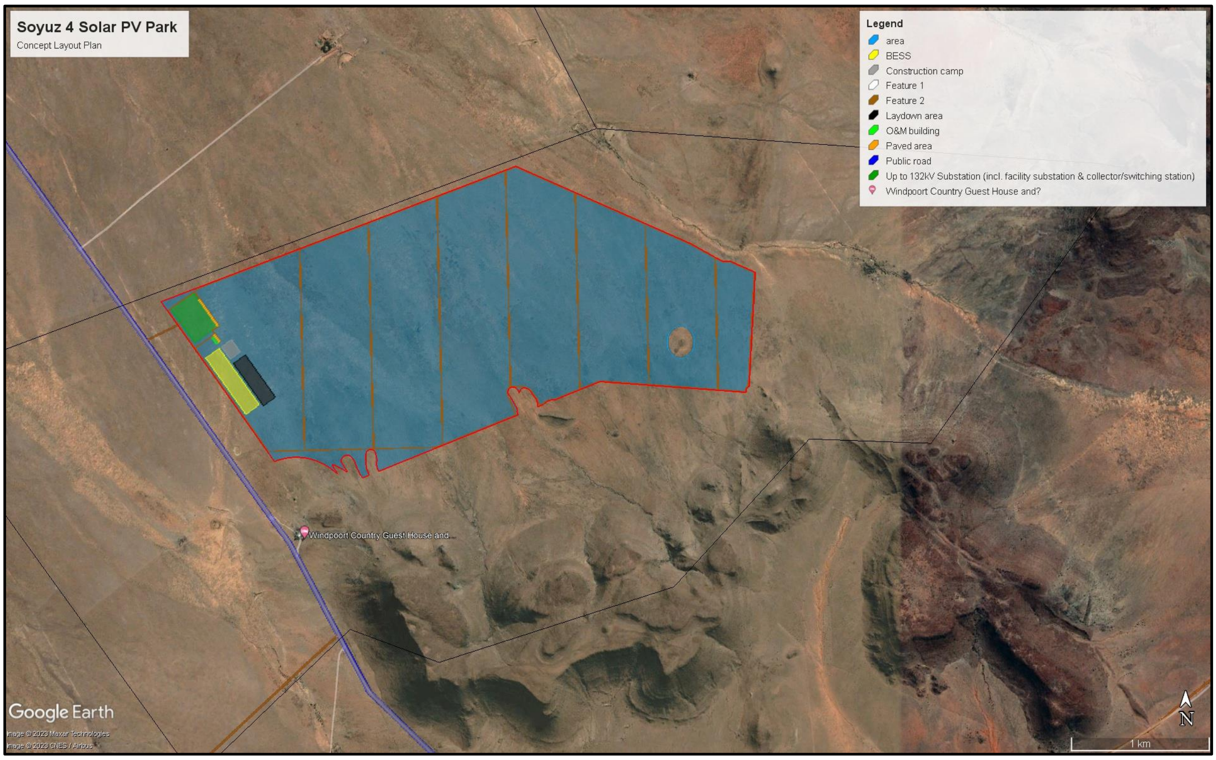

Figure 18: Preferred Conceptual Site Layout Plan

6.1 SOLAR PV AND BESS STORAGE TECHNOLOGY

A Solar PV Park is a power plant that generates electricity using the energy from the sun.

<u>Solar Panels</u>

The proposed Soyuz 4 Solar PV Park will consist of large arrays of **solar panels.** Each solar panel is made up of many individual solar cells that **convert sunlight into electricity** through a process called the **photovoltaic effect**.

The photovoltaic effect is a process in which certain materials, typically semiconductors such as silicon, generate an electrical current when exposed to light. This effect is what makes photovoltaic solar cells possible, as they rely on this phenomenon to convert sunlight into electricity.

The photovoltaic effect occurs when photons (light particles) strike the surface of a semiconductor material such as silicon, causing electrons in the material to be knocked loose from their atoms. These free electrons are then able to flow through the material as an electrical current.

Figure 19: An array of mounted PV Panels

The solar panels will be arranged in rows on a large flat surface area (see **Figure 19**). Traditional solar panels capture sunlight on one light-absorbing side facing the sun. The light energy that cannot be captured is simply reflected away. The Soyuz 4 PV Solar Park will use bifacial solar panels.

Bifacial solar panels have solar cells on both sides, which enables the panels to absorb light from the back and the front. This means that a bifacial solar panel can absorb light reflected off the ground or another material in addition to direct sunlight. This results in more power being generated from bifacial modules for the same area, without having to increase the development footprint.

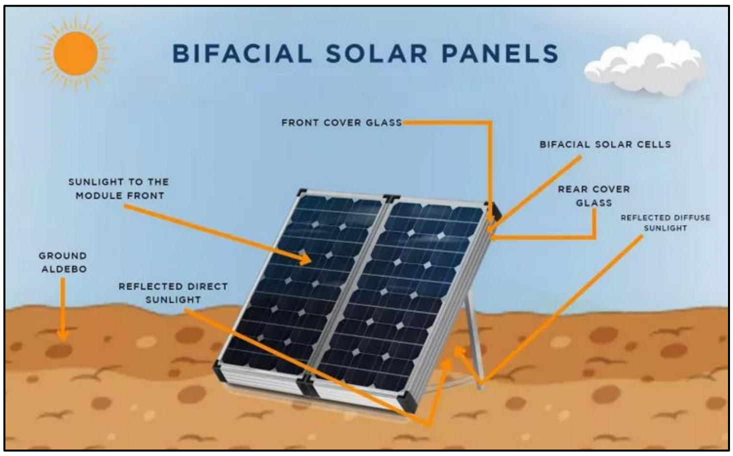

Figure 20: Bifacial Solar Panels

The PV panels are fixed to **support structures** to maximise exposure to the sun and a large fraction of the reflected irradiation. They can either utilise fixed / static support structures or alternatively single or double axis tracking support structures. PV panels that utilise fixed/static support structures are set at an angle (fixed-tilt PV system), to optimise the amount of solar irradiation. With fixed/static support structures, the angle of the PV panel is dependent on the latitude of the proposed Project and may be adjusted to optimise for summer and winter solar radiation characteristics.

Figure 21: Support structure for Tracking PV Panels

PV panels that utilise tracking support structures track the movement of the sun throughout the day, to receive the maximum amount of solar irradiation (see **Figure 21**).

Sections of the PV array will be electrically connected to central inverters via an internal reticulation network that will be lain underground at depths of up to 2.4 m. The inverters will be Pulse Width Mode Inverters (PWMI) that convert direct current (DC) electricity to alternating current (AC) electricity at grid frequency.

Battery Energy Storage System (BESS)

The Soyuz 4 Solar PV Park will include a Battery Energy Storage System (BESS). The **BESS** functions to store excess electricity generated by solar panels during times of low energy demand or when sunlight is abundant and release it into the grid when energy demand is high or when there is insufficient sunlight. The BESS helps to optimize the Solar PV Park’s energy output and reduce curtailment (i.e. the unused solar energy that is lost).

The BESS will have an output capacity of up to 1200 MWh and a development and operational footprint of 50,000 square m^2 (5ha). The BESS will utilise batteries for energy storage.

Individual rechargeable battery cells are wired together in series and parallel to form modules. Many modules are then stacked and combined to form racks. Racks are then wired together in series or parallel to reach the required voltage. Many racks are then normally combined in a container for ease of transport and installation. The system requires a sophisticated battery management system for controlling, monitoring and protecting battery cells, including the prevention of over or under-charging. During charging and discharging cycles, each cell generates heat. Without good thermal management the cells can overheat leading to increased degradation, malfunction. Each container is fitted with a heating, ventilation and air conditioning system to regulate each container internal environment to optimise performance and battery life.

The BESS comprise multiple such units or containers that will be interconnected with each other.

The BESS will consist of several rechargeable batteries, each comprising of one or more electrochemical cells. The batteries will be connected into modules which are then connected to form battery packs. Several battery packs are containerised to form a unit. The basic components in such a unit/container will comprise:

- Battery packs are made up of several modules.
- A battery management system for controlling, monitoring and protecting battery cells, including the prevention of over or under-charging.
- A power conversion system containing an inverter is required to convert the direct current (DC) from the batteries to alternating current (AC) to feed to the grid; and
- Cooling and fire suppression systems.

BESS batteries are solid-state batteries. Since the components are in solid form and sealed, the risk of accidental spillage to the environment is very low.

A typical BESS installation is shown in **Figure 22**. The BESS will arrive on site pre-assembled housed in containers.

Figure 22: Example of a BESS (Beacon Solar Plant Site, LADWP)

<u>Electrical Infrastructure</u>

The electricity generated by the solar panels is in the form of direct current (DC), but most electrical devices use alternating current (AC). **Inverters** are used to convert the DC electricity from the solar panels into AC electricity that can be used by homes and businesses. The AC electricity generated by the inverters is sent to a **transformer**, which increases the voltage of the electricity so that it can be transmitted over long distances through power lines.

The **switchgear** is used to control the flow of electricity through the facility. It includes switches, fuses, and other protective devices that ensure the safe and reliable operation of the facility.

Soyuz 4 Solar PV Park will be equipped with a **monitoring system** that tracks the performance of the solar panels and other components in real-time. This allows operators to detect and address any issues quickly, ensuring maximum efficiency and reliability.

The electricity generated will be connected to the Eskom national electrical grid through transformers, inverters, and an on-site **substation**, which will convert the electricity from 240MV to 33 kV to 132 kV. The normal components and dimensions of a distribution rated electrical substation will be required. Output voltage from the inverter is 480 V and this is fed into step up transformers to 132 kV. An onsite substation and switching station will be required on the site to step the voltage up to 132 kV, after which the power will be evacuated into the national grid via a single circuit 132 kV power line (to be authorised separate to this application).

The conceptual configuration and components of the Soyuz 4 Solar PV Park described are shown in **Figure 23** and a summary of the details and dimensions of the planned infrastructure is provided in **Table 6**.

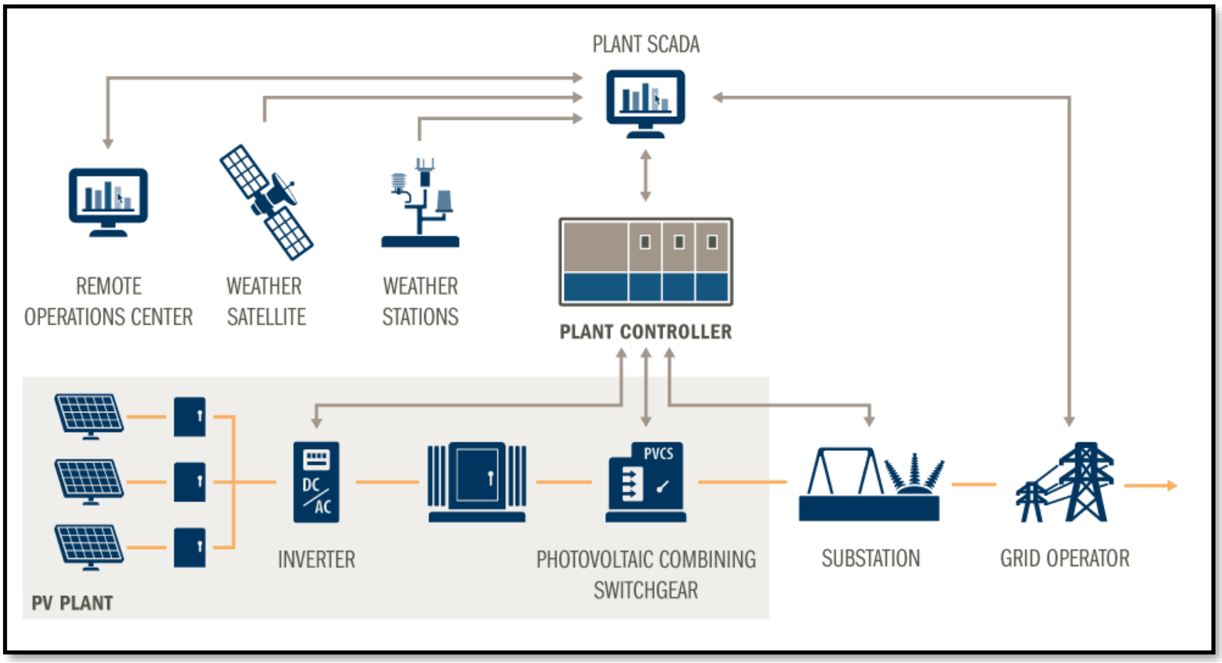

Figure 23: SOLAR PV PARK Conceptual Diagram with the Various Components

6.2 CO-ORDINATES

The co-ordinates of the proposed Soyuz 4 Solar Park and infrastructure are presented in **Table 7**.

Table 7: Soyuz 4 Solar PV Park Co-ordinates

Co-ordinates (degrees, minutes, seconds – WGS84)			
Project Area	A	31° 41’ 05.03 S	23° 35’ 45.34” E
	B	30° 40’ 33.86 S	23° 37’ 22.76” E
	C	30° 40’ 58.62 S	23° 38’ 27.80” E
	D	30° 41’ 26.59 S	23° 38’ 26.71” E
	E	30° 41’ 25.12 S	23° 37’ 26.25” E
	F	30° 41’ 52.68 S	23° 36’ 25.79” E

BESS	A	30° 41’ 18.74 S	23° 35’ 58.12” E
	B	30° 41’ 16.54 S	23° 36’ 01.78” E
	C	30° 41’ 29.71 S	23° 36’ 12.84” E
	D	30° 41’ 31.96 S	23° 36’ 08.97” E
Substation	A	30° 41’ 07.65 S	23° 35’ 48.23” E
	B	30° 41’ 02.83 S	23° 35’ 55.11” E
	C	30° 41’ 11.40 S	23° 36’ 01.15” E
	D	30° 41’ 15.38 S	23° 35’ 54.97” E

6.3 SERVICES

The Project will require the following services:

6.3.1 Roads

Access to the preferred site will be via an existing gravel off the provincial Witpoort Road. The access road off Witpoort Road is located at a position with clear site lines of at least 300m. The gravel road will be upgraded/repaired (gravel) and will be 8 m wide. This access road will be ±0,3km in length from the Witpoort Road to the north western boundary of the Soyuz 4 Solar PV Park. The internal roads will be 4 m wide gravel roads. The location of the access road is shown on **Figure 24.**

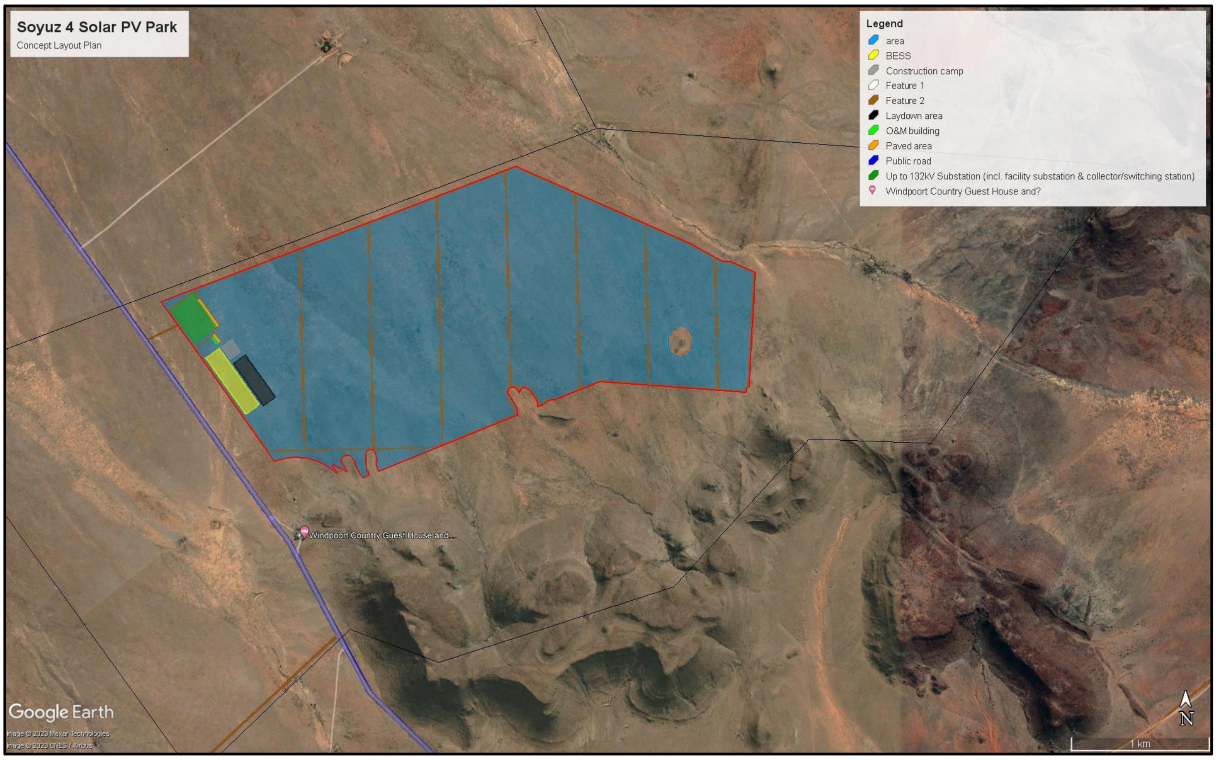

Figure 24: Access road and internal site roads

6.3.2 Water

Water supplies required during the construction phase will be brought on site by Licensed Contractors.

Solar PV panel cleaning will take place bi-annually by using any of the following methods:

- **Manual washing:** This involves manually cleaning the PV panels using water and non-abrasive cleaning tools, such as soft brushes or sponges.

- **Automated robotic systems:** These systems utilise specialised robots or machines that move along the solar panel arrays, performing automated cleaning using brushes, wipers, or sprayers.
- **Waterless cleaning systems:** These systems employ techniques like dry brushing or air blowing to remove dust and debris from the PV panels without using water.
- **Water spraying systems**: This method involves using water sprayers or nozzles to apply pressurized water for efficient cleaning of the PV panels.

Considering environmental factors, waterless cleaning systems are generally considered the best option for PV panel cleaning. These systems minimise water consumption and eliminate the need for wastewater management, reducing the potential for water pollution.

By utilising dry brushing or air blowing techniques, waterless cleaning systems are also more energy-efficient and do not contribute to the consumption of additional resources. Additionally, they can effectively remove dust and debris from the panels without introducing any harmful chemicals or detergents into the environment. Overall, waterless cleaning systems offer a more sustainable and environmentally friendly approach to PV panel maintenance.

If methods are used which require water, then about 6,050m^3 of water to be used per annum for panel cleaning for the duration of the operational phase. Water will be either sourced from a registered water services provider registered as such in terms of the Water Services Act 108 of 1997 or from licenced boreholes located on or near the project site.

6.3.3 Electricity

Electricity will be provided by generator sets for both the construction phase. Electricity required during the operational phase will be sourced from the Soyuz 4 PV Solar Park via the on-site substation and associated infrastructure.

6.3.4 Sewage

The construction phase will make use of portable, temporary chemical toilets.

Sewage generated on site during operational phase will be stored in a sewage tank on site and serviced by a licenced service provider regularly. Sufficient hygienic facilities will be made available for all workers employed on the site. The anticipated volumes during the operational phase will be small.

Both the temporary chemical toilets and conservancy tanks will be serviced by licensed service providers.

6.3.5 Waste

Designated areas will be allocated for waste storage. Waste will be removed by a licensed service provider for delivery to a licenced waste management facility.

6.4 LISTED ACTIVITIES TRIGGERED

The approach to the Environmental Application and process for the proposed ***Activity*** is based on the provisions stipulated in section 24(5) of the National Environmental Management Act 2008 (“NEMA”) No. 107 of 1998 (as amended) and the above EIA Regulations contained in Government Notice No.’s

R. 326, R. 327, R. 325 and R. 324, which dictate that a Scoping and EIA environmental permitting process is to be followed.

Based on the information currently available on the proposed Project, it is anticipated that the following Listed Activities contained in **Listing Notice 1** would require a Basic Assessment process in terms of the NEMA:

GNR 327 - Listing Notice 1: Activity 11
The development of facilities or infrastructure for the transmission and distribution of electricity *-* *(i) **outside urban areas or industrial complexes with a capacity of more than 33 but less than 275 kilovolts**; or* *(ii) inside urban areas or industrial complexes with a capacity of 275 kilovolts or more.* *Excluding where development of bypass infrastructure for the transmission and distribution of electricity where such bypass infrastructure is –* *(a) temporarily required to allow for maintenance of existing infrastructure;* *(b) 2 kilometres or shorter in length;* *(c) Within an existing transmission line servitude; and* *(d) Will be removed within 18 months of the commencement of development.*
The proposed development includes transformers, and underground and overhead cabling up to 33kV between project components. This activity is triggered due to the Back-to-Back Substations (Including the facility substation Eskom collector station with feeder bays) with a contracted capacity of up to 132kV based on Eskom requirements.

GNR 327 - Listing Notice 1: Activity 12
The development of - *(i) Dams or weirs, where the dam or weir, including infrastructure and water surface area, exceeds 100 square metres; or* *(ii) Infrastructure or structures with a physical footprint of 100 square metres or more;* ***(a) within a watercourse;*** *(b) in front of a development setback; or* ***(c) if no development setback exists, within 32 metres of a watercourse, measured from the edge of a watercourse;*** *excluding -* *(aa) the development of infrastructure or structures within existing ports or harbours that will not increase the development footprint of the port or harbour;* *(bb) where such development activities are related to the development of a port or harbour, in which case activity 26 in Listing Notice 2 of 2014 applies;* *(cc) activities listed in activity 14 in Listing Notice 2 of 2014 or activity 14 in Listing Notice 3 of 2014, in which case that activity applies;* *(dd) where such development occurs within an urban area;* *(ee) where such development occurs within existing roads, road reserves or railway line reserves; or* *(ff) the development of temporary infrastructure or structures where such infrastructure or structures will be removed within 6 weeks of the commencement of development and where indigenous vegetation will not be cleared.*
The proposed development will require the establishment of infrastructure within a physical footprint exceeding 100 square metres within a watercourse or within 32 metres of a watercourse identified in the project area.

GNR 327 - Listing Notice 1: Activity 14
The development and related operation of facilities and infrastructure, for the storage, or for the storage and handling, of a dangerous good, where such storage occurs in containers with a combined capacity of 80 cubic metres or more but not exceeding 500 cubic metres.
The development of the Soyuz 4 Solar PV Park will require the construction and operation of facilities and infrastructure for the storage and handling of dangerous goods (combustible and flammable liquids, such as oils, lubricants, solvents) associated with the onsite substation and PV trackers where such storage will occur inside containers with a combined capacity exceeding 80 cubic meters but not exceeding 500 cubic meters.

GNR 327 - Listing Notice 1: Activity 24
The development of a road— (ii) for which an environmental authorisation was obtained for the route determination in terms of activity 5 in Government Notice 387 of 2006 or activity 18 in Government Notice 545 of 2010; or (iii) with a reserve wider than 13,5 meters, **or where no reserve exists where the road is wider than 8 metres**; **but excluding a road—** (a) which is identified and included in activity 27 in Listing Notice 2 of 2014; ***(b)*** where the entire road falls within an urban area; or which is 1 kilometre or shorter.
Sections of the proposed access route from the public road to the proposed Soyuz 4 Solar PV Park development site will require development and it is likely that the road will be wider than 8 metres.

GNR 327 - Listing Notice 1: Activity 28
Residential, mixed, retail, commercial, industrial or institutional developments where such land was used for agriculture, game farming, equestrian purposes or afforestation on or after 01 April 1998 and where such development *(i) will occur inside an urban area, where the total land to be developed is bigger than 5 hectares; or* *(ii)* ***will occur outside an urban area, where the total land to be developed is bigger than 1 hectare;*** *excluding where such land has already been developed for residential, mixed, retail, commercial, industrial or institutional purposes.*
Soyuz 4 Solar PV Park will have a physical footprint exceeding 1ha and occurs outside an urban area and within an area currently zoned for agriculture.

Based on the information available on the proposed Project, it is anticipated that the following Listed Activities contained in **Listing Notice 2** require a Scoping and EIA Process in terms of the NEMA:

GNR 325 - Listing Notice 2: Activity 1
The development of facilities or infrastructure for the generation of electricity from a renewable resource where the electricity output is 20 megawatts or more, **e**xcluding where such development of facilities or infrastructure is for photovoltaic installations and occurs – (a) within an urban area; or (b) on existing infrastructure.
The Applicant has proposed to establish a Solar PV Park of up to 300MW.

GNR 325 - Listing Notice 2: Activity 15

The clearance of an area of 20 hectares or more of indigenous vegetation, excluding where such clearance of indigenous vegetation is required for— (i) the undertaking of a linear activity; or (ii) maintenance purposes undertaken in accordance with a maintenance management plan.
More than 20 hectares of indigenous vegetation is to be cleared.

Based on the information available on the proposed Project, it is anticipated that the following Listed Activities contained in **Listing Notice 3** require a Basic Assessment Process in terms of the NEMA:

GNR 324 - Listing Notice 3: Activity 10
The development and related operation of facilities or infrastructure for the storage, or storage and handling of a dangerous good, where such storage occurs in containers with a combined capacity of 30 but not exceeding 80 cubic metres. **g. Northern Cape** i. In an estuary; **ii. Areas within a watercourse or wetland; or within 100 metres from the edge of a watercourse or wetland;** **iii. Outside urban areas:** (aa) A protected area identified in terms of NEMPAA, excluding conservancies; **(bb) National Protected Area Expansion Strategy Focus areas;** (cc) Sensitive areas as identified in an environmental management framework as contemplated in chapter 5 of the Act and as adopted by the competent authority; (dd) Sites or areas identified in terms of an international convention; **(ee) Critical biodiversity areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans;** (ff) Core areas in biosphere reserves; **(gg) Areas within 10 kilometres from national parks or world heritage sites or 5 kilometres from any other protected area identified in terms of NEMPAA or from the core areas of a biosphere reserve;** (hh) Areas seawards of the development setback line or within 1 kilometre from the high-water mark of the sea if no such development setback line is determined; or (ii) Within 500 metres of an estuary; or iv. Inside urban areas: (aa) Areas zoned for use as public open space; (bb) Areas designated for conservation use in Spatial Development Frameworks adopted by the competent authority or zoned for a conservation purpose; or (cc) Within 500 metres of an estuary
The development of the Solar 4 PV Park will require the construction and operation of facilities and infrastructure for the storage and handling of dangerous goods (combustible and flammable liquids, such as oils, lubricants, solvents) associated with the onsite substation and PV trackers

This Application for Environmental Authorisation will be submitted to and considered by the National Department of Forestry, Fisheries and the Environment (DFFE) as the appropriate Competent Authority for the Application.

Based on the above and in terms of GN R. 326 of the NEMA EIA Regulations (2014, as amended), a **SCOPING AND ENVIRONMENTAL IMPACT ASSESSMENT PROCESS must be followed**.

7 LEGISLATIVE CONTEXT

*In accordance with **Appendix 1 Regulation 3(e) of GN No. R. 326 of the NEMA EIA Regulations (2014, as amended)**, the following information is presented in Section 5:*

i. An identification of all legislation, policies, plans and guidelines, spatial tools, municipal development planning frameworks and instruments that are applicable to this activity and have been considered in the preparation of the report

ii. How the proposed activity complies with and responds to the legislation and policy context, plans, guidelines, tools frameworks and instruments

This section provides an overview of the policy and legislative context within which the development of the Soyuz 4 Solar PV Park is proposed.

7.1 SOUTH AFRICAN LEGISLATION

7.1.1 National Environmental Management Act (Act No. 107 of 1998)

In terms of the National Environmental Management Act, 1998 (Act No. 107 of 1998) (NEMA), as amended and the NEMA EIA Regulations (2014 as amended), an Application for Environmental Authorisation for certain listed activities is required to be submitted to either the Provincial Environmental Competent Authority, or the National Competent Authority (Department of Environmental Affairs, DEA),

- The current NEMA EIA regulations, GN R.326, GN R.327, GN R.325 and GN R.324, promulgated in terms of Sections 24(5), 24M and 44 of the NEMA and subsequent amendments, commenced on 08 December 2014.
- GN R.327 lists those activities for which a Basic Assessment is required,
- GN R.325 lists the activities requiring a full S&EIA and
- GN R.324 lists certain activities and competent authorities in specific identified geographical areas.
- GN R.326 defines the EIA processes that must be undertaken to apply for Environmental Authorisation (EA).

The proposed development of the Soyuz 4 Solar PV Park triggers activities listed in GNR.327, GN R.325 and GN R.324 (see section 6.4) thereby requiring a S&EIA to be undertaken to apply for the EA.

7.1.2 National Water Act (Act No. 36 of 1998)

The National Water Act, 1998 (Act No. 36 of 1998) (NWA) is the primary legislation regulating both the use of water and the pollution of water resources. It is applied and enforced by the Department of Water and Sanitation (DWS). Section 19 of NWA regulates pollution, which is defined as “the direct or indirect alteration of the physical, chemical or biological properties of a water resource so as to make it:

- less fit for any beneficial purpose for which it may reasonably be expected to be used; or
- harmful or potentially harmful to;
- the welfare, health or safety of human beings;
- any aquatic or non-aquatic organisms;
- the resource quality; or
- property.

The persons held responsible for taking measures to prevent pollution from occurring, recurring or continuing include persons who own, control, occupy or use the land. This obligation or duty of care is initiated where there is any activity or process performed on the land (either presently or in the past) or any other situation which could lead or has led to the pollution of water.

The following measures are prescribed in the section 19(2) of the NWA to prevent pollution:

- cease, modify or control any act or process causing the pollution;
- comply with any prescribed standard or management practice;
- contain or prevent the movement of pollutants;
- eliminate any source of the pollution;
- remedy the effects of pollution; and
- remedy the effects of any disturbance to the bed or banks of a watercourse.

Section 21 of the NWA lists the water uses for which a water use licence (WUL) is required. In terms of the NWA, water uses include the following activities:

(a) Taking water from a water resource;
(b) Storing water;
(c) Impeding or diverting the flow of water in a watercourse;
(d) Engaging in a stream flow reduction activity contemplated in section 36;
(e) Engaging in a controlled activity identified as such in section 37(1) or declared under section 38(1);
(f) Discharging waste or water containing waste into a water resource through a pipe, canal, sewer, sea
(g) outfall or other conduit;
(h) Disposing of waste in a manner which may detrimentally impact on a water resource;
(i) Disposing in any manner of water which contains waste from or which has been heated in, any industrial or power generation process;
(j) Altering the bed, banks, course or characteristics of a watercourse:
(k) Removing, discharging or disposing of water found underground if it is necessary for the efficient
(l) continuation of an activity or for the safety of people; and
(m) Using water for recreational purposes.

The preferred site for the development and operation of the Soyuz 4 Solar PV Park falls within the 500 m zone of regulation (ZoR) of the delineated watercourse. Authorisation in terms of GN509 of 2016 as it related to Sections 21(c) and (i) of the NWA will be required from the DWS for the proposed development.

7.1.3 National Heritage Act (Act No. 25 of 1999)

The National Heritage Resources Act (NHRA) governs the management of heritage resources which are of cultural significance. The South African Heritage Resources Agency (SAHRA) is the national body responsible for the protection of South Africa's cultural heritage resources.

Section 38(3) of the NHRA requires that all heritage resources are identified and assessed and that any comments and recommendations of the relevant heritage resources authority regarding the proposed development have been taken into account prior to the granting of the consent.

The NHRA provides protection for the following categories of heritage resources:

- Landscapes, cultural or natural (Section 3 (3))
- Buildings or structures older than 60 years (Section 34);
- Archaeological Sites, palaeontological material and meteorites (Section 35);
- Burial grounds and graves (Section 36);
- Public monuments and memorials (Section 37);
- Living heritage (Section 2 (d) (xxi)).

In terms of the definitions provided in Section 2 of the NHRA, heritage resources are potentially present on the Soyuz 4 Solar PV Park site.

7.1.4 National Energy Act (Act No 34 of 2008)

The National Energy Act was promulgated in 2008 (Act No 34 of 2008). One of the objectives of the Act was to promote diversity of supply of energy and its sources. In this regard, the preamble makes direct reference to renewable resources, including wind:

"To ensure that diverse energy resources are available, in sustainable quantities, and at affordable prices, to the South African economy, in support of economic growth and poverty alleviation, taking into account environmental management requirements (…); to provide for (…) increased generation and consumption of renewable energies…" (Preamble)"

The Soyuz 4 Solar PV Park contributes to the diversification of the supply of energy in the form of renewable energy and therefore complies with and responds to this legislation.

7.1.5 White Paper on the Energy Policy of the Republic of South Africa

Investment in renewable energy initiatives, such as the Soyuz Solar PV Park 2, is supported by the White Paper on Energy Policy for South Africa (December 1998).

In this regard, the document notes:

"Government policy is based on an understanding that renewables are energy sources in their own right, are not limited to small-scale and remote applications, and have significant medium and long-term commercial potential".

"Renewable resources generally operate from an unlimited resource base and, as such, can increasingly contribute towards a long-term sustainable energy future".

The support for renewable energy policy is guided by a rationale that South Africa has a very attractive range of renewable resources, particularly wind and solar and that renewable applications are in fact the least cost energy service in many cases; more so when social and environmental costs are considered.

Government policy on renewable energy is thus concerned with meeting the following challenges:

- Ensuring that economically feasible technologies and applications are implemented;
- Ensuring that an equitable level of national resources is invested in renewable technologies, given their potential and compared to investments in other energy supply options; and,
- Addressing constraints on the development of the renewable industry.

The White Paper acknowledges that South Africa has neglected the development and implementation of renewable energy applications, despite the fact that the country's renewable energy resource base is extensive, and many appropriate applications exist.

The White Paper also notes that renewable energy applications have specific characteristics that need to be considered.

Advantages include:

- Minimal environmental impacts in operation in comparison with traditional supply technologies; and
- Generally lower running costs, and high labour intensities.

Disadvantages include:

- Higher capital costs in some cases;
- Lower energy densities; and
- Lower levels of availability, depending on specific conditions, especially with sun and wind-based systems.

The IRP 2010[5] also allocates 43% of new energy generation facilities in South Africa to renewables.

7.1.6 White Paper on Renewable Energy

The White Paper on Renewable Energy (November 2003) (further referred to as the White Paper) supplements the White Paper on Energy Policy (see Section 7.1.5), which recognizes that the medium and long-term potential of renewable energy is significant. This Paper sets out Government's vision, policy principles, strategic goals and objectives for promoting and implementing renewable energy in South Africa. The Soyuz 4 Solar PV Park aligns with this vision and falls squarely within the goals and objectives laid out in the White Paper on Renewable Energy.

The White Paper notes that while South Africa is well-endowed with renewable energy resources that have the potential to become sustainable alternatives to fossil fuels, these have thus far remained largely untapped. As signatory to the Kyoto Protocol[6] , Government is determined to make good the country's commitment to reducing greenhouse gas emissions. To this purpose, Government has committed itself to the development of a framework in which a national renewable energy framework can be established and operate.

South Africa is also a signatory of the Copenhagen Accord, a document that delegates at the 15th session of the Conference of Parties (COP 15) to the United Nations Framework Convention on Climate Change agreed to "take note of" at the final plenary on 18 December 2009. The accord endorses the

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[5] *Integrated Resource Plan (IRP) for South Africa 2010 - 2030*

[6] *The Kyoto Protocol is a protocol to the United Nations Framework Convention on Climate Change (UNFCCC), aimed at fighting global warming. The UNFCCC is an international environmental treaty with the goal of achieving "stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system."[The Protocol was initially adopted on 11 December 1997 in Kyoto, Japan and entered into force on 16 February 2005. As of November 2009, 187 states have signed and ratified the protocol (Wikipedia)*

continuation of the Kyoto Protocol and confirms that climate change is one of the greatest challenges facing the world. In terms of the accord South Africa committed itself to a reduction target of 34% compared to business as usual.

Apart from the reduction of greenhouse gas emissions (GHG), the promotion of renewable energy sources is aimed at ensuring energy security through the diversification of supply (in this regard, also refer to the objectives of the National Energy Act).

Government's long-term goal is the establishment of a renewable energy industry producing modern energy carriers that will offer in future years a sustainable, fully non-subsidized alternative to fossil fuels. The medium-term (10-year) target set in the White Paper is:

10 000GWh[7] renewable energy contribution to final energy consumption by 2013, to be produced mainly from biomass, wind, solar and small-scale hydro. The renewable energy is to be utilised for power generation and non-electric technologies such as solar water heating and bio-fuels. This is approximately 4% (1667MW) of the projected electricity demand for 2013 (41539MW) (Executive Summary, ix).

7.1.7 National Integrated Resource Plan for Electricity (2010-2030)

South Africa's National Development Plan (NDP) 2030 offers a long-term plan for the country. It defines a desired destination where inequality and unemployment are reduced, and poverty is eliminated so that all South Africans can attain a decent standard of living. Electricity is one of the core elements of a decent standard of living and therefore the proposed development of the Soyuz 4 Solar PV Park is in alignment with the NDP. In formulating its vision for the energy sector, the NDP took as a point of departure the Integrated Resource Plan (IRP) 2010–2030 (see 7.1.7) promulgated in March 2011. The IRP is an electricity infrastructure development plan based on least-cost electricity supply and demand balance, considering security of supply and the environment (minimize negative emissions and water usage). The IRP notes that South Africa is a signatory to the Paris Agreement on Climate Change and has ratified the agreement. The energy sector contributes close to 80% towards the country's total Green House Gas (GHG) emissions of which 50% are from electricity generation and liquid fuel production alone. A transition from a fossil fuel-based energy sources is therefore critical to reducing GHG emissions. In terms of IRP (2019) provision has been made for the following new additional capacity by 2030:

- 1 500MW of coal
- 2 500MW of hydro
- 6 000MW of solar PV
- 14 400MW of wind
- 1 860MW of nuclear
- 2 088MW for storage
- 3 000MW of gas/diesel
- 4 000MW from other distributed generation, co-generation, biomass and landfill technologies.

[7] *Gigawatt hours, abbreviated as GWh, is a unit of energy representing one billion (1 000 000 000) watt hours and is equivalent to one million kilowatt hours. A kilowatt hour is equivalent to a steady power of one kilowatt running for one hour and is equivalent to 3.6 million joules or 3.6 megajoules.*

As indicated in **Figure 25**, capacity allocations see an increase in solar PV and wind, and a significant decrease in gas and diesel; and new inclusions include nuclear and storage.

	Coal	Coal (Decommis-sioning)	Nuclear	Hydro	Storage	PV	Wind	CSP	Gas & Diesel	Other (Distributed Generation, CoGen, Biomass, Landfill)
Current Base	37,149		1 860	2,100	2 912	1 474	1 980	300	3 830	499
2019	2,155	-2,373					244	300		Allocation to the extent of the short term capacity and energy gap.
2020	1,433	-557				114	300			
2021	1,433	-1403				300	818			
2022	711	-844			513	400 / 1,000	1,600			
2023	750	-555				1000	1,600			500
2024			1,860				1,600		1000	500
2025						1000	1,600			500
2026		-1,219					1,600			500
2027	750	-847					1,600		2000	500
2028		-475				1000	1,600			500
2029		-1,694			1575	1000	1,600			500
2030		-1,050		2,500		1000	1,600			500
TOTAL INSTALLED CAPACITY by 2030 (MW)	33,364		1,860	4,600	5,000	8,288	17,742	600	6,380	
% Total Installed Capacity (% of MW)	43		2.36	5.84	6.35	10.52	22.53	0.76	8.1	
% Annual Energy Contribution (% of MWh)	58.8		4.5	8.4	1.2*	6.3	17.8	0.6	1.3	

- Installed Capacity
- Committed/Already Contracted Capacity
- Capacity Decommissioned
- New Additional Capacity
- Extension of Koeberg Plant Design Life
- Includes Distributed Generation Capacity for own use

- 2030 Coal Installed Capacity is less capacity decommissioned between years 2020 and 2030.
- Koeberg power station rated/installed capacity will revert to 1,926MW (original design capacity) following design life extension work.
- Other/ Distributed generation includes all generation facilities in circumstances in which the facility is operated solely to supply electricity to an end-use customer within the same property with the facility.
- Short term capacity gap is estimated at 2,000MW.

Figure 25: Summary of energy allocations and commitments based on the 2019 IRP

7.1.8 National Development Plan

The National Development Plan (NDP) contains a plan aimed at eliminating poverty and reducing inequality by 2030. The NDP identifies 9 key challenges and associated remedial plans. Managing the transition towards a low carbon national economy is identified as one of the 9 key national challenges. Expansion and acceleration of commercial renewable energy is identified as a key intervention strategy.

The Plan aims to address poverty and exclusion whilst simultaneously attempting to nurture economic growth. It works to achieve this by creating a cycle of expanding opportunities, capacity building, poverty reduction, community integration and upliftment and involvement, which all contribute to better living standards.

7.1.9 The New Growth Path Framework

Government released the New Economic Growth Path Framework on 23 November 2010. The aim of the framework is to enhance growth, employment creation and equity. The policy's main target is to create five million jobs over the next 10 years to reflect government's commitment to prioritising employment creation in all economic policies. The framework identifies strategies that will enable South Africa to grow in a more equitable and inclusive manner while attaining South Africa's developmental agenda. Central to the New Growth Path is a massive investment in infrastructure as a critical driver of jobs across the economy. In this regard, the framework identifies investments in five key areas namely: energy, transport, communication, water and housing. As an energy project, the Soyuz 4 Solar PV Park aligns well with this framework.

The New Growth Path also identifies five other priority areas as part of the programme to create jobs, through a series of partnerships between the State and the private sector. The Green Economy is one of the five priority areas, including expansions in construction and the production of technologies for solar, wind and biofuels. In this regard, clean manufacturing and environmental services are projected to create 300 000 jobs over the next decade.

The renewable energy sector can make a substantial contribution towards meeting the need for job creation through manufacturing, operation management of renewable energy plants and materials, and maintenance.

7.1.10 National Infrastructure Plan

The South African Government adopted a National Infrastructure Plan in 2012. The aim of the plan is to transform the economic landscape while simultaneously creating significant numbers of new jobs, and strengthen the delivery of basic services. The plan also supports the integration of African economies.

These investments will improve access by South Africans to healthcare facilities, schools, water, sanitation, housing and electrification. On the other hand, investment in the construction of ports, roads, railway systems, electricity plants, hospitals, schools and dams will contribute to faster economic growth.

7.2 PROVINCIAL LEVEL POLICY AND PLANNING

7.2.1 Northern Cape Province Provincial Growth and Development Strategy

The Northern Cape Provincial Growth and Development Strategy (NCPGDS) identifies poverty reduction as the most significant challenge facing the government and its partners. All other societal challenges that the province faces emanate predominantly from the effects of poverty. The NCPGDS notes that the only effective way to reduce poverty is through long-term sustainable economic growth and development.

The sectors where economic growth and development can be promoted include:

- Agriculture and Agro-processing
- Fishing and Mariculture
- Mining and mineral processing
- Transport
- Manufacturing
- Tourism

However, the NCPGDS also notes that economic development in these sectors also requires:

- Creating opportunities for lifelong learning
- Improving the skills of the labour force to increase productivity
- Increasing accessibility to knowledge and information

The achievement of these primary development objectives depends on the achievement of several related objectives that, at a macro-level, describe necessary conditions for growth and development.

These are:

- Developing requisite levels of human and social capital
- Improving the efficiency and effectiveness of governance and other development institutions
- Enhancing infrastructure for economic growth and social development

The NCPGDS references the need to ensure the availability of inexpensive energy. To promote economic growth in the Northern Cape, the availability of electricity to key industrial users at critical localities at rates that enhance the competitiveness of their industries must be ensured. At the same time, the development of new sources of energy through the promotion of the adoption of energy applications that display a synergy with the province's natural resource endowments must be encouraged.

In this regard the NCPGDS notes "the development of energy sources such as solar energy, the natural gas fields, biofuels, etc., could be some of the means by which new economic opportunity and activity is generated in the Northern Cape". The NCPGDS also highlights the importance of close co-operation between the public and private sectors for the economic development potential of the Northern Cape to be realised.

The NCPGDS highlights the importance of enterprise development and notes that the current level of private sector development and investment in the Northern Cape are low. In addition, the province also lags in the key policy priority areas of SMME Development and Black Economic Empowerment. The proposed solar energy facility therefore has the potential to create opportunities to promote private sector investment and the development of SMMEs in the Northern Cape Province.

In this regard, care will need to be taken to ensure that the proposed development and associated renewable energy facilities do not negatively impact on the region's natural environment. In this regard, the NCPGDS notes that the sustainable utilisation of the natural resource base on which agriculture depends is critical in the Northern Cape with its fragile eco-systems and vulnerability to climatic variation. The document also indicates that due to the provinces exceptional natural and cultural attributes, it has the potential to become the preferred adventure and ecotourism destination in South Africa.

7.2.2 Northern Cape Provincial Spatial Development Framework

Northern Cape Provincial Spatial Development Framework (NCSDF) (2012) lists several sectoral strategies and plans that are to be read and treated as key components of the Provincial Spatial Development Framework (PSDF). Of these there are a number that are relevant to the proposed development, including:

- **Sectoral Strategy 1**: Provincial Growth and Development Strategy of the Provincial Government.
- **Sectoral Strategy 2:** Comprehensive Growth and Development Programme of the Department of Agriculture, Land Reform and Rural Development.
- **Sectoral Strategy 5:** Local Economic Development (LED) Strategy of the Department of Economic Development and Tourism.
- **Sectoral Strategy 11:** Small Micro Medium Enterprises (SMME) Development Strategy of the Department of Economic Development and Tourism.
- **Sectoral Strategy 12:** Tourism Strategy of the Department of Economic Development and Tourism.

- **Sectoral Strategy 19:** Provincial renewable energy strategy (to be facilitated by the Department of Economic Development and Tourism).

The energy objectives for the Northern Cape Province makes specific reference to renewable energy. Of relevance the objectives include:

- **Promote the development of renewable energy supply schemes**. Large-scale renewable energy supply schemes are strategically important for increasing the diversity of domestic energy supplies and avoiding energy imports while minimizing detrimental environmental impacts.
- **Develop and institute innovative new energy technologies to improve access to reliable, sustainable, and affordable energy services with the objective to realize sustainable economic growth and development.** The goals of securing supply, providing energy services, tackling climate change, avoiding air pollution, and reaching sustainable development in the province offer both opportunities and synergies which require joint planning between local and provincial government as well as the private sector.
- **Develop and institute energy supply schemes with the aim to contribute to the achievement of the targets set by the White Paper on Renewable Energy (2003)**.

The policy guidelines for the development of the energy sector make specific reference to the renewable energy sector.

- The construction of telecommunication infrastructure must be strictly regulated in terms of the spatial plans and guidelines put forward in the PSDF. They must be carefully placed to avoid visual impacts on landscapes of significant symbolic, aesthetic, cultural or historic value and should blend in with the surrounding environment to the extent possible.
- EIAs undertaken for such construction must assess the impacts of such activities against the directives listed in (a) above.
- **Renewable energy sources such as wind, solar, thermal, biomass and domestic hydroelectricity are to constitute 25% of the province's energy generation capacity by 2020.**
- The following key policy principles for renewable energy apply.
  - Full cost accounting: Pricing policies will be based on an assessment of the full economic, social and environmental costs and benefits of energy production and utilisation.
  - Equity: There should be equitable access to basic services to meet human needs and ensure human well-being. Each generation has a duty to avoid impairing the ability of future generations to ensure their own well-being.
  - Global and international cooperation and responsibilities: Government recognises its shared responsibility for global and regional issues and act with due regard to the principles contained in relevant policies and applicable regional and international agreements.
  - Allocation of functions: Government will allocate functions within the framework of the Constitution to competent institutions and spheres of government that can most effectively achieve the objectives of the energy policy.
  - The implementation of sustainable renewable energy is to be promoted through appropriate financial and fiscal instruments.
  - An effective legislative system to promote the implementation of renewable energy is to be developed, implemented, and continuously improved.

- Public awareness of the benefits and opportunities of renewable energy must be promoted.
- The development of renewable energy systems is to be harnessed as a mechanism for economic development throughout the province in accordance with the Sustainable Development Initiative (SDI) approach or any comparable approach.
- Renewable energy must, first, and foremost, be used to address the needs of the province before being exported.

The overall energy objective for the province also includes promoting the development of renewable energy supply schemes which are strategically important for increasing the diversity of domestic energy supply and avoiding energy impacts, while also minimising the detrimental environmental impacts. The implementation of sustainable renewable energy is also to be promoted within the province through appropriate financial and fiscal instruments.

The development of the Soyuz 4 Solar PV Park supports the overall energy objective of the province to have 25% of its electricity from renewable energy sources.

7.2.3 Northern Cape Provincial Spatial Development Framework (SDF) 2018

The Northern Cape PSDF (2018) refers to infrastructure investment and that a balance must be made and maintained between investments aimed at meeting the social needs of communities and investments and investment aimed to promote economic development and job creation.

The SDF strategy referred to in the PSDF for infrastructure includes achieving the provision of green infrastructure which includes renewable energy. The 2040 Vision of the PSDF identifies key opportunities for the Northern Cape. These include the strengthening of the development triangle that is formed by the linking of Kimberly, Vryburg, Upington and De Aar. The development triangle sustains a diverse economy with strong mining, agricultural, and renewable energy sectors. The PSDF states that a sustainable and viable economic network must be pursued within the development triangle with the purpose of improving the return of public investment in the province.

The development at the Soyuz 4 Solar PV Park will contribute to the economic network of the province specifically in terms of the renewable sector in general.

7.2.4 Northern Cape Climate Change Response Strategy

The Northern Cape Provincial Government (NCPG) is committed to development in accordance with the National Green Paper for National Climate Change Response Strategy (2010) and acknowledges the Northern Cape Province's extreme vulnerability to climate change driven desertification.

The development of provincial green economy which includes green jobs and environmental learnership programmes are important provincial projects that will address climate change. The renewable energy sector is a key element in meeting and addressing the Provincial Climate Change Response Strategy.

The development of the Soyuz 4 Solar PV Soyuz 4 Park will contribute to meeting the promotion of provincial green economy within the Northern Cape.

7.2.5 The Northern Cape Province Green Document

The Northern Cape occupies a central position in the global debate regarding the renewable energy contribution in South Africa . The province locality has resulted in investment into renewable energy and to date the province hosts 59 of South Africans 112 independent power producers. 23 of these projects are already connected to the grid at a capacity of over 1500MW. The Northern Cape has the potential to generate energy by means of Concentrated Solar Panels (CSP), Photovoltaic (PV) and wind energy.

The NCP Green Document (2017-2018) was prepared by the Northern Cape Department of Economic Development and Tourism. The report assesses the impact of Independent Power Producers (IPPs) on the community level, especially those communities located within 50km of the existing facilities. The document alludes to the fact that the NCP is the overall leader of commercial scale renewable energy projects within the province.

The goal is that by 2018, 23 IPP projects will have been integrated into the national grid, this has already been achieved. The renewable energy projects are recognised as significant forms of development for addressing energy demands in the Country. These projects include Solar PV, concentrated solar and wind farms. Existing projects of this nature have already made significant positive impacts due to their economic development requirements and obligations. Job creation, education and economic surplus are significant contributions by these projects. Considering the life span of these projects (20 years), the future socio-economic potential for upliftment and contribution is significant.

7.3 DISTRICT AND LOCAL POLICY AND PLANNING ENVIRONMENT

The local spheres and levels of government relevant to the Soyuz 4 Solar PV Park are the Pixley Ka Seme District Municipality (PKSDM) and the Emthanjeni Local Municipality. The policies and goals outlined in the policy documents of the above municipalities align with the development of the proposed Soyuz 4 Solar PV Park, with specific relation to job creation, economic growth and poverty alleviation through community upliftment and resilience building.

7.3.1 Pixley ka Seme District Municipality Integrated Development Plan (2020)

The vision of the PKSDM is a “Developed and Sustainable District for Future Generations”. The PKSDM aims to achieve this by various objectives which include: supporting the local municipality to create a home for all in the town, settlement and rural areas and to ensure services are rendered to these areas; to provide political and administrative leadership and direction regarding development planning processes; promoting economic growth that is shared across and within communities; promoting integrated development planning in the operations of the municipality; aligning development initiatives in the district to the NDP.

The strategic objectives which are outlined in the IDP and which are relevant to the proposed development are: economic growth in the district regarding service delivery. The IDP notes that growth and development in PKSDM are defined by high levels of poverty and education; low levels of development; high unemployment rates and a vulnerability towards climate change impacts. The IDP recognises the potential for renewable energy to address the challenges mentioned above. The IDP notes that the economy in the Pixley ka Seme municipal area is characterized by:

- High levels of poverty and low levels of education.
- Low levels of development despite the strategic location in terms of the national transport corridors.
- High rate of unemployment, poverty and social grant dependence.
- Prone to significant environmental changes owing to long-term structural changes (such as climate change, energy crises and other shifts).

Of specific relevance the IDP highlights the potential for renewable energy to help address some of these challenges. **The development of the proposed Soyuz 4 Solar PV Park will help to meet these needs and address these challenges and to do so in an environmentally sustainable manner.**

7.3.2 Pixley ka Seme District Municipality Spatial Development Framework (SDF) (2017)

The SDF notes that the vision for the PKSDM is "*Pixley Ka Seme District Municipality, pioneers of development, a home and future for all*".

The Mission Statement that underpins the vision refers to:

- Effective and efficient service delivery.
- Optimal human and natural resource development.
- Local economic growth and development, job creation and poverty alleviation.
- A vibrant tourism industry.
- To participate in the fight to reduce the infection rate and lessen the impact of HIV/ Aids and other communicable diseases.
- A safe, secure and community friendly environment.

The SDF identifies the opportunities and constraints associated with the district. Of relevance to the project the opportunities include:

Renewable Energy and the identification of a renewable energy hub in the region. The natural environment and maintenance and conservation of the pristine natural environment to support sustainable farming into the future is an identified opportunity. The SDF notes that Pixley Ka Seme District area with its abundance of sunshine and vast tracts of available land has attracted considerable interest from solar energy investors. The high solar index of the area provides many opportunities in terms of the development of renewable energy. This has been acknowledged by the Northern Cape Government with the identification of the Renewable Energy Hub. The areas around the northern and eastern borders of the Pixley Ka Seme District Municipality form part of this hub with the potential to stimulate special economic development zoned within the area that have the potential to stimulate industrial development.

The PKSDM also falls within the **Solar Development Corridor** as identified in the Northern Cape Provincial Spatial Development Framework. The corridor extends from Kakamas to Upington and down to De Aar in the south-east (**Figure 26**). The SDF also refers to the establishment of a **Renewable Energy Hub** proposed for the Northern Cape stretching from the west coast right up to the De Aar region (**Figure 27**). The Hub can accommodate special economic development within the zone as earmarked and entails a 100km wide zone.

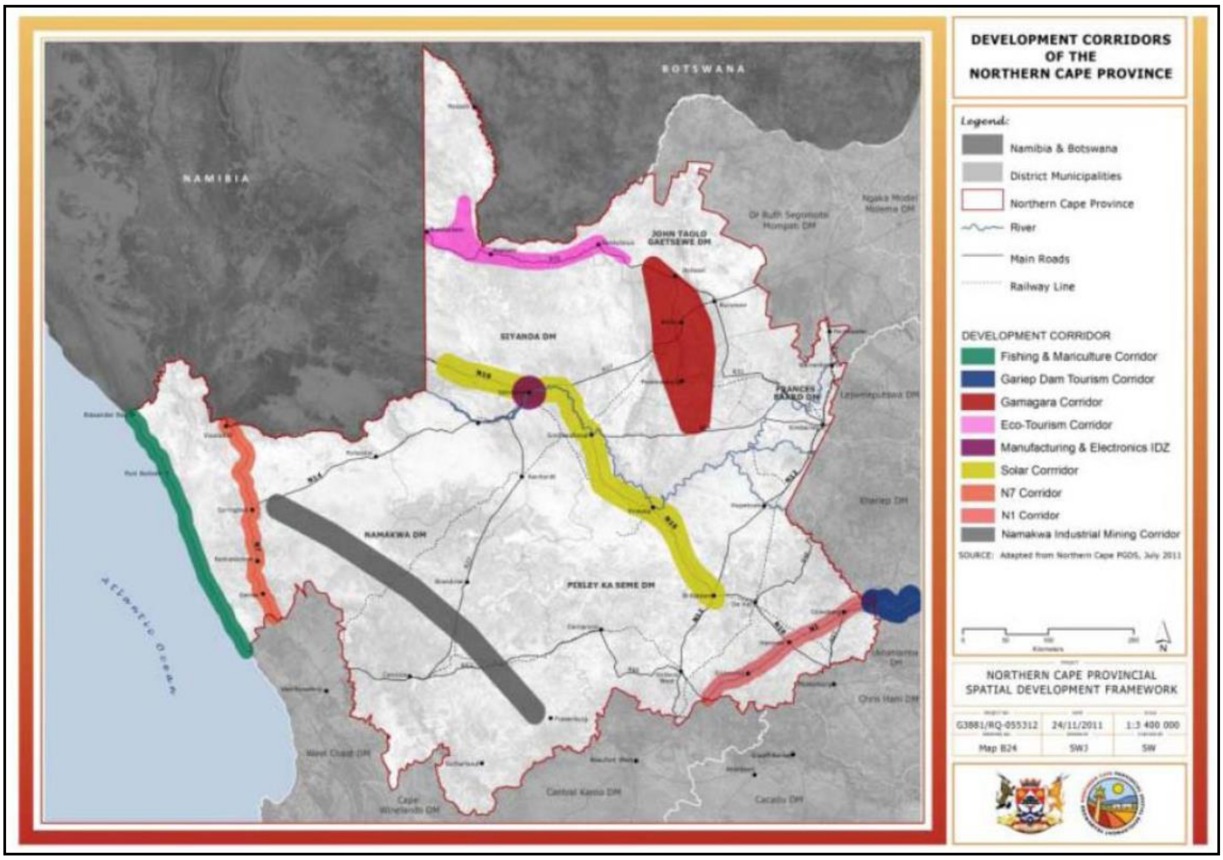


Figure 26: Northern Cape Development Corridors-Solar Corridor (yellow)

The SDF notes that the area is known for its clean air and open skies with limited light pollution. Potential visual impacts must be considered. In this regard the SDF notes that the topography of Pixley Ka Seme region is one of its main assets with vast open spaces and unspoilt panoramic visual vistas stretching over great distances. This asset makes for excellent scenic drives throughout the whole of the region from the flat plains to crossing the main rivers of South Africa. Visual vistas, ridges and "koppies" are assets within the region and they must be managed with sensitivity.

The relevant constraints include high levels of poverty and unemployment, backlog in basic services, including electricity and housing in rural areas, the limited supply of water and overall scarcity of water in the region to support economic development.

The development challenges that face the PKSDM include high unemployment and poverty rates and low income which are placing increasing demand on service delivery because very few people can pay for services. Declining population numbers, and alcohol and substance abuse are also key challenges.

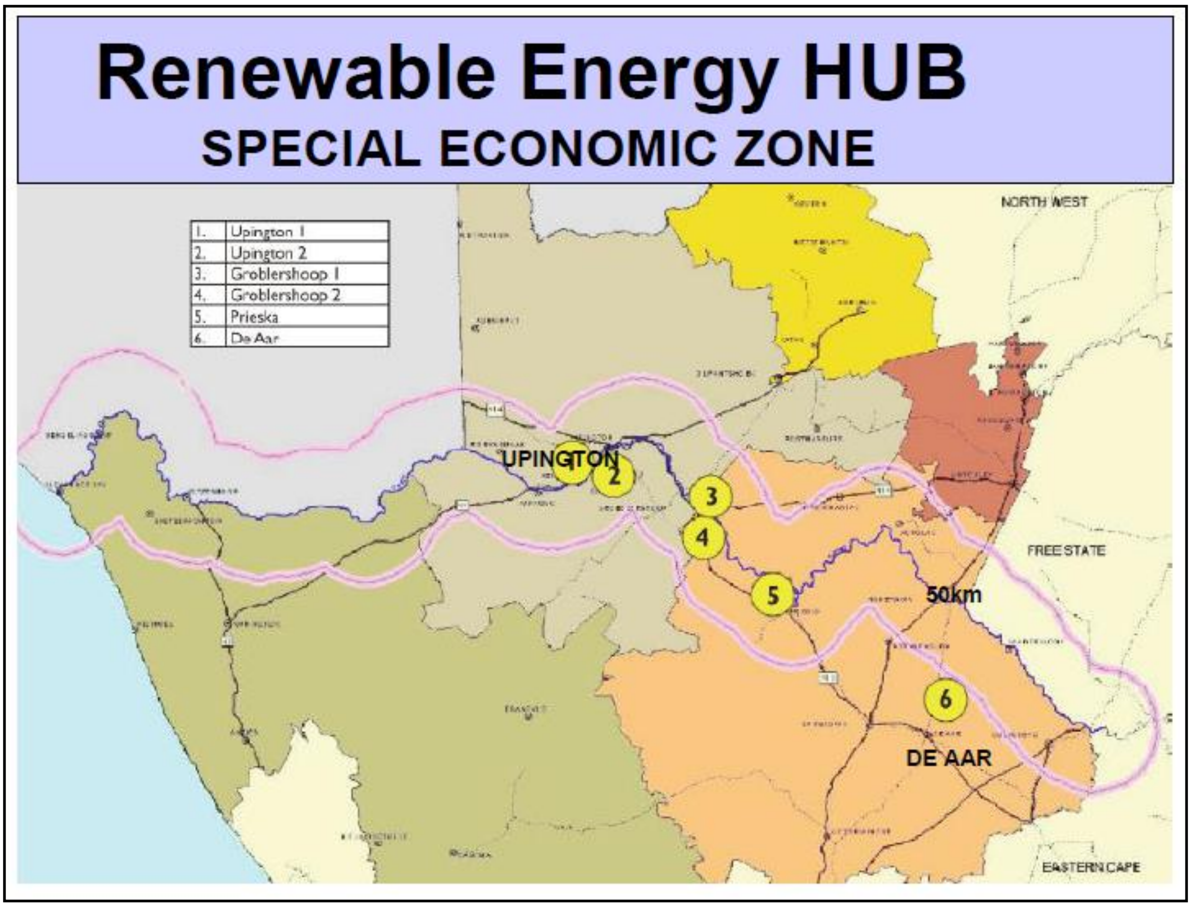


Figure 27: Northern Cape Renewable Energy Hub[8]

In terms of services, inadequate schools in farming areas results in children having to travel long distances to areas where they go to school. There are also insufficient health centres and lack of amenities and recreational services. Where these services do exist, they are often poorly managed and maintained. The level of key services, such as refuse removal, are also low, while many rural and a number of urban households rely on boreholes for their water supply.

Climate change is identified as a key risk. The SDF notes that the Karoo is predicted to experience more drought periods, coupled with increased evaporation and temperatures and this will negatively impact already restricted water supply. It is likely that the greatest impacts will be on water supply.

The SDF identifies that there are various opportunities and challenges associated with the realisation of the PKSDM vision. **Soyuz 4 Solar PV Park links directly to job creation, economic development and community upliftment and presents an opportunity to help overcome and address the above-mentioned issues.**

7.3.3 Emthanjeni Local Municipality Integrated Development Plan (IDP) (2022)

The Emthanjeni Local Municipality (ELM) is a category B municipality consisting of three towns, namely, De Aar, Britstown and Hanover. The vision of the ELM is *"Leading sustainable development for inclusive economic growth"*. The mission statement linked to the vision is *"To create a viable economic development plan that is relevant to the characteristics of the Emthanjeni Municipal area,*

[8] *Source: Northern PKSDM SDF*

designed to create and maintain a sound and healthy local economy, drawing upon local strengths and resources. This will be achieved through:

- Strategic partnerships and collaboration
- Effective stakeholder communications
- Supporting existing businesses and encourage the expansion and repositioning of desirable commercial and industrial uses
- To increase the number of farms or agricultural land in the community

The IDP refers to the national economic pillars adopted on the National Framework for Local Economic Development in South Africa which launched in 2014. The pillars are aligned to the main thrusts and opportunities within ELM to ensure an integrated approach for optimal rate of implementation and economic development in the municipality. The five pillars are:

- Pillar 1: Building a Diverse Economic Base
- Pillar 2: Developing learning and skilful economies
- Pillar 3: Developing Inclusive Economies
- Pillar 4: Enterprise Development and Support
- Pillar 5: Economic Governance and Infrastructure

Pillars 1, 2, 3 and 4 are relevant to the proposed development

Pillar 1: Building a Diverse Economic Base

The first pillar focuses on building a diverse economic base and growing the local economy through industrial and sector-specific (e.g., Tourism, Mining, Agriculture, Manufacturing, etc.).

Pillar 2: Developing learning and skilful economies

The IDP notes that addressing the skills gap and improving skills levels is critical to the to the successful implementation of all the other pillars, as increased skills lead to increased opportunities for stimulating local economies.

Pillar 3: Developing Inclusive Economies

Creating decent work and sustainable livelihoods improves the living standards and ensures a dignified existence for individuals.

Pillar 4: Enterprise Development and Support

The IDP highlights the importance of supporting economic development and creating a diverse economic sector. The need to support SMMEs is also noted.

The development of the Soyuz 4 Soalr PV Park will support these pillars. The IDP also lists 7 Key Performance Areas (KPAs) of which KPA 1: Basic Services and Infrastructure Development, KPA 5: Local Economic Development and KPA 7: Social Development, are relevant to the project.

The IDP highlights the importance to the renewable energy sector and refers to a number of IPP projects located in the ELM and PKSDM.

The proposed Soyuz 4 Solar PV Park can contribute to five of the above objectives such as economic development, infrastructure development, health services (through economic growth), SMME development, and skills development.

7.4 KEY AUTHORITIES FOR THIS ENVIRONMENTAL APPLICATION

The EAP confirms that based on the associated legislations that this Project triggers, the following Competent Authorities will form the key decision makers for the Project at a District and National Level:

- **Department of Mineral Resources and Energy (DMRE):** This Department is responsible for policy relating to all energy forms and for compiling and approving the Integrated Resources Plan (IRP) for electricity. Furthermore, the Department is responsible for approvals for the use of land that is contrary to the objects of the Mineral and Petroleum Resource Development Act (Act No. 28 of 2002) (MPRDA) in terms of Section 52 of the Act. Therefore, in terms of the Act, approval from the Minister is required to ensure that proposed activities do not sterilise potential mineral resources that may occur within the project site and development area.

- **National Energy regulator of South Africa (NERSA):** NERSA is responsible for Regulating all aspects of the electricity sector and will issue licenses for IPP projects to generate electricity.

- **Department of Forestry, Fisheries, and the Environment (DFFE):** DFFE is responsible for environmental policy and is the controlling authority in terms of NEMA and the EIA Regulations, 2014 (GNR 326) as amended. DEA is the Competent Authority for this project (GN R779 of 2016) and is charged with granting the EA for the project under consideration.

- **The South Africa Heritage Resources Agency (SAHRA):** SAHRA is a statutory organisation established under the National Heritage Resources Act (No. 25 of 1999). NHRA is responsible for the protection of South Africa's cultural heritage.

- **South African National Roads Agency Limited (SANRAL):** This Agency is responsible for the regulation and maintenance of all national road routes.

- **Department of Water and Sanitation (DWS):** This Department is responsible for effective and efficient water resource management to ensure sustainable economic and social development. This Department is also responsible for evaluating and issuing licenses pertaining to water use (Water Use Licenses (WUL) and General Authorisations).

- **The Department of Agriculture, Rural Development and Land Reform (DARDLR):** This Department is the custodian of South Africa's agricultural resources and is primarily responsible for the formulation and implementation of policies governing the agricultural sector, Furthermore, the Department is responsible for issuing permits for the disturbance or destruction of protected tree species listed under Section 15(1) of the National Forest Act (No. 84 of 1998) (NFA).

Based on the associated legislations that this Project triggers, the following Competent Authorities will form the key decision makers for the Project at a Provincial and Local Level:

- **Provincial Government of the Northern Cape – Northern Cape Department of Agriculture, Environmental Affairs, Rural Development and Land Reform (DAEARD&LR):** This Department is the commenting authority of the EIA process for the project and is responsible for issuing of biodiversity and conservation related permits.
- **Northern Cape Department of Transport, Safety and Liaison:** This Department provides effective coordination of crime prevention initiatives, provincial police oversight, traffic management and road safety towards a more secure environment.
- **Ngwao-Boswa Ya Kapa Bokone (NBKB):** This department identifies, conserves and manages heritage resources throughout the Northern Cape Province.
- **Emthanjeni Local Municipality (ELM):** The Municipality provides important documentation (IDP) which assist the CA in determining the approval of a project.
- **Pixley Ka Seme District Municipality (PKSDM):** PKSDM are responsible for providing provincial and district level guiding documentation and support.

7.5 INTERNATIONAL CONVENTIONS AND AGREEMENTS

The International Conventions and Agreements[9] that have bearing on the proposed development of the Soyuz Solar PV Park Cluster 1-6 and to which South Africa is a signatory are summarised in **Table 8**.

Table 8: International Conventions and Agreements

CONVENTION	SUMMARY OF OBJECTIVES APPLICABLE
Convention on Biological Diversity (29 December 1993)	Develop strategies, plans or programs for conservation and sustainable use of biological diversity or adapt for this purpose existing strategies, plans or programs which shall reflect, inter alia, the measures set out in this Convention.
Convention on Wetlands of International Importance (Ramsar) (21 December 1975)	To stem the progressive encroachment and loss of wetlands now and in the future.
United Nations Framework Convention on Climate Change - Kyoto Protocol (23 February 2005)	To further reduce greenhouse gas emissions by enhancing the national programs of developed countries aimed at this goal and by establishing percentage reduction targets for the developed countries and through the clean development mechanism (CDM) (where developed countries can invest in developing country clean technology to offset emissions).
Montreal Protocol on Substances That Deplete the Ozone Layer (1 January 1989)	Calculated levels of consumption and production of CFCs must not exceed the stipulated thresholds.
United Nations Convention to Combat Desertification (26 December 1996)	To combat desertification and mitigate the effects of drought through national action programs.
United Nations Framework Convention on Climate Change (21 March 1994)	Protection of the climate system: Operations must protect the climate system by controlling greenhouse gases not controlled by the Montreal Protocol, which cause climate change through anthropogenic interference with the climate system.

[9] *Sources: United States Central Intelligence Agency World Fact book (https://www.cia.gov/the-world-factbook/)*

CONVENTION	SUMMARY OF OBJECTIVES APPLICABLE
Stockholm Convention on Persistent Organic Pollutants (POPs) (17 May 2004)	This convention seeks to ban the production and use of persistent organic chemicals but allow the use of some of these banned substances, such as DDT, for vector control.
The Fourth ACP-EEC Convention 15 December 1989 (Lome)	Control of hazardous and radioactive waste: the operation must be aware that international law emphasizes strict control of hazardous waste and compliance with domestic legislation in this regard. It also seeks to prohibit imports and exports of such substances.
Convention concerning the Protection of the World Cultural and Natural Heritage 1972 (Paris)	Ensuring the identification, protection, conservation, presentation and transmission to future generations of the cultural and natural heritage
Rotterdam Convention on the Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade (24 February 2004)	Promote shared responsibility and cooperative efforts among Parties in the international trade of certain hazardous chemicals to protect human health and the environment from potential harm

7.6 INTERNATIONAL FINANCE CORPORATION PERFORMANCE STANDARDS

The Applicant is committed to complying with the International Finance Corporation (IFC) Performance Standards (PS) on social and environmental sustainability. These were developed by the IFC and were last updated on 1st January 2012 (refer to **Figure 28)**. The overall objectives of the IFC PS are:

- To fight poverty;
- To do no harm to people or the environment;
- To fight climate change by promoting low carbon development;
- To respect human rights;
- To promote gender equity;
- To provide information prior to project development, free of charge and free of external manipulation;
- To collaborate with the project developer to achieve the PS;
- To provide advisory services; and
- To notify countries of any Transboundary impacts because of a Project.

The PS comprise of eight performance standards namely:

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

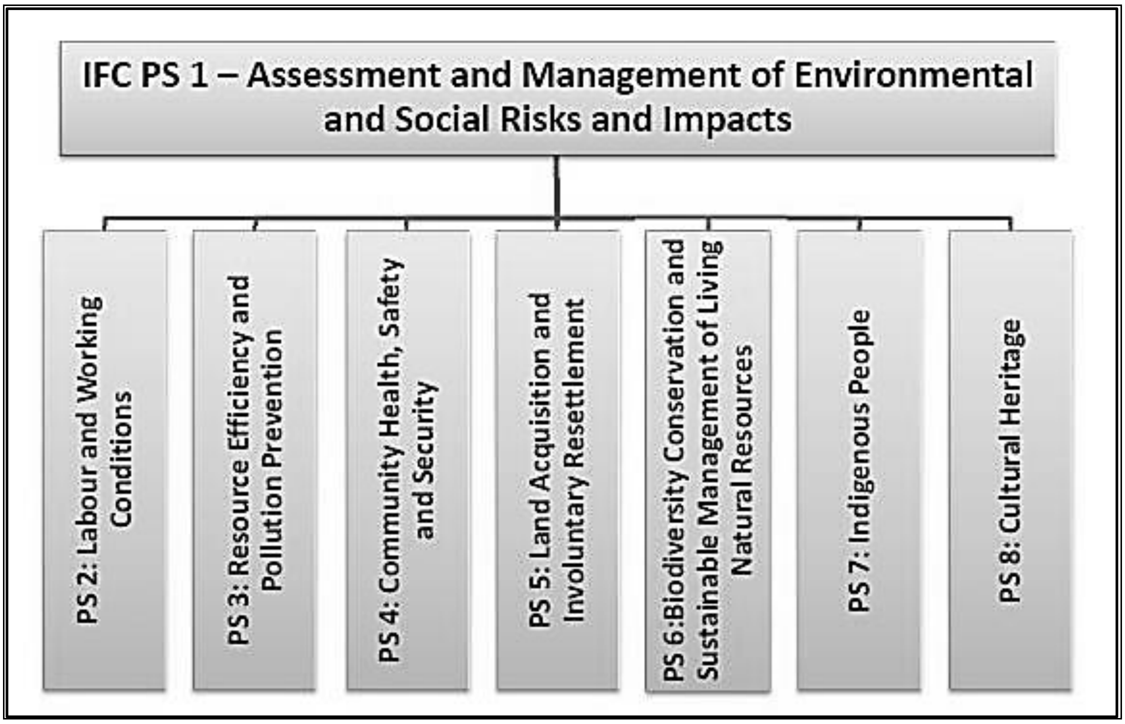


Figure 28: IFC Performance Standards Framework[10]

Performance Standard 1 establishes the importance of:

i. integrated assessment to identify the social and environmental impacts, risks, and opportunities of projects;

ii. effective community engagement through disclosure of project-related information and consultation with local communities on matters that directly affect them; and

iii. the management of social and environmental performance throughout the life of a project through an effective Environmental and Social Management System (ESMS).

PS 1 is the overarching standard to which all the other standards relate. The ESMS should be designed to incorporate the aspects of PS 2 to 8 as applicable.

Performance Standards 2 through to 8 establish specific requirements to avoid, reduce, mitigate or compensate for impacts on people and the environment, and to improve conditions where appropriate. While all relevant social and environmental risks and potential impacts should be considered as part of the assessment, Performance Standards 2 through 8 describe potential social and environmental impacts that require particular attention in emerging markets. Where social or environmental impacts are anticipated, the developer is required to manage them through its Social and Environmental Management System consistent with Performance Standard 1.

[10] *Extracted from the International Finance Corporation (IFC) Performance Standards (PS)*

7.6.1 Equator Principles

The Equator Principles (EPs) is a credit risk management framework for determining, assessing and managing environmental and social risk in Project Finance transactions. Project Finance is often used to fund the development and construction of major infrastructure and industrial projects. The EPs are adopted by financial institutions and are applied where total project capital costs exceed US$10 million. The EPs are primarily intended to provide a minimum standard for due diligence to support responsible risk decision-making.

The EPs are based on the IFC PS 2012 and on the World Bank Group Environmental, Health and Safety Guidelines (EHS Guidelines).

The Equator Principles Financial Institutions (EPFIs) have consequently adopted these Principles to ensure that the projects they finance are developed in a manner that is socially responsible and reflect sound environmental management practices.

EPFIs will only provide loans to projects that conform to the following principles:

- Principle 1: Review and Categorisation;
- Principle 2: Social and Environmental Assessment;
- Principle 3: Applicable Social and Environmental Standards;
- Principle 4: Action plan and Management;
- Principle 5: Consultation and Disclosure;
- Principle 6: Grievance Mechanism;
- Principle 7: Independent review;
- Principle 8: Covenants;
- Principle 9: Independent Monitoring and Reporting; and
- Principle 10: EPFI Reporting

7.6.2 The World Bank Group Environmental Health and Safety Guidelines

The EHS Guidelines (World Bank Group, 2007) are technical reference documents with general and industry specific (i.e. mining) examples of Good International Industry Practice (GIIP). Reference to the EHS guidelines is required under IFC PS 3.

The EHS Guidelines contain the performance levels and measures normally acceptable to the IFC and are generally considered to be achievable in new facilities at reasonable cost. When host country regulations differ from the levels and measures presented in the EHS Guidelines, Projects are expected to achieve whichever standard is more stringent.

8 NEED AND DESIRABILITY

This section outlines the purpose of considering the activity's "need" and "desirability" in accordance with the National Environmental Management Principles in terms of NEMA which serve as a guide for the interpretation, administration and implementation of NEMA and the NEMA EIA regulations (2014 as amended). Overall, the development of renewable energy is strongly supported at a national, provincial, and local level. The development of and investment in renewable energy is supported by the National Development Plan (NDP), New Growth Path Framework and National Infrastructure Plan, which all refer to and support renewable energy. The PKSDM SDF and IDP and ELM IDP also support the development of renewable energy. The development of the proposed Soyuz 4 Solar PV Park is therefore supported by key policy and planning documents.

8.1 LEGISLATIVE FRAMEWORK

The National Environmental Management Principles specifically inter alia require the following:

- *Environmental Management must place people and their needs at the forefront of its concern and equitably serve their interests;*
- *Environmental Management must be integrated, acknowledging that all elements of the environment are linked and interrelated, and it must take into account the effects of decisions on all aspects of the environment and all people in the environment by pursuing the selection of the best practicable environmental option;*
- *Environmental justice must be pursued so that adverse environmental impacts shall not be distributed in such a manner as to unfairly discriminate against any person; and*
- *Decisions must take into account the interests, needs and values of all interested and affected parties;*
- *The Environment is held in public trust for the people, the beneficial use of environmental resources must serve the public interest and the environment must be protected as the people's common heritage.*

Need and Desirability must thus be considered in the context of **sustainable development** which is underpinned by social, economic and environmental considerations and takes a long-term strategic view to environmental management.

8.2 SUSTAINABLE DEVELOPMENT

Sustainable development is best summarised by an extract from the United Nations World Commission on Environment and Development and reads as follows:

"Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs. As such it requires the promotion of values that encourage consumption standards that are within the bounds of the ecologically possible and to which all could reasonably aspire."[11]

The interdependency model for sustainable development (see **Figure 29)** is a framework that emphasizes the interconnectedness of economic, social, and environmental systems, and the need to address their interdependencies in a holistic manner to achieve sustainable development.

The model recognizes that economic development, social development, and environmental sustainability are mutually reinforcing, and that neglecting any one of these dimensions can have negative consequences for the others. For example, environmental degradation can have negative impacts on social and economic well-being, while economic growth that does not consider environmental and social considerations can be unsustainable in the long term.

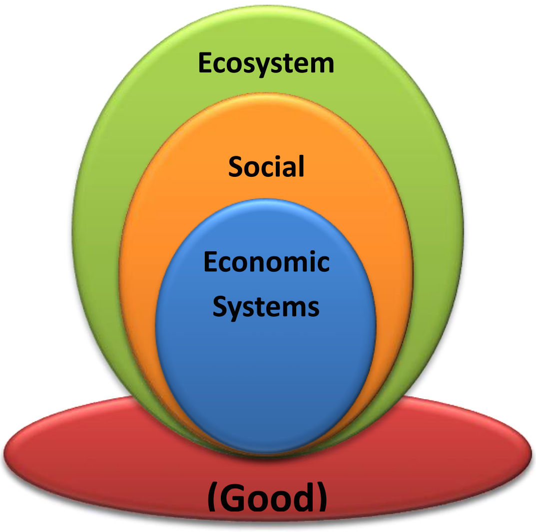
The interdependency model for sustainable development emphasizes the need to adopt integrated approaches that consider the economic, social, and environmental dimensions of development. It

[11]*Our Common Future, WCED, 1987*

recognizes that these dimensions are not independent, but are rather interdependent, and that achieving sustainable development requires balancing these dimensions in a way that supports their mutual reinforcement.

The model also emphasizes the importance of participation, collaboration, and partnerships in sustainable development. It recognizes that sustainable development cannot be achieved by any single actor, but rather requires the participation and collaboration of government, civil society, the private sector, and other stakeholders.

Overall, the interdependency model for sustainable development provides a framework for understanding the complex interrelationships among economic, social, and environmental systems, and for addressing these interdependencies in a holistic manner to achieve sustainable development.



The widely accepted inter-dependence model of sustainability recognises that social and economic systems **have never been and can never be independent of the natural system**.

This model further supports the belief that **interactions** between and within component systems will result in **feedback** throughout the system

Endorsed by the DFFE (Mebratu, 1998)

Figure 29: Interdependence Model of Sustainability

The EIA Phase has considered and assessed the broad principles of sustainable development to demonstrate the "need and desirability" of the proposed Soyuz 4 Solar PV Park in the context of NEMA.

8.3 NATIONAL NEED AND DESIRABILITY

The requirement for renewable energy projects (solar, wind, hydrological to name a few) across the country has been steadily increasing over the last five to ten years. Renewable energy has been found to be a reliable source of alternative energy supply to the ever under equipped national grid. The need for such renewable energy is driven by the increasing population and economic growth and development within South Africa.

South Africa has one of the most carbon-intensive economies in the world, therefore making the greening of the electricity mix a national imperative. Within this context the green economy is an extremely important trigger and lever for enhancing a country's growth potential and redirecting its development trajectory in the 21st century. The attractiveness of solar technologies is not only supported by local conditions, but also by the relatively mature stage of their technological development.

From a national perspective, there are several needs and desirability factors associated with the proposed development of Soyuz 4 Solar PV Park (and the associated Soyuz Solar PV Cluster):

- **Electricity supply:** South Africa has faced chronic electricity shortages in recent years, which have had negative impacts on economic growth and social development. The development of Soyuz 4 Solar PV Park can contribute to the electricity supply and help to meet the growing demand for energy. In addition, by diversifying the sources of power in the country, the surety of supply will improve.

- **Climate change mitigation:** South Africa is one of the world's largest emitters of greenhouse gases, which contributes to global climate change. The development of Soyuz 4 Solar PV Park can contribute help to mitigate climate change by reducing the country's reliance on fossil fuels and reducing greenhouse gas emissions.

- **Reduced energy losses:** The transmission of power from the power stations in Mpumalanga and Gauteng to the Northern Cape results in the high energy losses. By creating a substantial electrical feed from the Soyuz Solar PV Cluster into the grid in the Northern Cape will result in reduced energy losses in transmission.

- **Economic development:** The development of Soyuz 4 Solar PV Park can contribute to economic development by creating jobs and attracting investment. The construction and operation of a Solar PV Park requires skilled labour, which can create employment opportunities in the local community. In addition, the development of a solar PV park can attract domestic and foreign investment, which can contribute to economic growth.

- **Lower costs of alternative energy:** An increase in power supply by increasing the number of solar PV facilities, like the proposed Soyuz Solar PV Cluster, will eventually reduce the cost of power generated through solar facilities.

- **Environmental sustainability:** South Africa is a country with rich biodiversity and natural resources that need to be protected. The development of Soyuz 4 Solar PV Park can contribute to environmental sustainability by reducing the negative impacts associated with the extraction and transportation of fossil fuels.

- **Social development:** In South Africa, there are many rural and remote communities that lack access to electricity. The development of the Soyuz 4 Solar PV Park can contribute to providing reliable source of electricity to these communities, which can support social development and improve living standards.

- **Renewable energy targets:** South Africa has set a target of generating 18 GW of renewable energy by 2030, with solar PV being a major component of this target. The development of the Soyuz 4 Solar PV Park, and the associated Soyuz Solar PV Cluster, can contribute to meeting this national target.

In summary, the development of Soyuz 4 Solar PV Park (and by association the Soyuz Solar Cluster) is a desirable and necessary development to contribute to South Africa's national strategy for meeting the energy needs of the country. This development can enhance energy security, contribute to the electricity supply, mitigate climate change, support economic development, improve energy affordability, promote environmental sustainability, and support social development.

8.4 REGIONAL NEED AND DESIRABILITY

From a regional perspective in the Northern Cape province of South Africa, there are several needs and desirability factors associated with the development of the Soyuz 4 Solar PV Park and the associated Soyuz Solar PV Cluster:

- **Economic development:** The Northern Cape is a region with significant potential for economic development, but it is also one of the poorest provinces in South Africa. The development of the Soyuz 4 Solar PV Park can contribute to economic development by creating jobs and attracting investment. The construction and operation of a solar PV park requires skilled labour, which can create employment opportunities in the local community. In addition, the development of a solar PV park can attract domestic and foreign investment, which can contribute to economic growth.

- **Social development:** The Northern Cape is a region with many rural and remote communities that lack access to electricity. The development of the Soyuz 4 Solar PV Park can provide a reliable source of electricity to these communities, which can support social development and improve living standards.

- **Resource availability:** The Northern Cape is a region with abundant solar radiation, which makes it an ideal location for the development of the Soyuz 4 Solar PV Park. The high levels of solar radiation in the region can support the generation of large amounts of electricity from solar PV, which can help to meet the energy needs of the region and contribute to meeting national renewable energy targets.

In summary, the development of the Soyuz 4 Solar PV Park (within the context of the Soyuz Solar PV Cluster) in the Northern Cape province of South Africa is a desirable and necessary strategy for meeting the energy needs of the region. Solar PV Parks can enhance the electricity supply, contribute to economic development, improve energy affordability, promote environmental sustainability, support social development, contribute to meeting national renewable energy targets, and take advantage of the abundant solar resources available in the region.

8.5 LOCAL AND SITE-SPECIFIC NEED AND DESIRABILITY

The proposed Soyuz 4 Solar PV Park is highly desirable due to its unique site-specific benefits. The area offers ample open space that is suitable for solar facility development, along with an amply high solar resource to generate renewable energy.

The proposed facility is located in an area where environmental sensitivities to such a development are low, ensuring that it is a responsible and sustainable project that will have nominal negative impacts on the surrounding environment but significantly contribute to socio-economic development locally and regionally.

The facility will create employment opportunities for the local community, providing a much-needed boost to the local economy. In addition, the skills development that will be provided to employees and contractors involved in the construction and operation of the facility will have a lasting impact on the community.

Due to the climate and soil limitations the proposed development site for the Soyuz 4 Solar PV Cluster has low agricultural potential in terms of cultivated crops. Low density grazing can continue to take place in and around the Solar PV facility. The proposed development of the Soyuz 4 Solar PV Park (and the association Soyuz Solar PV Cluster) will generate alternative land use income through the rental for the facility. This will provide the farming enterprises with increased cash flow and rural livelihood and thereby improve the financial sustainability of the landowner and employees and the "run-on" benefits to the local economy.

The environmental impact assessment, inclusive of input from specialists on the local direct impacts and the cumulative impacts has assessed that the potential negative environmental impacts associated with the development of the Soyuz 4 Solar PV Park on the preferred site are low.

8.6 CONCLUSION ON NEED AND DESIRABILITY

The development of the Soyuz 4 Solar PV Park on the proposed (preferred) site will clearly contribute significant benefits to the national and regional environments but will not result in significant biodiversity loss at a local level (direct or cumulative).

9 EIA SPECIALIST STUDIES

*In accordance with **Appendix 2 Regulation 2(1)(g) (iv); of GN No. R. 326 of the NEMA EIA Regulations (2014 as amended)**, the following information is presented in this Section:*

> ***2(1)(g) (iv)** – The environmental attributes associated with the alternatives focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects;*

During the Pre- Application Meeting with the Competent Authority (the DFFE) held on 28 February 2023 to discuss the NEMA Environmental Permitting Process for the proposed Soyuz 4 Solar PV Park the DFFE confirmed that the following specialist input was required during the Scoping Phase to confirm or refute the Environmental Sensitivities identified by the DFFE EIA Screening Tool:

- Screening Tool Report – Compiled by Luke Verburgt from Enviro-Insight cc dated September 2022
- Avifaunal Scoping Assessment – Compiled by Luke Verburgt from Enviro-Insight cc dated February 2023
- Biodiversity Scoping Assessment – Compiled by Charne Gouws from SAS Environmental Group of Companies (Pty) Ltd dated February 2023
- Climate Change Assessment – Compiled by Hanlie Liebenberg-Enslin from Airshed Planning Professionals (Pty) Ltd (C/O) date February 2023
- Freshwater Ecological Scoping Assessment – Compiled by Paul Da Cruz and Stephen van Staden from SAS Environmental Group of Companies (Pty) Ltd dated February 2023
- Geotechnical Reconnaissance Study - Compiled by Louis Jonk from GEOSS South Africa (Pty) Ltd dated February 2023

- Heritage Scoping Assessment – Compiled by John Gribble from ACO Associates cc dated February 2023
- Noise Scoping Assessment – Compiled by Barend van der Merwe from dBA Acoustics dated xx February 2023
- Social Scoping Assessment – Compiled by Tony Barbour from Tony Barbour Environmental Consulting dated February 2023
- Soil, Landuse and Land Capability Scoping Assessment – Compiled by Tshiamo Setsipane and Stephen van Staden from SAS Environmental Group of Companies (Pty) Ltd dated February 2023
- Town Planning – Compiled by Soné vd Merwe from Warren Petterson Planning dated February 2023
- Traffic Scoping Assessment – Compiled by Christoph Krogscheepers from Innovative Transport Solutions dated March 2023
- Visual Scoping Assessment – Compiled by Sanja Erwee and Stephen van Staden from SAS Environmental Group of Companies (Pty) Ltd dated February 2023

Review of the specialist input during the Environmental Scoping phase confirmed that the following additional specialist input would be required during the EIA phase:

- Avifauna Environmental Impact Assessment
- Biodiversity Impact Assessment
- Climate Change Assessment
- Freshwater Ecology Impact Assessment
- Geotechnical Reconnaissance Study
- Heritage Impact Assessment
- Noise Impact Assessment
- Social Impact Assessment
- Soil, Land Use and Land Capability Impact Assessment
- Town Planning Assessment
- Traffic Impact Assessment
- Visual Impact Assessment

The information provided in the specialist reports is presented in the following sections.

Please note that all Specialist Scoping Reports are attached in Appendix B and form part of the EIA Report for Public Consultation.

10 AVIFAUNAL IMPACT ASSESSMENT

TMG, on behalf of the Applicant appointed Enviro-Insight CC (C/O Luke Verburgt) (hereinafter referred to as the "Avifaunal Specialist") to undertake the Avifaunal Impact Assessment for the proposed Soyuz 4 Solar PV Park.

10.1 INTRODUCTION

While each of the six proposed Solar PV Parks that form part of the Soyuz Solar PV Park Cluster 1-6 Project are treated as separate S&EIA processes for the purposes of environmental authorisation, the following factors contributed to treating the fieldwork and certain elements of the discussion as a single project:

- the same developer for each Solar PV Park, albeit via separate companies;
- the close spatial proximity of each Solar PV Park to each other;
- minimisation of establishment and disbursement costs for fieldwork execution;
- taking advantage of avifauna observations from adjacent renewable energy developments to provide a more comprehensive account of the avifauna community for the Soyuz Solar PV Park Cluster 1-6 Project and surroundings; and
- potential cumulative impacts that prevent discussion of each proposed Solar PV Park in isolation.

This report addresses the avifauna species of the Sensitive Animal Species Theme of the EIA Phase of the Environmental Impact Assessment report (EIAr) required for the environmental authorisation process for a proposed development. The report complies with the following:

- The minimum report content requirements for environmental impacts on terrestrial animal and plant species in terms of sections 24(5)(a) and (h) and 44 of the National Environmental Management Act, 1998 (Act No. 107 of 1998);
- Guidance for the implementation of the above-mentioned protocol is followed according to SANBI (2020)[12], hereafter referred to as "the terrestrial animal species protocol guidelines"; and
- Guidance for avifauna studies in relation to developments of solar facilities is followed according to the "Best-Practice Guidelines for assessing and monitoring the impact of solar energy facilities on birds in southern Africa" (Jenkins et al., 2017[13]).

10.2 METHODOLOGY

The methodology applied to conduct the avifaunal impact assessment included the following:

- **GIS:** Existing data layers were incorporated into a GIS to establish how the study area interacts with important terrestrial and aquatic entities. A simple habitat classification procedure using the latest satellite imagery (Sentinel 2) was performed to help identify habitat types of importance for avifauna during the initial surveys. Furthermore, a drainage and aquatic habitat map was created from the National Freshwater Ecosystem Priority Area (NFEPA) rivers[14] and wetlands[15] database and from manually delineating other large aquatic features from satellite imagery. These were pre-emptively buffered by 100 m. Finally, a digital elevation

[12] *SANBI. 2020. Species Environmental Assessment Guideline. Guidelines for the implementation of the Terrestrial Fauna and Terrestrial Flora Species Protocols for environmental impact assessments in South Africa. South African National Biodiversity Institute, Pretoria. Version 3.1. 2022*

[13] *Jenkins AR, Ralston-Paton S, Smit-Robinson HA. 2017. Birds & Solar Energy. Best Practice Guidelines: Guidelines for assessing and monitoring the impact of solar power generating facilities on birds in southern Africa*

[14] NFEPA Rivers(http://bgis.sanbi.org/SpatialDataset/Detail/397)

[15] NFEPA Wetlands (http://bgis.sanbi.org/nfepa/project.asp)

model (DEM) was obtained for the area and a slope analysis was performed to delineate sensitive rocky habitats. Slopes of > 7° were considered steep enough in this region to constitute potentially sensitive rocky habitats and these were buffered by 30 m. All mapping was performed using open-source GIS software (QGIS[16] and SAGA[17]).

- **Desktop and Literature Survey:** A desktop study and literature review was undertaken to evaluate all bird species which could potentially occur in the vicinity of the Soyuz Solar PV Cluster, referred to as the "Project Area", predominantly using data from the second South African Bird Atlas Project (SABAP 2[18]; [SABAP2, 2020]) but cross-referencing with Hockey et al. (2005) and Sinclair & Ryan (2010). SABAP 2 data are collected as records per pentad (i.e., 5' X 5' or roughly 9 x 9 km).

- **Existing Avifauna Data:** Pre-construction avifauna data were collected as part of the ESR phase between July 2021 – May 2022 and were as observations per VP, walk and drive transect near the proposed Soyuz Solar PV Cluster. This dataset represents a complete year of pre-construction avifauna monitoring data collected in accordance with the birds and wind energy guideline (Jenkins et al., 2015).

- **Solar Energy Facilities (SEF) Survey Requirements**: The Birds and Solar Energy Guidelines (Jenkins et al. 2017) provide clear requirements for Avifauna Impact Assessments of Solar PV Parks. Solar PV Parks are categorised into 3 regimes depending on the potential impact on Avifauna. The regime determines the level and intensity of surveys to be completed by the avifauna specialist. Soyuz 4 Solar PV Park is regarded to be a Regime 2 facility based on the generating capacity >100 MW and a footprint >150 ha. The requirements and the progress in effecting these requirements for a Regime 2 facility are provided in **Table 9**.

Table 9: Avifauna Impact Assessments Regime 2 Requirements

REQUIREMENT	PROGRESS
1. Preliminary Assessment	
a. Literature review, habitats and desktop	Documented in the Specialist Scoping Report
2. Structured and detailed data collection	
a. Baseline data collection over 6-12 months, across as many seasons as possible	A summer season survey was performed 7 – 19 January 2023. This is considered sufficient when combined with the pre-construction surveys undertaken between July 2021 and May 2022.
b. Small bird abundance estimates	Provided with in this Avifauna EIA report.
c. Transect and vantage point abundances for large birds and raptors	Provided with in this Avifauna EIA report.
d. Flight behaviour of priority species	Recorded and discussed in in this f Avifauna EIA report.

[16] http://qgis.osgeo.org/en/site/
[17] https://saga-gis.sourceforge.io/
[18] http://sabap2.birdmap.africa/

REQUIREMENT	PROGRESS
e. Wetland bird counts and movements between wetlands using the CWAC initiative (Taylor et al. 1999)[19]	No suitable sites on or surrounding the Soyuz Solar PV Park Cluster 1-6 Project to perform this protocol
f. Existing power line collision mortalities	None observed.
3. Impact Assessment	
a. Map key habitats and flyways to be avoided	Provided with in this Avifauna EIA report.
b. Inform Solar PV Park layout	Provided with in this Avifauna EIA report.
c. Assess impacts and mitigation strategies	Provided with in this Avifauna EIA report.

- **Walking & Driving Transects:** A single site visits was conducted (Summer: 7-19 January 2023). Sampling was performed by means of combined walking and driving transects in and around the Soyuz Solar PV Park Cluster. Driving was done at very low speeds, with frequent stoppages to observe birds and record data. Short walking transects were conducted from the vehicle wherever habitat allowed, and bird productivity was high. Suitable nesting structures and habitats were evaluated carefully for any possible nests of sensitive/priority bird species and recorded for mapping purposes.
- **Species of Conservation Concern:** The Red List of threatened species generated by the IUCN (http://www.iucnredlist.org/) provided the global conservation status of avifauna.
- **Impact Assessment:** The impact assessment was conducted applying the methodology described in this report in Section 24.

10.3 REGIONAL CONTEXT

The Soyuz Solar PV Cluster is situated entirely within the Least Concern "Northern Upper Karoo" regional vegetation type (**Figure 30**; SANBI 2018[20]) and contains mostly natural habitats, with some low intensity impacts from sheep farming. The Soyuz Solar PV Cluster is not within a REDZ but is situated entirely within the Central Power Corridor. The nearest protected area is the De Aar Nature Reserve situated ~ 20 km away towards the east and the nearby "Platberg-Karoo Conservancy" Important Bird Area (IBA) entirely encompasses the Soyuz 6 Solar PV Park, while all other proposed Solar PV Parks are situated outside of this IBA (**Figure 31**).

[19] *Taylor MR, Peacock F, Wanless RM. (eds). 2015. The 2015 Eskom Red Data Book of Birds of South Africa, Lesotho and Swaziland. BirdLife South Africa, Johannesburg, South Africa.*

[20] *SANBI. 2018. Beta Vegetation Map of South Africa, Lesotho and Swaziland [File geodatabase] 2018. Available from the Biodiversity GIS website (http://bgis.sanbi.org/SpatialDataset/Detail/670).*

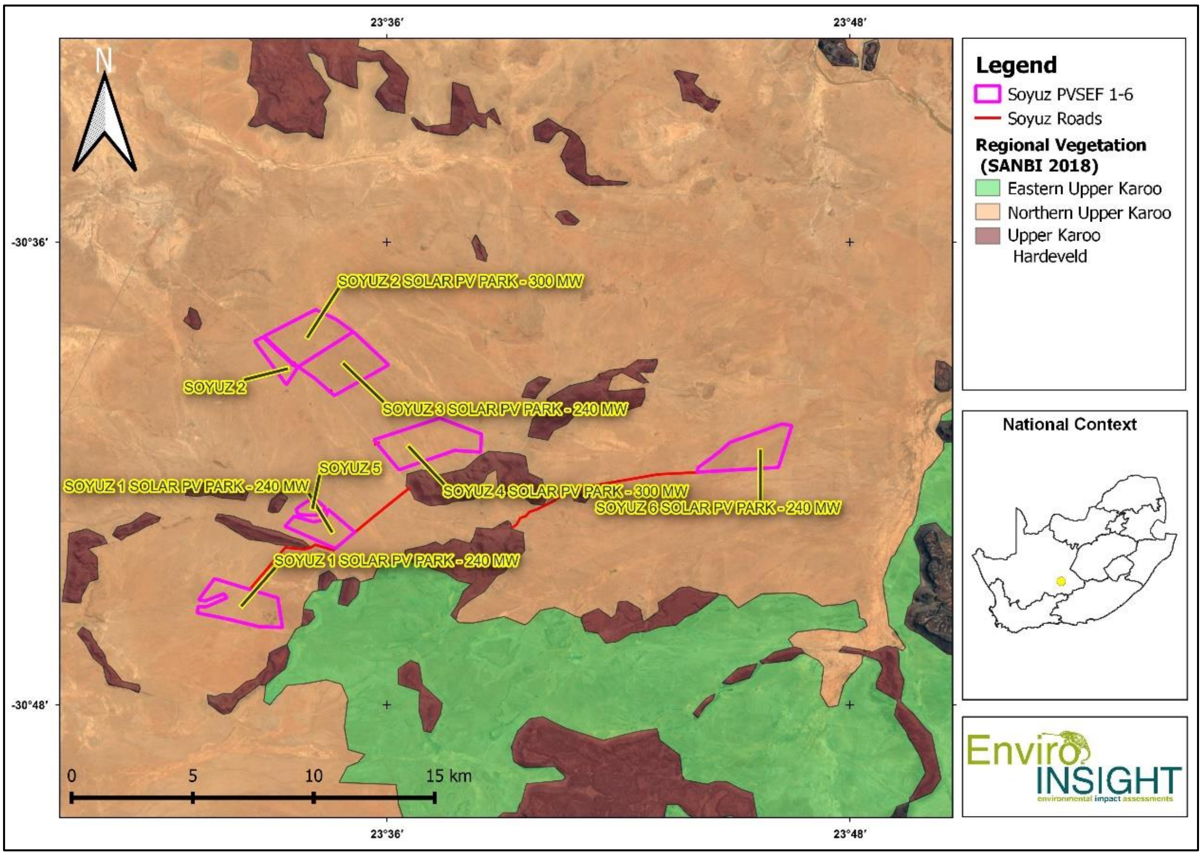


Figure 30:Regional Vegetation Types

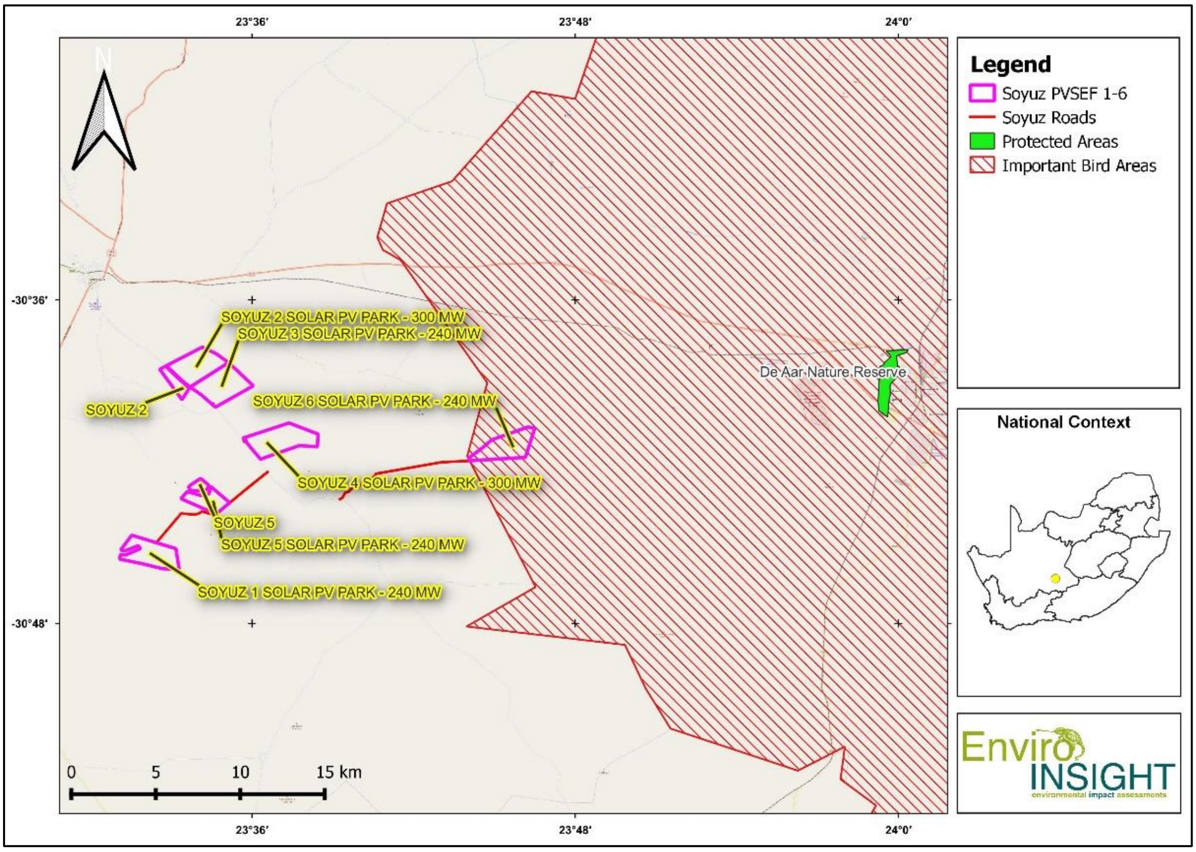


Figure 31: Regional Protected Areas and IBAs

10.3.1 Regional Habitat Description

The Soyuz Solar PV Park Cluster is located on relatively flat land, between the elevated rocky ridges characterised by Upper Karoo Hardeveld vegetation (**Figure 30**). These flat areas of Northern Upper Karoo vegetation are characterised by two major habitat types; namely Nama Karoo Low Shrubland and Natural Grassland according to the National Landcover Classification (NLC) (**Figure 32**).

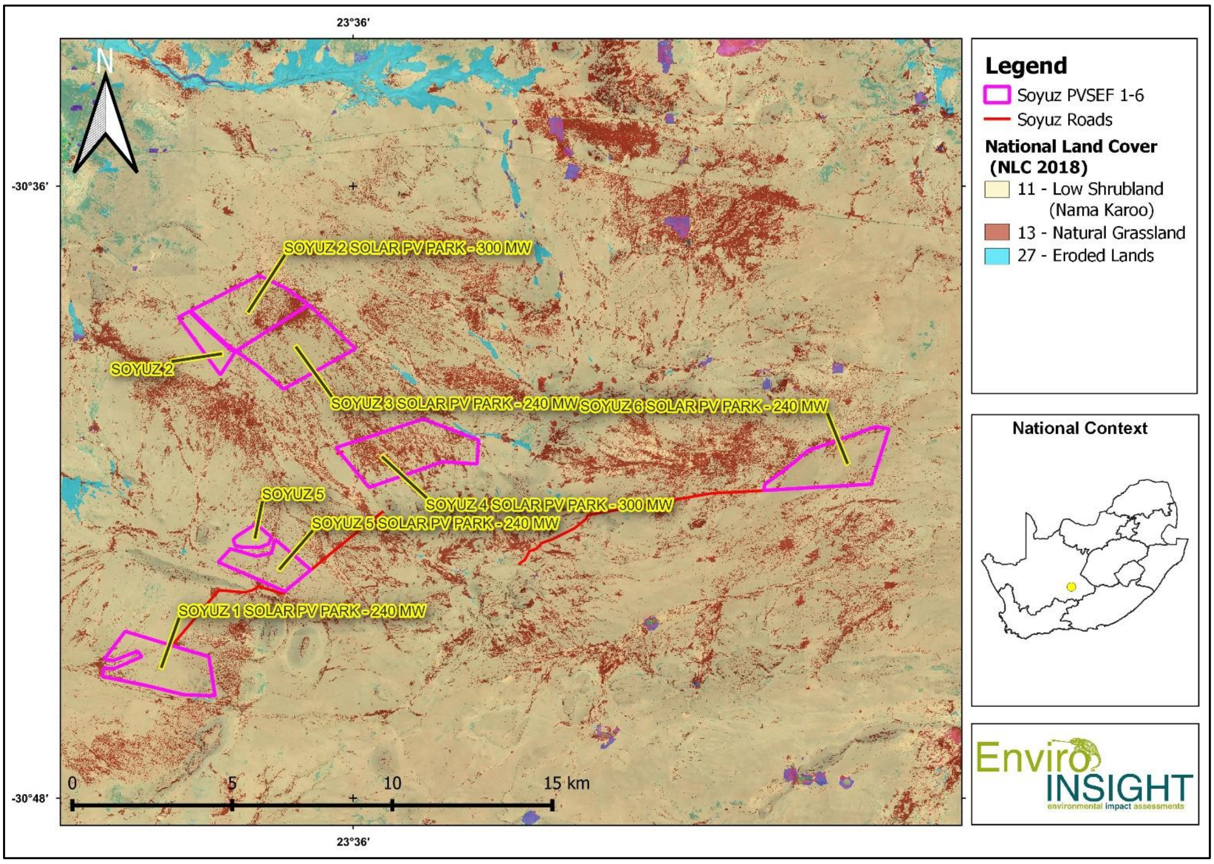


Figure 32: Regional Major Habitats

10.3.2 Regional Expected and Observed Avifauna

A total of 114 bird species have been recorded by the South African Bird Atlas Project (SABAP2) on the seven focal pentads in which the Soyuz Solar PV Park Cluster is situated, all of which are expected to occur on the sites. As per the SABAP desktop assessment, only four species of conservation concern (SCC; threatened and near-threatened) have been observed within at least one of the seven focal the pentads in which the Soyuz SOLAR PV PARK Cluster is situated namely Verreaux's Eagle (VU), Karoo Korhaan (NT), Blue Crane (NT) and Ludwig's Bustard (EN).

However, these pentads suffer from under-sampling as 13 additional species, 6 of which are SCC, were observed during the Soyuz WEF pre-construction avifauna monitoring and 13 additional species, 4 of which are SCC, were observed during the first seasonal avifauna survey conducted for this report. In combination, these two surveys observed an additional 18 species, 6 of which are SCC. **Table 10** shows the 10 expected and observed avifauna SCC for the Soyuz Solar PV Park Cluster. It is worth noting that 6 of these species were not previously recorded by SABAP2.

Table 10: Regional Area Expected Avifauna SCC Observed

COMMON NAME	SCIENTIFIC NAME	# SABAP2 pentads (7 max)	January 2023 survey	Global Status (IUCN)[21]	Regional Status
Ludwig's Bustard	Neotis ludwigii	3	X	EN	EN
Black Harrier	Circus maurus	-		EN	EN
Tawny Eagle	Aquila rapax	-	X	VU	EN
Verreaux's Eagle	Aquila verreauxii	1		LC	VU
Denham's Bustard	Neotis denhami	-		NT	VU
Lanner Falcon	Falco biarmicus	-	X	LC	VU
Secretarybird	Sagittarius serpentarius	-	X	EN	VU
Karoo Korhaan	Eupodotis vigorsii	5	X	LC	NT
Blue Crane	Grus paradisea	3	X	VU	NT
Kori Bustard	Ardeotis kori	-	X	NT	NT

The total number of bird species observed within and around the Soyuz Solar PV Park Cluster 1-6 Project site during the summer survey (7-19 January 2023) was 72 from 1605 observation comprising a total of 3013 individuals. The observed avian species richness is relatively low but expected for this region and abundances were moderate to high due to a productive summer season.

10.4 SITE ENVIRONMENT

10.4.1 Departure from the recommendations of the Birds and Solar Energy guidelines

The Birds and Solar Energy guidelines (Jenkins et al., 2017) recommends two site visits for Regime 2 Solar PV Park developments such as the Soyuz 4 Solar PV Park. However, given that one optimal seasonal survey took place with specific effort applied to the detection of Ludwig's Bustard lekking sites and nesting sites of other SCC, and that an entire years' worth of avifauna pre-construction monitoring surveys are available for the immediate surrounding area, the combined data from the single optimal season survey, the existing WEF pre-construction monitoring data, and additional online data from iNaturalist, are considered sufficient for evaluating impacts to the avifauna of the region from the proposed Solar PV Park development. Any additional data collection, originally scheduled for Autumn (April 2023), would have been unlikely to add significant value as it would not inform on the key concerns surrounding lekking sites for Ludwig's Bustard, since this species does not exhibit breeding behaviour during this time in the Nama Karoo. In addition, all suitable nesting habitats (trees, electricity pylons etc.) were surveyed during the summer survey, have been recorded and will be buffered from development. No additions to the nest locations were realistically expected during the autumn survey, since the suitable nesting habitats for avifauna SCC are rare in the landscape and had already been captured.

A letter was drafted and sent to BirdLife SA on 1 February 2023 to evaluate the above and consider relaxing the requirements for an additional seasonal survey to be substituted/supplemented with the existing avifauna observation data from the Soyuz WEF. A response was received on 27 February from Samantha Ralston Patton of BirdLife SA indicating that BirdLife SA was not able to formally review the

[21] *Endangered (EN) – very high risk of extinction in the wild; Vulnerable (VU) – considered to be at high risk of unnatural extinction without further human intervention; Near threatened (NT) – close to being endangered soon; Least concern (LC) – unlikely to become endangered or extinct in the near future.*

report, but that she personally considered the approach to be reasonable and recommended inclusion of additional sources of data (such as iNaturalist) which was done.

The scoping report, which included the above-mentioned approach, and which was subject to the require public participation process (PPP), received no comments or concerns for the above-mentioned approach from any of the registered Interested and Affected Parties (I&APs). Nevertheless, a follow-up letter to BirdLife SA was sent on 27 May 2023 to confirm whether BirdLife SA did manage to review the scoping report as part of the PPP and whether Samantha's personal position on the approach had changed at all. No response was received, which was taken to indicate no objection to the approach.

Table 11: A summary of the available information on lekking behaviour for Ludwig's Bustard (Nama Karoo)

<table>
<tr><th>Habitat</th><th>Lekking Dates</th><th>Lekking Times</th><th>Lekking Movements</th><th>Laying Dates</th></tr>
<tr><td></td><td>Related to seasonal rainfall
(Allan, 1994)
See rainfall graph below</td><td>Concentrated around dawn and dusk
(Allan, 2004)</td><td>Flights mostly by females & sub-adult males during lekking hours
(Allan, 2004)</td><td>(Chittenden et al., 2016)</td></tr>
<tr><td>Nama Karoo</td><td>Aug - Feb</td><td rowspan="6">Morning:
05h00 – 10h00

Afternoon:
16h00 – 19h00</td><td rowspan="6">Morning:
05h00 – 09h00

Afternoon:
16h00 – 18h00</td><td>Sept - Feb</td></tr>
<tr><td>Bushmanland</td><td>June - Sept</td><td>July - Sept</td></tr>
<tr><td>Succulent Karoo</td><td>June - Sept</td><td>July - Sept</td></tr>
<tr><td>During droughts</td><td>Delayed</td><td>Delayed</td></tr>
<tr><td colspan="2">Likely case for Soyuz cluster
(based on general habitat and rainfall data)</td><td></td></tr>
<tr><td>Soyuz cluster</td><td>Oct - Feb</td><td>Nov - Feb</td></tr>
</table>

10.4.2 Survey Coverage

The survey coverage of the Soyuz 4 Solar PV Park was comprehensive and sufficient even if only a 500 m distance on either side of the transect was the effective observation distance (**Figure 33**).

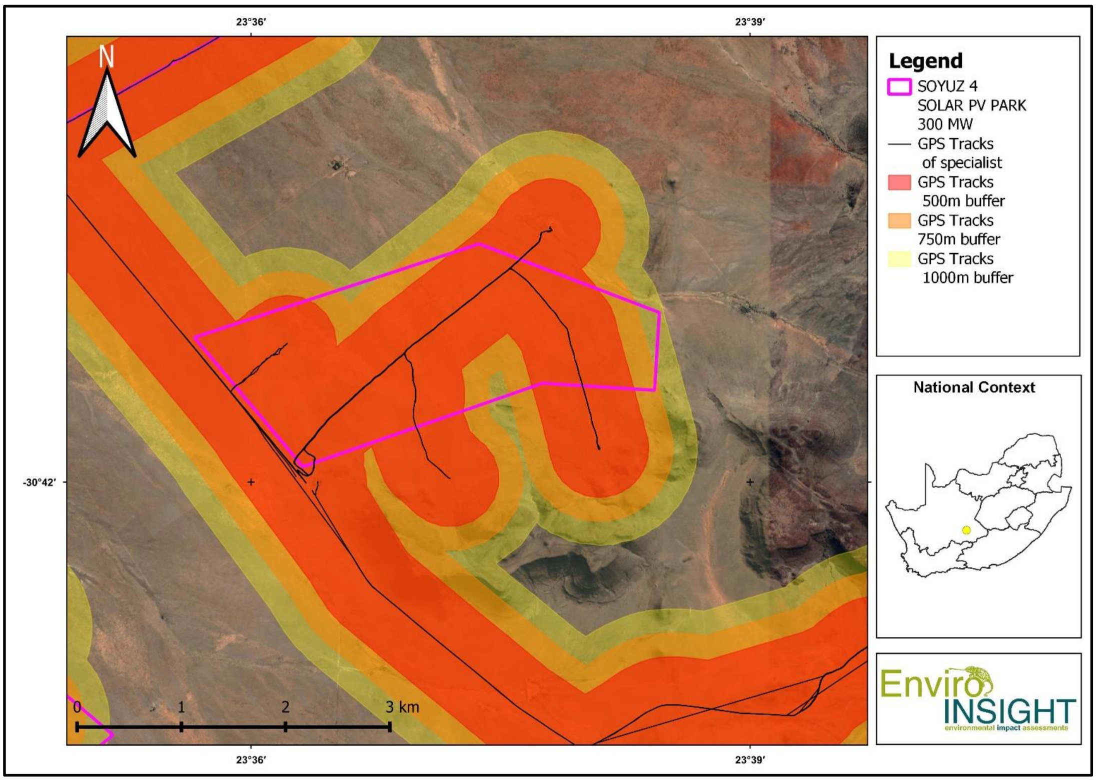


Figure 33:Avifauna survey coverage of the Soyuz 4 Solar PV Park

10.4.3 Local Habitats

The habitats observed within the Soyuz 4 Solar PV Park were consistent with the national landcover data (**Figure 32**) and consisted predominantly of grassland on soft sandy soils and scrubland on harder more stony soils (**Figure 34**). These habitats were fairly homogenous and occasionally formed mosaics along the ecotone between habitats. No major drainage lines or rocky ridge habitats were observed within the Soyuz 4 Solar PV Park boundary as provided by the client during the Scoping survey. However, subsequent refinement of the development area by the client spans the large drainage area in the south but all infrastructure avoids this sensitive habitat and its buffer. The major habitats are mapped in **Figure 35**.

Grassland on soft sandy soils

Scrubland/grassland mosaic on harder stony soils

Figure 34: Major habitat types of the Soyuz 4 Solar PV Park

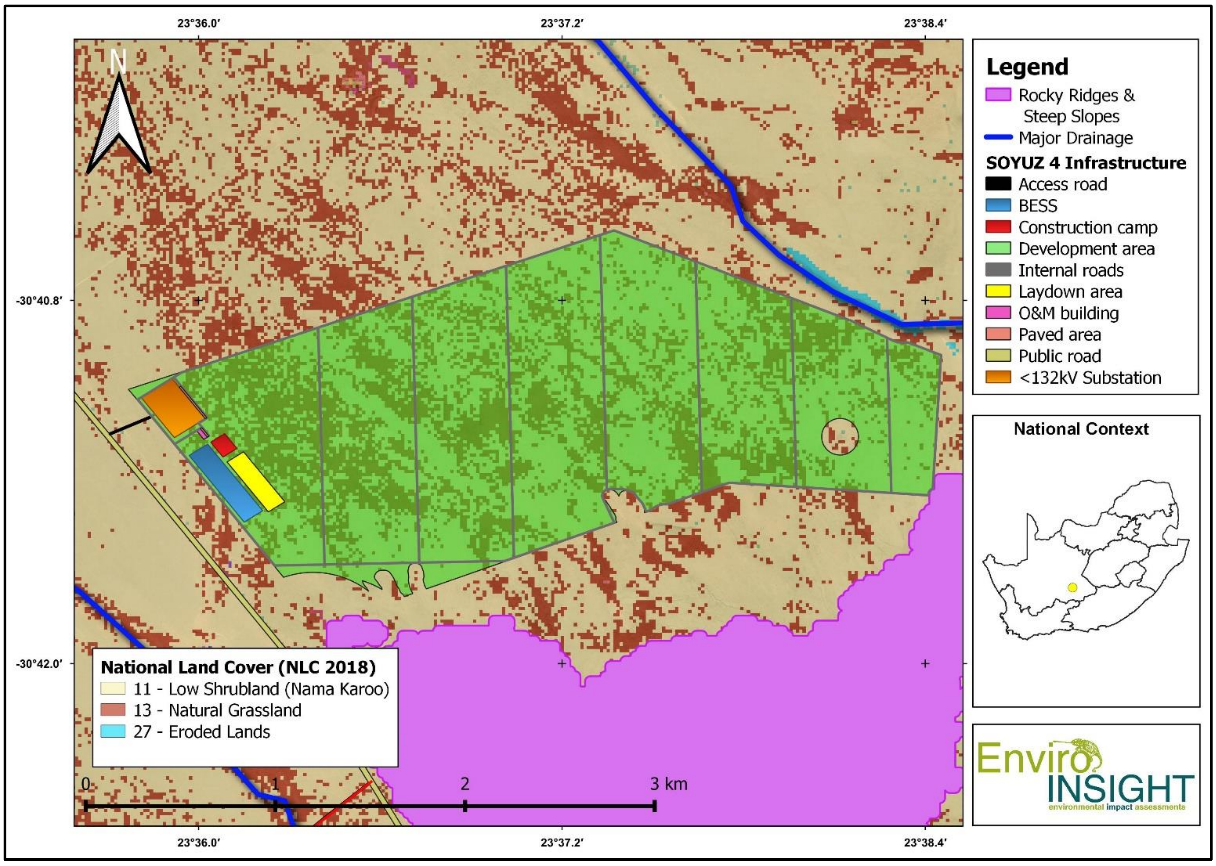


Figure 35: Site Major Types

10.4.4 Observed Avifauna

A total of 516 individuals representing 40 species were observed during the summer survey of the project site (**Table 12**). Of these, only one species is considered to be of conservation concern, namely the Ludwig's Bustard, which was observed twice (single individuals) within the Soyuz 4 Solar PV Park.

Encountered abundances of avifauna species groups are presented in **Table 13**, which demonstrates relatively low encounter rates for raptors (despite many observations of Lesser Kestrels) and very low encounter rates for waterbirds. Small-bodied species were dominant. Large-bodied species were dominated by the presence of Pied Crows. None of the encounter rates shown in Table 13 are considered to represent a potential concern for the proposed development.

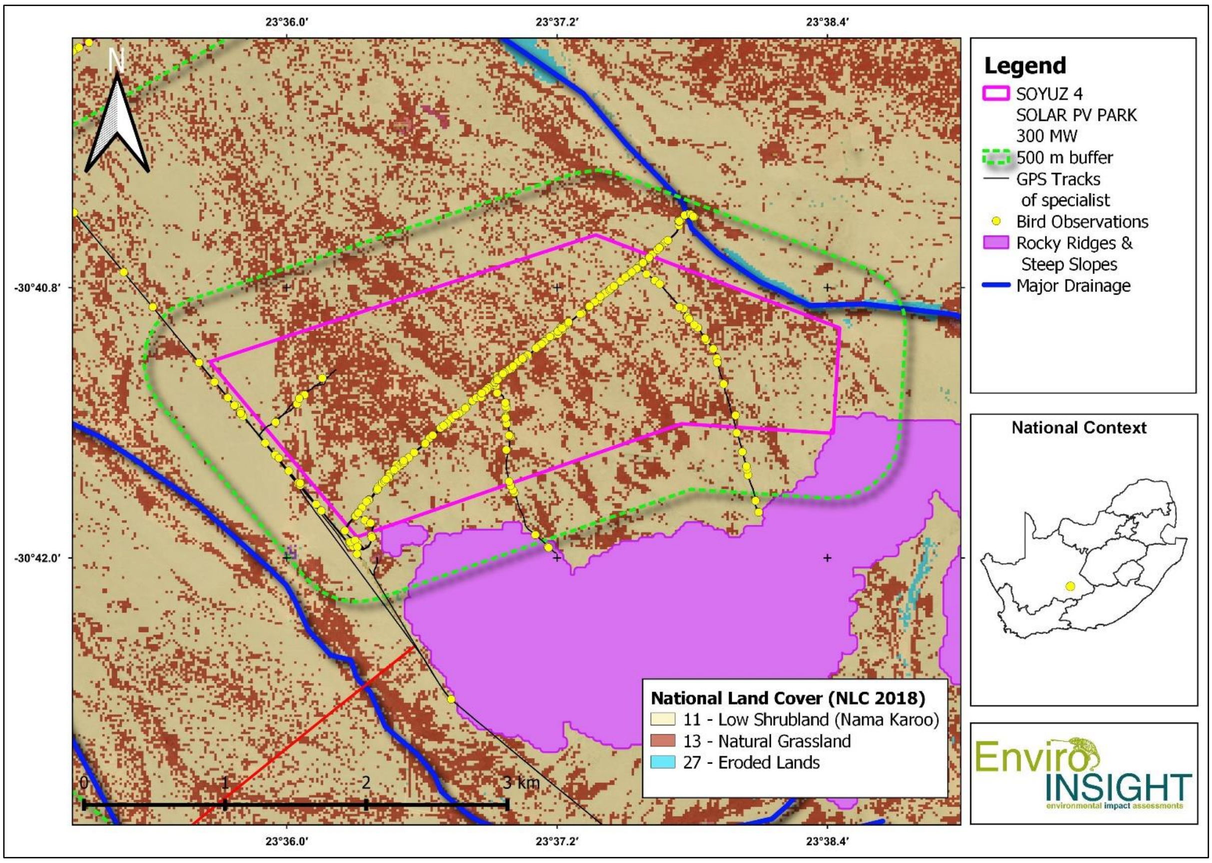


Figure 36: Habitat Delineation and Avifaunal Observations

Table 12: Observed Avifauna Species

COMMON NAME	SCIENTIFIC NAME	TOTAL
Northern Black Korhaan	*Afrotis afraoides*	15
Egyptian Goose	*Alopochen aegyptiaca*	2
African Pipit	*Anthus cinnamomeus*	3
Little Swift	*Apus affinis*	4
Common Swift	*Apus apus*	39
Jackal Buzzard	*Buteo rufofuscus*	1
Fawn-colored Lark	*Calendulauda africanoides*	2
Sabota Lark	*Calendulauda sabota*	14
Karoo Scrub Robin	*Cercotrichas coryphoeus*	18
Kalahari Scrub Robin	*Cercotrichas paena*	1
Spike-heeled Lark	*Chersomanes albofasciata*	42
Black-chested Snake Eagle	*Circaetus pectoralis*	3
Desert Cisticola	*Cisticola aridulus*	41
Zitting Cisticola	*Cisticola juncidis*	3
Grey-backed Cisticola	*Cisticola subruficapilla*	23
White-backed Mousebird	*Colius colius*	19
Speckled Pigeon	*Columba guinea*	11
Pied Crow	*Corvus albus*	17
White-throated Canary	*Crithagra albogularis*	9
Lark-like Bunting	*Emberiza impetuani*	19

COMMON NAME	SCIENTIFIC NAME	TOTAL
Yellow-bellied Eremomela	*Eremomela icteropygialis*	1
Amur Falcon	*Falco amurensis*	2
Large-billed Lark	*Galerida magnirostris*	5
Barn Swallow	*Hirundo rustica*	60
Southern Fiscal	*Lanius collaris*	1
Rufous-eared Warbler	*Malcorus pectoralis*	49
Chat Flycatcher	*Melaenornis infuscatus*	9
Pale Chanting Goshawk	*Melierax canorus*	1
Eastern Clapper Lark	*Mirafra fasciolata*	39
Ant-eating Chat	*Myrmecocichla formicivora*	9
Ludwig's Bustard	***Neotis ludwigii***	**2**
Namaqua Dove	*Oena capensis*	8
Cape Sparrow	*Passer melanurus*	2
Southern Masked Weaver	*Ploceus velatus*	4
Black-chested Prinia	*Prinia flavicans*	4
Red-billed Quelea	*Quelea quelea*	8
Scaly-feathered Weaver	*Sporopipes squamifrons*	14
Ring-necked Dove	*Streptopelia capicola*	3
Bokmakierie	*Telophorus zeylonus*	6
Red-faced Mousebird	*Urocolius indicus*	3
Grand Total	**40**	**516**

Table 13: Observed avifauna species groups during the summer survey of the proposed Soyuz 4-6 Solar Cluster

Date	Time (h)	Distance (m)	Small Bird (<30cm)	Large Bird (>30cm)	Raptors	Waterbirds
PV1	**7.9**	**33.8**	**618 [78.3/h; 18.3/km]**	**103 [13/h; 3/km]**	**22 [2.8/h; 0.7/km]**	**3 [0.4/h; 0.1/km]**
PV2	4.6	27.3	383 [83.2/h; 14/km]	42 [9.1/h; 1.5/km]	6 [1.3/h; 0.2/km]	1 [0.2/h; 0/km]
PV3	4.3	28.3	384 [89.2/h; 13.6/km]	46 [10.7/h; 1.6/km]	12 [2.8/h; 0.4/km]	5 [1.2/h; 0.2/km]
PV4	23.3	49.9	464 [19.9/h; 9.3/km]	50 [2.1/h; 1/km]	5 [0.2/h; 0.1/km]	5 [0.2/h; 0.1/km]
PV5	46.6	62.4	456 [9.8/h; 7.3/km]	75 [1.6/h; 1.2/km]	6 [0.1/h; 0.1/km]	6 [0.1/h; 0.1/km]
PV6	32.2	87.6	453 [14.1/h; 5.2/km]	91 [2.8/h; 1/km]	9 [0.3/h; 0.1/km]	21 [0.7/h; 0.2/km]
Total	118.9	289.3	2758 [23.2/h; 9.5/km]	407 [3.4/h; 1.4/km]	60 [0.5/h; 0.2/km]	41 [0.3/h; 0.1/km]

Note: presented as actual densities observed and by survey effort [per hour and per km]. The focal development, Soyuz 4 Solar PV Park, is highlighted in red.

10.4.5 Species of Conservation Concern (SOC)

Brief descriptions of each of the expected and observed SCC (**Table 14**) are provided below in context with the proposed Development Area.

Endangered species

- Ludwig's Bustard (*Neotis ludwigii*) is widely but patchily distributed across the arid interior of South Africa, extending into western Namibia (Shaw 2015). This species is particularly prone to fatalities caused by collisions with electricity transmission lines and is also susceptible to disturbance, as well as hunting and poisoning (Shaw 2015). This species was recorded during the survey in the Development Area and is considered a resident. It was also observed numerous times in the Soyuz Solar PV Park Cluster area. Although no lekking sites were observed despite specifically searching for them, the high density of individuals in the Soyuz Solar PV PArkCluster area could suggest that there are lekking sites in the area. Lekking sites are typically elevated areas compared to the surrounding landscape and therefore all such areas, indicated by the delineated "Rocky Ridges & Steep Slopes" have been pre-emptively buffered from development.
- The Tawny Eagle (*Aquila rapax*) is one of the most threatened eagles in South Africa with a high sensitivity to land transformation. They are known to have been electrocuted by overhead power lines (Taylor *et al.* 2015). They forage extremely widely and require tall structures (trees or electricity pylons) for breeding, which are absent in the proposed development area. This species is only expected to sporadically forage over the Development Area.
- Secretarybird (Sagittarius serpentarius) is listed as Endangered globally and Vulnerable regionally (Taylor et al., 2015; BirdLife International 2020). Secretarybirds favour open habitats for terrestrial foraging and seek out flat-top trees for nesting. This species has an extremely wide distribution across Africa but occurs at very low densities. It is prone to collision with powerlines and fences (from being flushed), while habitat loss and alteration are *also major regional threats (Retief 2015). Only a single individual was observed during the* survey, but this species is expected to be an infrequent visitor to the Development Area.
- The Black Harrier (*Circus maurus*) was not observed during the survey but was observed during the year-long preconstruction surveys of the proposed Soyuz 4-6 Wind Energy Facility (WEF) cluster project. It is most likely an infrequent seasonal visitor during the wetter times of the year. No nesting/breeding behaviour was observed nor are any of the habitats present considered as suitable breeding habitat. This species is strongly associated with wetlands, marshes and drainage lines, where it focusses its foraging activities and consequently, these habitats have been pre-emptively buffered from development.

Vulnerable species

- Lanner Falcon (*Falco biarmicus*) occurs widely across South Africa in nearly all open habitat types. Major threats include habitat loss and collisions with powerlines. No individuals were recorded within the Development Area during the surveys, but it was observed in the Soyuz SOLAR PV PARK Cluster area. This species is adept at using man-made structures such as transmission pylons as perches, sites to hunt from, and nesting sites. It is an infrequent visitor to the Development Area.

- Verreaux's Eagle (*Aquila verreauxii*) is quite widely distributed in South Africa, showing a preference for rocky ridges and mountains on which it breeds. The main threats facing this species in South Africa are direct persecution, drowning in farm dams, and collisions with and electrocutions on electricity transmission lines. Collisions with wind turbines is a growing threat. This species may occasionally forage over the Development Area but is not expected to breed there.
- Blue Crane (*Grus paradisea*) was recently downgraded from regionally Vulnerable to Near-Threatened (Taylor et al., 2015), but is still considered as globally Vulnerable (IUCN, 2023). The species was frequently observed foraging over the Soyuz SOLAR PV PARK Cluster area. No suitable breeding habitat was however observed. The species prefers open areas and it is considered as a regular foraging visitor in the region.
- Denham's Bustard (*Neotis denhami*) is very similar to Ludwig's bustard (described above) in its habitat requirements. It was not observed during the survey but was observed during the year-long preconstruction surveys of the proposed Soyuz 4-6 Wind Energy Facility (WEF) cluster project, indicating that it's not common in the region.

Near-Threatened species

- The Kori Bustard (*Ardeotis kori*) prefers foraging in open areas. The main threats to this species are habitat destruction (especially conversion to agriculture) and collision with overhead power lines (Taylor *et al.* 2015). This species was observed on multiple occasions in the Soyuz SOLAR PV PARK Cluster area and is considered a low density resident in the region.
- Karoo Korhaan (*Eupodotis vigorsii*) is a fairly common resident favouring areas close to drainage lines but also utilising open areas. Highly susceptible to collisions with powerlines and fences (from being flushed).

Table 14: Observed and expected avifauna species of conservation concern for the proposed Soyuz 4 Solar PV Park

Common Name	Scientific Name	# SABAP2 pentads (7 max)	Jan 2023 survey	Soyuz WEF surveys	Global Status (IUCN)	Regional Status (Taylor et al. 2015)	WEF Priority Species Rank
Ludwig's Bustard	*Neotis ludwigii*	3	X	X	EN	EN	14
Black Harrier	*Circus maurus*	-		X	EN	EN	6
Tawny Eagle	*Aquila rapax*	-	X	X	VU	EN	30
Verreaux's Eagle	*Aquila verreauxii*	1		X	LC	VU	3
Denham's Bustard	*Neotis denhami*	-		X	NT	VU	21
Lanner Falcon	*Falco biarmicus*	-	X	X	LC	VU	24
Secretarybird	*Sagittarius serpentarius*	-	X	X	EN	VU	13
Karoo Korhaan	*Eupodotis vigorsii*	5	X	X	LC	NT	51

Blue Crane	*Grus paradisea*	3	X	X	VU	NT	
Kori Bustard	*Ardeotis kori*	-	X	X	NT	NT	39

10.4.6 Summary of Soyuz 4 Solar PV Park Avifaunal Environment

Loss of foraging habitat and potential collisions with associated powerlines represents the major threats from the proposed development to the avifauna SCC discussed above. No loss of breeding habitat is expected from the proposed development.

10.5 EXISTING IMPACTS

Very low levels of existing impacts to avifauna were observed in the Soyuz 4 Solar PV Park during the surveys. Land use is almost exclusively low intensity livestock farming. Nevertheless, some potential impacts to avifauna observed on site include:

- **Livestock grazing** – reduces plant diversity and abundance and therefore habitat viability for foraging avifauna. However the low intensity of this practice is unlikely to have significantly altered the avifauna assemblage within the region.
- **Built infrastructure** – Some small farm structures, predominantly drinking facilities for livestock, are present which modify the habitat. Usually this is through the presence of a few alien trees which act as an attractant for avifauna and the trampling of vegetation by livestock which removes foraging habitat for birds.
- **Alien and invasive species** – Very few alien tree species are present, usually in association with the built infrastructure.

10.6 SITE ECOLOGICAL IMPORTANCE (SEI)

The SEI was evaluated for each of the avifauna habitats in the project area of influence, and the detailed evaluation is presented in **Table 15**. The spatial representation of this SEI evaluation, which does include the application of buffers for the drainage (100 m) and rocky ridge (30 m) habitats, is presented in **Figure 37**, from which can be seen that the proposed project infrastructure has no interaction with the Very High SEI and entirely interacts with the Medium SEI.

Table 15: Evaluation of Site Ecological Importance (SEI) of avifauna habitats in the project area of influence for the proposed Soyuz 4 Solar PV Park.

Habitat	Conservation Importance (CI)	Functional Integrity (FI)	Receptor Resilience (RR)	Site Ecological Importance (SEI)
Low Shrubland (Nama Karoo), Natural Grassland and Eroded Lands	**Medium** – Confirmed foraging habitat of Endangered Secretarybird (Global EN [A2acde+3cde+4acde]; Regional: VU, [A4acd; C1]) and Endangered Ludwig's Bustard (A4cd). Due to the extensive geographical distribution of both species and their low density occurrences in the habitats present in the Development Area, the CI is downgraded to **Low**. This is considered	**Very High** – Very large (> 100 ha) intact area for any conservation status of ecosystem type, high habitat connectivity serving as functional ecological corridors, minimal current negative ecological impacts.	**Medium** – Arid area habitats will typically recover slowly (~ more than 10 years) to restore > 75% of the original species composition and functionality. Scarification of landscape due to vegetation clearing remains visible for decades.	**MEDIUM (BI = Medium)**

Habitat	Conservation Importance (CI)	Functional Integrity (FI)	Receptor Resilience (RR)	Site Ecological Importance (SEI)
	appropriate given the buffering of optimal foraging habitat (Major Drainage) and the large number of protected areas in which both species occur.			
Major Drainage	High – Sporadic predicted occurrence of Black Harrier (EN [C1+2a(ii)]) utilising this habitat for foraging purposes. Confirmed preferred foraging habitat of Endangered Secretarybird (Global EN [A2acde+3cde+4acde]; Regional: VU, [A4acd; C1]) and Endangered Ludwig's Bustard (A4cd). Presence of moisture leads to greater probability and persistence of prey items, which is why it is preferred.	Very High – Very large (> 100 ha) intact area for any conservation status of ecosystem type, high habitat connectivity serving as functional ecological corridors, minimal current negative ecological impacts.	Medium – Arid area habitats will typically recover slowly (~ more than 10 years) to restore > 75% of the original species composition and functionality. Scarification of landscape due to vegetation clearing remains visible for decades.	**VERY HIGH (BI = Very High)**
Rocky Ridges & Steep Slopes	Medium – Highly likely lekking habitat of the Endangered Ludwig's Bustard (A4cd). Due to the importance of lekking habitat for the conservation of this species, and the fact that such habitat is limited in the landscape, the CI is upgraded to High. This is considered appropriate given the downgrading of CI for foraging habitat of this species.	Very High – Very large (> 100 ha) intact area for any conservation status of ecosystem type, minimal current negative ecological impacts. Despite the isolated nature of rocky ridges, this habitat is well connected by natural areas in-between.	Very Low – Habitat that is unable to recover from major impacts – complete functionality cannot be restored if any excavations or physical alterations take place on the rocky ridges itself.	**VERY HIGH (BI = Very High)**

Note: BI = Biodiversity Importance

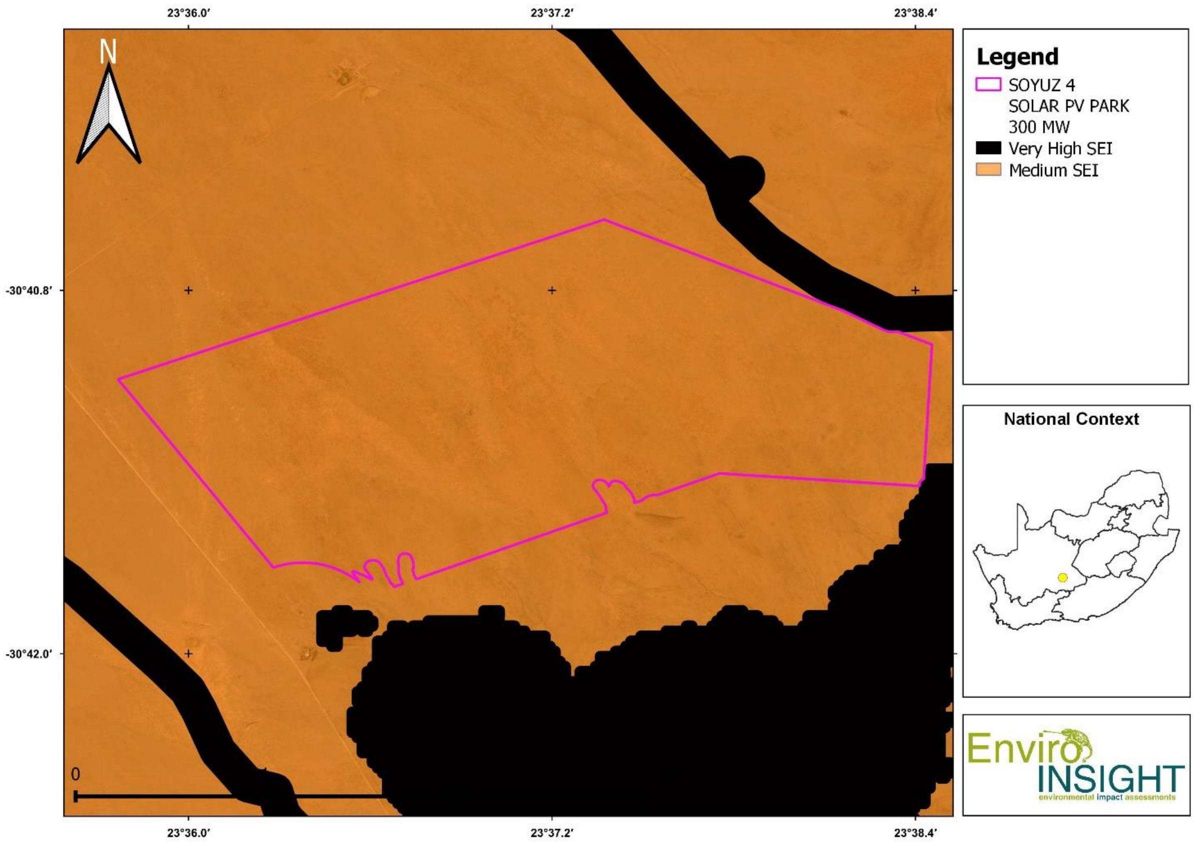


Figure 37: Avifauna Site Ecological Importance (SEI) for the proposed Soyuz 4 Solar PV Park

10.7 POTENTIAL AVIFAUNAL IMPACTS

The main anticipated environmental impacts on avifauna from the proposed Soyuz 4 Solar PV Park are described in **Figure 38**.

Habitat Loss

- The removal or alteration of large expanses of habitat specifically utilised by avifauna SCC

Collision and Electrocution

- Collisions with panels from the effects of polarized light and/or the "lake effect"
- Collisions/electrocutions with auxiliary infrastructure, specifically electrical transmission lines and security fences (vehicle induced flushing);

Disturbance

- Disturbance due to noise such as, machinery movements and maintenance operations during the construction and operational phase of the proposed SOLAR PV PARK;

Attraction to the Facility

- Attraction of certain bird species due to the development of SOLAR PV PARK with associated infrastructure such as perches, nest and shade opportunities.
- Chemicals used to keep the PV panels clean from dust (suppressants) may cause poisoning and or exacerbate habitat loss.

Figure 38: Avifauna Impacts Descriptions

Each of these potential impacts to avifauna are described and assessed in Section 24.

10.8 OPPORTUNITIES AND CONSTRAINTS

Following the appropriate buffering of the sensitive habitats for avifauna, a No-Go delineation was developed to indicate the areas where development of infrastructure should be avoided. By implication, the areas outside of the No-Go delineation and within the boundary of the Soyuz 4 Solar PV Park are considered developable. The opportunities (developable) and constraints (non-developable) map identified during the environmental scoping phase for the proposed the Soyuz 4 Solar PV Park remain relevant and are presented in **Figure 39**.

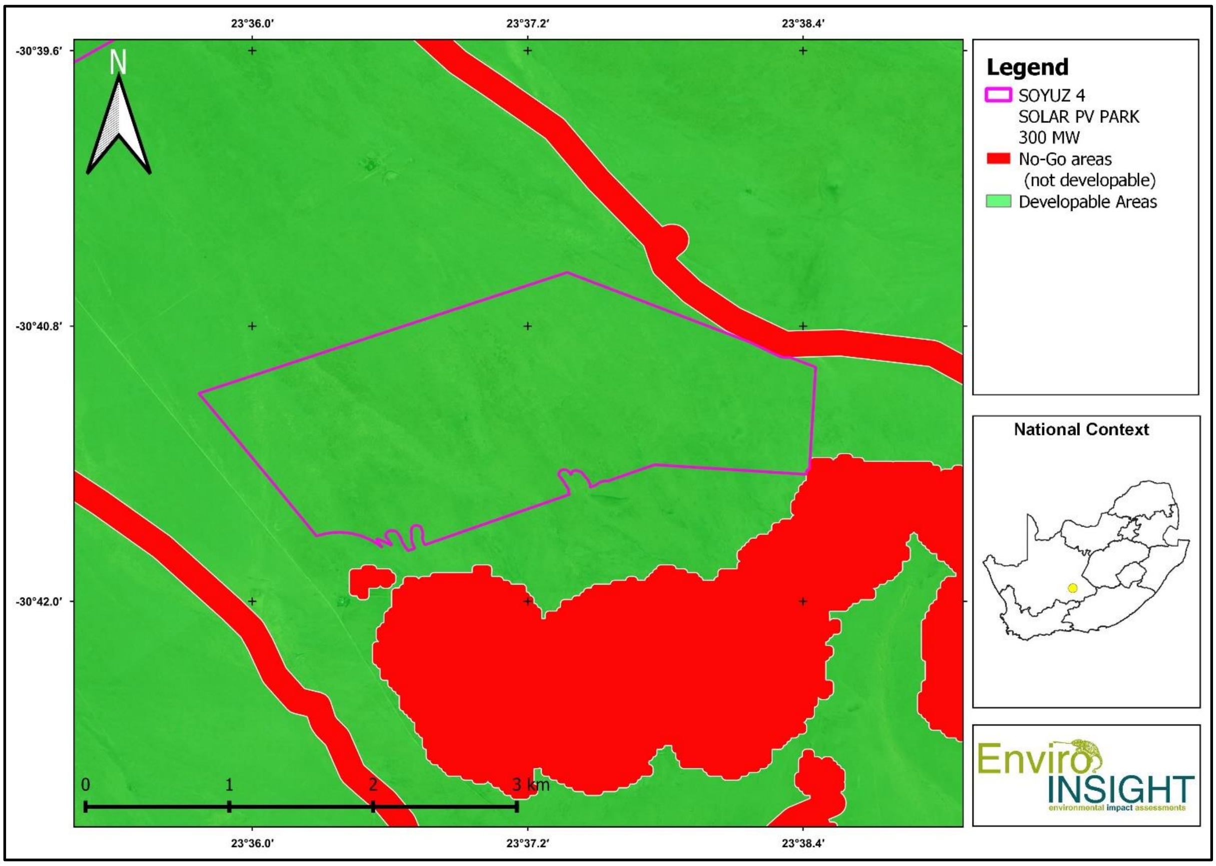


Figure 39: Avifaunal Opportunities and constraints (No-Go areas) map for the proposed the Soyuz 4 Solar PV Park

10.9 CONCLUSION OF AVIFAUNAL SPECIALIST

There are no major negative impacts to avifauna SCC expected from the proposed development, provided that the proposed mitigation measures recommended are applied. The Soyuz PV Cluster and proposed project activities are likely to represent a low risk to avifauna (after application of mitigation) and therefore, the same is true for the **Soyuz 4 Solar PV Park**. The avifauna specialist therefore recommends that DFFE should grant environmental authorisation (exclusive of any transmission lines which are to be evaluated separately), on condition that:

- All mitigation measures stipulated by the avifauna specialist are incorporated into the EMPr and are adhered to;
- The EMP must also include the necessity for post-construction avifauna monitoring as stipulated in Jenkins et al. (2017).

11 TERRESTRIAL BIODIVERSITY ASSESSMENT

TMG, on behalf of the Applicant appointed SAS (C/O Mr C Steyn) (hereinafter referred to as the “Terrestrial Specialist”) to undertake a Terrestrial Biodiversity Impact Assessment for the proposed Soyuz 4 Solar PV Park.

11.1 ASSESSMENT APPROACH

Maps and digital satellite images were generated prior to the field assessment to determine broad habitats, vegetation types and potentially sensitive sites. Relevant databases and documentation that were considered during the desktop assessment of the Soyuz 4 Solar PV Park included:

- National Protected Areas Expansion Strategy (NPAES) – 2018 database;
- The South African Conservation Areas Database, Quarter 3 (SACAD, 2022);
- The South African Protected Areas Database, Quarter 3 (SAPAD, 2022);
- The Northern Cape Critical Biodiversity Areas (CBA) Map, including the following datasets and research documents:
    - 2016 Northern Cape Critical Biodiversity Areas (Northern Cape DAEARDLR, 2016a);
    - 2016 Northern Cape Critical Biodiversity Areas Reason (Northern Cape DAEARDLR, 2016b); and
    - Critical Biodiversity Areas of the Northern Cape: Technical Report (Holness et al. 2016).
- The National Vegetation Map Project (VEGMAP), with the below vector dataset used for information on Biomes, Bioregions and Vegetation Type(s):
    - 2018 Final Vegetation Map of South Africa, Lesotho, and Swaziland (SANBI 2006–2018; SANBI, 2018a).
- The 2022 Red List of Ecosystems (RLE) for the terrestrial realm for South Africa (SANBI 2022a and 2022b);
- From the National Biodiversity Assessment (NBA, 2018) Terrestrial Assessment project (Skowno et al., 2019):
    - 2018 Terrestrial ecosystem threat status and protection level - remaining extent (SANBI, 2018b); and
    - 2018 Terrestrial ecosystem threat status and protection level layer (SANBI, 2018c).
- The Important Bird and Biodiversity Areas (IBA) Programme and vector dataset (BirdLife South Africa, 2015; Marnewick et al., 2015a and 2015b), in conjunction with the South African Bird Atlas Project 2 (SABAP 2);
- The International Union for Conservation of Nature (IUCN);
- The National Web-Based Environmental Screening Tool (accessed 2022); and
- From the 2017 Strategic Water Source Areas (SWSA) project:
    - 2017 SWSA Surface water (Water Research Commission, 2017)

The field assessment took place to determine the ecological status of the Soyuz 4 Solar PV Park and to “ground-truth” the results of the desktop assessment.

11.2 DESKTOP ASSESSMENT – CONSERVATION CHARACTERISTICS

The Conservation Characteristics of the study area as determined by the desktop assessment are summarised as a “dashboard” in **Table 16** .

Table 16: Summary of the conservation characteristics for the Soyuz 4 Solar PV Park (Quarter Degree Square (QDS) 3023 DA).

DETAILS OF THE SOYUZ 4 SOLAR PV PARK IN TERMS OF MUCINA & RUTHERFORD (2006) AND THE NATIONAL VEGETATION MAP PROJECT (SANBI, 2018A) - ORIGINAL EXTENT OF MAPPED VEGETATION TYPE		
BIOME		Soyuz 4 Solar PV Park is situated within the **Nama-Karoo Biome**.
BIOREGION		Soyuz 4 Solar PV Park is located within the **Upper Karoo Bioregion.**
VEGETATION TYPES		**Northern Upper Karoo (Nku3) Covering the entire Soyuz 4 Solar PV Park**
ALTITUDE (M)		1 000–1 500 m
CLIMATE		Rainfall peaks in autumn (March)
CLIMATE	**MAP (mm)**	275
	MAT (°C)	16.5
	MFD (Days)	37
	MAPE (mm)	2615
	MASMS (%)	83
DISTRIBUTION		Northern Cape and Free State Provinces: Northern regions of the Upper Karoo plateau from Prieska, Vosburg and Carnarvon in the west to Philipstown, Petrusville and Petrusburg in the east. Bordered in the north by Niekerkshoop, Douglas and Petrusburg and in the south by Carnarvon, Pampoenpoort and De Aar. A few patches occur in Griqualand West
GEOLOGY AND SOILS		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.
CONSERVATION		**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 (Houwater, Kalkfontein and Smart Syndicate 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%). *Prosopis glandulosa*, regarded as one of the 12 agriculturally most important invasive alien plants in South Africa, is widely distributed in this vegetation type (Hoffman et al. 1999). Prosopis occurs in generally isolated patches, with densities ranging from very scattered to medium (associated with the lower Vaal River drainage system and the confluence with the Orange River) to localised closed woodland on the western border of the unit with Bushmanland Basin Shrubland.
VEGETATION AND LANDSCAPE FEATURES		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.

DETAILS OF THE SOYUZ 4 SOLAR PV PARK IN TERMS OF THE 2018 NATIONAL BIODIVERSITY ASSESSMENT- REMAINING EXTENT OF MAPPED VEGETATION TYPE		
NBA (2018): ECOSYSTEM PROTECTION LEVEL AND ECOSYSTEM THREAT STATUS	The NBA indicates the perceived remaining extent of vegetation types. The Soyuz 4 Solar PV Park is located within the Northern Upper Karoo which is considered **Least Concerned (LC)** and **Not Protected (NP).** The NBA is the primary tool for monitoring and reporting on the state of biodiversity in South Africa. Two headline indicators that are applied to both ecosystems and species are used in the NBA: **threat status** and **protection level**. Ecosystem threat status tells us about the degree to which ecosystems are still intact or alternatively losing vital aspects of their structure, function, and composition, on which their ability to provide ecosystem services ultimately depends. Ecosystem types are categorised as Critically Endangered (CR), Endangered (EN), Vulnerable (VU) or LC, based on the proportion of each ecosystem type that remains in good ecological condition relative to a series of thresholds. Ecosystem protection level tells us whether ecosystems are adequately protected or under-protected. Ecosystem types are categorised as not protected, poorly protected, moderately protected or well protected, based on the proportion of each ecosystem type that occurs within a protected area recognised in the NEMPAA.	
NATIONAL THREATENED ECOSYSTEMS ASSOCIATED WITH THE SOYUZ 4 SOLAR PV PARK (2011 AND PROPOSED 2021)		
NATIONAL RED LISTED ECOSYSTEMS (2022)	According to the 2022 RLE, the Soyuz 4 Solar PV Park is within LC ecosystems, namely the Northern Upper Karoo. The purpose of the list of threatened terrestrial ecosystems is an important input into spatial planning and decision making in South Africa. The list and the spatial data underpinning it is referred to in national regulations relating to EIA; specifically – CR and EN ecosystem types trigger additional steps and processes during EA processes. The data will also become part of the Environmental Screening Tool developed by the DFFE which all prospective developers are required to complete prior to the EA process. The remnants of the threatened types are input features in systematic biodiversity plans and are mostly absorbed as part of the CBA network.	
CONSERVATION DETAILS PERTAINING TO THE AREA OF INTEREST (VARIOUS DATABASES)		**NATIONAL WEB BASED ENVIRONMENTAL SCREENING TOOL (accessed 2022)**
IMPORTANT BIRD AND BIODIVERSITY AREAS (IBA) (2015)	No IBA's are located within the Soyuz 4 Solar PV Park however, the Platberg Karoo Conservancy is located approximately 8km east of the Soyuz 4 Solar PV Park (IBA, 2015). This IBA contributes significantly to the conservation of large terrestrial birds and raptors. These include Blue Crane *Anthropoides paradiseus*, Ludwig's Bustard *Neotis ludwigii*, Kori Bustard *Ardeotis kori*, Blue Korhaan *Eupodotis caerulescens*, Black Stork *Ciconia nigra*, Secretarybird *Sagittarius serpentarius*, Martial Eagle *Polemaetus bellicosus*, Verreauxs' Eagle *Aquila verreauxii* and Tawny Eagle *A. rapax*.	The screening tool is intended to allow for pre-screening of sensitivities in the landscape to be assessed within the EA process. This assists with implementing the mitigation hierarchy by allowing developers to adjust their proposed development footprint to avoid sensitive areas

<table>
<tr>
<td rowspan="3">SAPAD (2022, Q3); SACAD (2022, Q3); NPAES (2018); AND SWSA (2017)</td>
<td rowspan="3">The various datasets associated with nationally protected areas (i.e., SAPAD, and NPAES) do not indicate any protected areas or focus areas within 10 km of the Soyuz 4 Solar PV Park .

The various national conservation areas checked for the Soyuz 4 Solar PV Park (i.e., SACAD, SWSA) did not indicate the Soyuz 4 Solar PV Park to be within 10 km of any conservation areas. For the SWSA, only the surface water was checked for the terrestrial biodiversity assessment. Refer to the Freshwater report (SAS 22- 1182) for details on underground SWSA.</td>
<td>Animal Species Theme[4]</td>
<td>The Animal Species Theme for the Soyuz 4 Solar PV Park was identified to be of medium sensitivity.
Trigger species as indicated by the screening tool;
- Medium: Aves- Neotis ludwigii (Ludwig's Bustard: EN)</td>
</tr>
<tr>
<td>Terrestrial Biodiversity Theme</td>
<td>For the Terrestrial Biodiversity Theme, the Soyuz 4 Solar PV Park has an overall low sensitivity.</td>
</tr>
<tr>
<td>Plant Species Theme</td>
<td>The Plant Species Theme for the Soyuz 4 Solar PV Park was identified to be of medium sensitivity. However, most of the Soyuz 4 Solar PV Park is identified as low sensitivity area with only a small section on the north western boundary classified as mediums sensitivity for the plant species theme.
Trigger species as indicated by the screening tool;
Medium: Tridentea virescens (Rare; R)</td>
</tr>
<tr>
<td colspan="4">NORTHERN CAPE PROVINCIAL SPATIAL DEVELOPMENT FRAMEWORK (NCPSDF, 2019)</td>
</tr>
<tr>
<td colspan="4">The NCPSDF is to function as an innovative strategy that will apply sustainability principles to all forms of land use management throughout the northern cape as well as to facilitate practical results, as it relates to the eradication of poverty and inequality and the protection of the integrity of the environment.</td>
</tr>
<tr>
<td colspan="4">The Soyuz 4 Solar PV Park is not located within any development corridors.</td>
</tr>
<tr>
<td colspan="4">RENEWABLE ENERGY DEVELOPMENT ZONES AND CORRIDORS</td>
</tr>
<tr>
<td colspan="4">The proposed Soyuz 4 Solar PV Park within the Britstown solar cluster is not present within any renewable energy development zone (REDZ). Furthermore, according to the South African Renewable Energy EIA Application Database (REEA, 2021) there are twenty-two applications for renewable energy facilities (wind and solar) within a 50 km radius of the Soyuz 4 Solar PV
Park, of which thirteen have been approved, three has lapsed or have been withdrawn and six is still in the process. This indicates that the larger region has been earmarked for renewable energy facilities, which may alter the landscape character.</td>
</tr>
<tr>
<td colspan="4">STRATEGIC TRANSMISSION CORRIDORS</td>
</tr>
<tr>
<td colspan="4">The five strategic transmission corridors were assessed as part of the 2016 Electricity Grid Infrastructure (EGI) Strategic Environmental Assessment (SEA). These corridors were Gazetted for implementation on 16 February 2018 in government Gazette 41445, GN 113. The gazette documented notice given by the minister of environmental affairs of alternative procedures to be followed when applying for environmental authorisation for large scale electricity transmission and distribution development activities, identified in terms of section 24(2)(a) of the NEMA in the identified strategic transmission corridors (i.e. Areas declared as geographical areas of strategic importance).</td>
</tr>
<tr>
<td colspan="4">The proposed Soyuz 4 Solar PV Park within the Britstown Solar Cluster is located within the Central Corridor of the Strategic Transmission Corridors.</td>
</tr>
</table>

NORTHERN CAPE CRITICAL BIODIVERSITY AREAS (2016)	
Other Natural Areas (ONA)	The entire extent of the Soyuz 4 Solar PV Park is comprised of areas classified as ONAs. According to the Technical Guidelines for CBA Maps document, ONA consist of all those areas in good or fair ecological condition that fall outside the protected area network and have not been identified as CBAs or ESAs (SANBI, 2017).

Areas Database; SAPAD = South African Protected Areas Database; IBA = Important Bird Area; MAP – Mean annual precipitation; MAT – Mean annual temperature; MAPE – Mean annual potential evaporation; MFD = Mean Frost Days; MASMS – Mean annual soil moisture stress (% of days when evaporative demand was more than double the soil moisture supply).

11.3 FAUNAL ASSESSMENT

11.3.1 Assessment Approach

The field assessment was undertaken during summer (16th January – 20th of January 2023), to determine the faunal ecological status of the Soyuz 4 Solar PV Park. A reconnaissance 'walkabout' was initially undertaken to determine the general habitat types found throughout the sites where the Soyuz 4 Solar PV Park will occur. Following this, specific study sites were selected that were representative of the habitats found within the sites, with special emphasis being placed on areas that may potentially support faunal SCC. Sites were investigated on foot to identify the occurrence of fauna within the sites. Sherman and camera traps were used to increase the likelihood of capturing and observing mammal species, notably nocturnal and reclusive mammals.

To accurately determine the PES of the habitat and associated faunal assemblages within the sites and capture comprehensive data with respect to faunal taxa, the following methodology was applied:

- Maps and digital satellite images were consulted prior to the field assessment to determine broad habitats, vegetation types and potentially sensitive sites. An initial visual on-site assessment of the sites was made in order to confirm the assumptions made during consultation of the digital satellite imagery;
- A literature review with respect to habitats, vegetation types and species distribution was conducted;
- Relevant databases considered during the assessment of the proposed Soyuz 4 Solar PV Park activities included online atlases on the Animal Demography Unit (ADU) Virtual Museum website; the Important Bird and Biodiversity Areas (IBA, 2015); International Union for Conservation of Nature (IUCN); iNaturalist website; South African National Biodiversity Institute (SANBI) Red List of South African Species; the Northern Cape Biodiversity Areas Database (2016), the DFFE Screening Tool and the National Biodiversity Assessment (NBA, 2018).
- **Sensitivity mapping -** All the ecological features associated with the sites were considered, and sensitive areas were assessed. In addition, identified locations of protected species were marked by means of Global Positioning System (GPS). A Geographic Information System (GIS) was used to project these features onto satellite imagery and/or topographic maps. The sensitivity map should guide the final design and layout of the Soyuz 4 Solar PV Park.
- **Faunal Species of Conservation Concern** - During field assessments, it is not always feasible to identify or observe all species within an area, largely due to the secretive nature of many faunal species, possible low population numbers or varying habits of species. As such, and to specifically assess an area for faunal SCC, a Probability of Occurrence (POC) estimation is used, considering several factors to determine the probability of faunal SCC occurrence within the sites. Species listed in Appendix B of Appendix B and those which were listed in the screening tool whose known distribution ranges and habitat preferences include the proposed infrastructure development sites were taken into consideration. Faunal species likely to occur within the Soyuz 4 Solar PV Park are indicated and briefly discussed within each of the relevant dashboards, along with their POC.

11.3.2 Faunal Habitat

During the site assessment, two habitat units were identified within the Soyuz 4 Solar PV Park footprint area, namely plains and freshwater ecosystems:

- **Plains Habitat:** This habitat is considered largely natural and representative of the reference vegetation type. The plains habitat can further be split into two sub-units, namely:
  - Open Karoo veld;
  - Upper Karoo footslope.

  Although these two sub-units differed in vegetative structure and plant species composition, there were still some shared plants species between them. These habitat units provided suitable habitat for a diversity of faunal species common to the region. Further, the alternating vegetation structure, albeit absent of large woody species, does provide increase habitat opportunities for various species. These two sub-units were predominantly favoured by species that select for more open areas, as well as smaller species which rely on the dense woody shrubs for refuge. This habitat is relatively open and unrestricted, with habitat connectivity being unimpeded, allowing for fauna to move through, and in and out the Soyuz 4 Solar PV Park without restriction.
- **Freshwater Ecosystem Habitat:** The freshwater habitat comprised of Episodic Drainage Lines, located at the north-eastern and southern boundaries of the Soyuz 4 Solar PV Park. These drainage lines are typically channelled features which did not have riparian vegetation. During the assessment it was evident that these drainage lines had small catchments and contained water for a very limited period of time. As the drainage lines were not notably different in terms vegetation structure, they provided similar degrees of habitat for fauna to that of the surrounding areas. The drainage line may however serve as movement corridors for more secretive and recluse species which wish to avoid detection. Food resources within this habitat were on par with that of the plains habitat, whilst the limited hydroperiod of the drainage lines does not provide increased opportunities for water dependant species, notably amphibians.

The habitats identified are depicted on **Figure 40** and Error! Reference source not found..

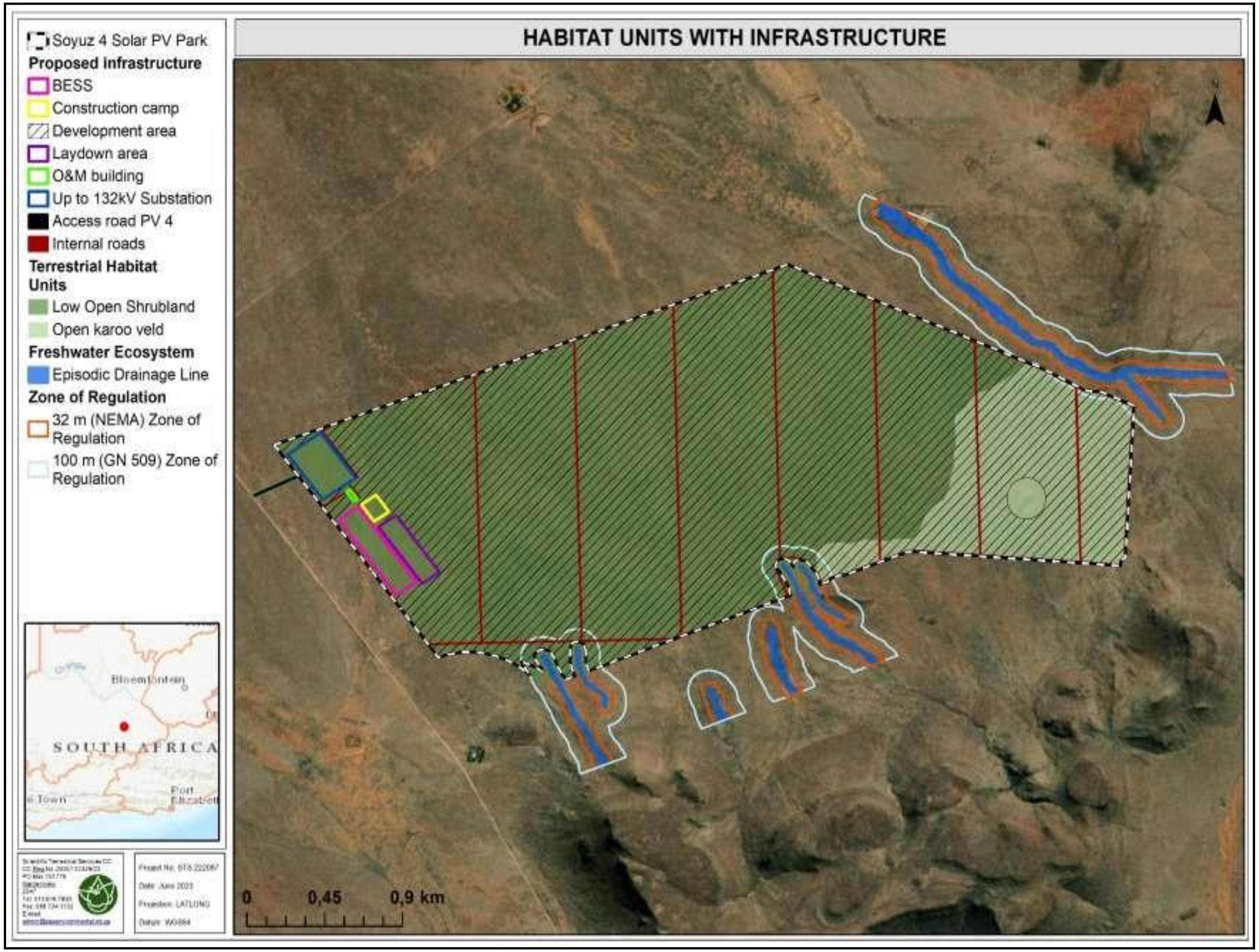


Figure 40: Habitat units associated with the Soyuz 4 Solar PV Park

11.3.3 Mammal Observations

Table 17: Field assessment results pertaining to mammal species within the Soyuz 4 Solar PV Park.

MAMMALS REFERENCE PHOTOGRAPHS


Photographs - Top: (Left to right) *Cryptomys hottentotus (Common Mole-rat) and Raphicerus campestris (Steenbok).*

DISCUSSION

The majority of the Soyuz 4 Solar PV Park comprises of large open space areas, with little anthropogenic structures or activities that may hinder species movement. Mammal species are free to move both within and out of the Soyuz 4 Solar PV Park, maintaining continued ecological connectivity. Although there are several fences present, the mammal species in the region appear to be well adept at moving past these boundaries, either by jumping over, climbing under or in some instances where possible, through the fence itself. As this is an arid region, continued large scale habitat connectivity is important as food and water resources will be limited requiring mammals, notably larger mammals, to cover greater distances to meet their individual energy demands and hydration needs. The habitat within the Soyuz 4 Solar Park is not considered unique to the region nor are there niche areas which would support isolated or endemic populations. Mammal species observed during the site assessment, as well as those contained in the relevant databases, are common and widespread throughout the region.

MAMMAL SCC

Species	Habitat and Resources in the project boundary	RSA Status	POC
Vulpes chama (Cape Fox)	This species is extremely secretive with a nocturnal or crepuscular lifestyle. Inhabits drier parts of the country. Preys upon small mammals, insects, birds, reptiles, fruits and carrion. This species will forage through the Soyuz 4 Solar PV Park as well as the surrounding areas. The Soyuz 4 Solar PV Park will lead to loss of habitat and foraging grounds, but not to such an extent that it will pose a threat to this species or conservations thereof.	P TOPS	Low
Hyaena brunnea (Brown Hyaena)	This species is extremely secretive with a nocturnal or crepuscular lifestyle. Inhabits drier parts of the country. Preys upon rodents but will also feed upon small reptiles. This species will forage across a large area, with the Soyuz 4 Solar PV Park likely only forming a small part of this species overall home range. The Soyuz 4 Solar PV Park will lead to loss of habitat and foraging grounds, but not to such an extent that it will pose a threat to this species or conservations thereof.	P TOPS	Medium
Orycteropus afer (Aardvark)	This species is extremely secretive with a nocturnal or crepuscular lifestyle. Inhabits the savanna, grasslands and woodlands parts of the country. Preys upon ants and termites. This species is known to forage over large distances, notably in the arid regions. The Soyuz 4 Solar Park will lead to loss of foraging ground for this species, however at present there is suitable and sufficient habitat remaining in the surrounding area for this species.	P TOPS	Confirmed

CONCLUDING REMARKS

The Soyuz 4 Solar PV Park is located within a largely functional and ecologically intact landscape that can support mammal species similar to the region. The Soyuz 4 Solar PV Park is located in an area that is primarily used for livestock farming and it is highly likely that predatory animals will be eradicated as these animals will potentially utilise livestock as a food source.

The Soyuz 4 Solar PV Park did not provide any unique or niche habitat for mammal species, and as such, the risk to specialist mammal species is low The main impact that will occur within the Soyuz 4 Solar PV Park is considered to be habitat loss, along with the inevitable displacement of mammal species from these footprint areas. For a full list of observed mammal species of the Soyuz 4 Solar PV Park, refer to Appendix C.

The Screening Tool indicated a medium sensitivity for the Animal Species Theme for the Soyuz 4 Solar PV Park. Following the assessment of the site, it is the opinion of the specialist that the sensitivity rating is correct and aligns with the field results.

11.3.4 Herpetofauna (Reptiles and Amphibians) Observations

Table 18: Field assessment results pertaining to herpetofauna within the Soyuz 4 Solar PV Park.

HERPETOFAUNA REFERENCE PHOTOGRAPHS


Photographs: (Left to right) *Stigmochelys pardalis* (Leopard Tortoise) and*Agama aculeata aculeata* (Common Ground Agama)

DISCUSSION

Reptiles are inherently well adapted to surviving within arid regions, largely as they are not reliant of permanent water sources, but also as they can regulate their metabolic rates, syncing with seasonal changes as well as food availability. This ability allows reptiles to survive in areas where regular food resources are not always readily available and often highly seasonal. The Soyuz 4 Solar PV Park lacks habitat with rocky areas and outcrops, however suitable burrowing substrate (deep sandy soils) provide suitable habitat in which reptiles can easily excavate burrows. Woody species and dead wood on the ground will further provide shelter and areas of refuge for reptiles, notably small skinks and lizards. Reptile species within the Soyuz 4 Solar PV Park are not limited in terms of habitat connectivity, however smaller skinks and lizards are more restricted in terms of home ranges and are less likely to expend energy reserves moving over large distances. As such, these smaller reptiles were notably more common within the Soyuz 4 Solar PV Park. The episodic drainage lines are highly ephemeral in nature. This is a result of the region's dry climate, coupled with high rates of rainfall infiltration due to the dominance of sandy soils in the region, resulting in the drainage lines remaining dry for extended periods of time. Other than the episodic drainage lines, no further freshwater systems (permanent or temporary), occur within the Soyuz 4 Solar PV Park. As such, suitable habitat for water dependant amphibians is absent from the site, which significantly limits amphibian species, as very few can survive in such dry conditions. *Poyntonophrynus vertebralis* (Pygmy Toad) and *Cacosternum boettgeri* (Boettger's Dainty Frog) do show increased tolerance to dry conditions and have been recorded further south of the Soyuz 4 Solar PV Park. These species were however observed in close association with artificial water bodies in the area, none of which occur in the Soyuz 4 Solar PV Park.

HERPETOFAUNA SCC			
Species	**Habitat and Resources in the project boundary**	**RSA status**	**POC**
Python natalensis (African Rock Python)	*Python natalensis* (African Rock pythons) often utilize burrows dug by *Orycteropus afer* (Aardvark) and other burrowing mammals to lay eggs, escape to when disturbed or when the outside temperatures increase. These snakes are ambush predators that kill by constriction. They wait silently for a suitable prey item to move into striking range. Pythons will feed on a variety of small and medium sized mammals, depending on the size of the snake. Smaller snakes may also prey upon lizards and frogs.	TOPS	Medium
CONCLUDING REMARKS			
Reptiles, notably skinks and lizards, were abundant within the Soyuz 4 Solar PV Park, whilst predatory snakes which are known to occupy the immediate area but were not observed during the site assessment. Amphibian species are not expected to occur within the Soyuz 4 Solar PV Park, largely due to the lack of suitable moisture-driven habitat. Overall, the Soyuz 4 Solar PV Park can be considered largely homogenous in terms of habitat provisioning for herpetofauna, lacking any unique or niche habitats that may support increased species diversity or unique species assemblages, such as wetland systems or rupicolous habitat. As such, the herpetofauna species composition of the Soyuz 4 Solar PV Park does not differ from the surrounding areas nor does it provide increased opportunities for SCC occurrence. Habitat loss is the main impact that will occur, along with the inevitable displacement of species from the footprint area. For a full list of observed herpetofauna species observed please refer to Appendix C of the Terrestrial Biodiversity Impact Assessment Report. The Screening Tool indicated a medium sensitivity for the Animal Species Theme for the Soyuz 4 Solar PV Park. Following the assessment of the site, it is the opinion of the specialist that the sensitivity rating is correct and aligns with the field results.			

11.3.5 Invertebrates (Insects and Arachnids) Observations

Table 19: Field assessment results pertaining to invertebrates within the Soyuz 4 Solar PV Park

INVERTEBRATE REFERENCE PHOTOGRAPHS

Photographs - (Left to right) *Sternocera orissa* (Giant Jewel Beetle, NYBA) and *Eurychora sp.* (Mouldy Beetle).

DISCUSSION

Insects and arachnids that area adapted to arid nature present within the Soyuz 4 Solar PV Park will utilise these areas for feeding and breeding habitat. The relatively homogenous structure and absence of niche habitat within the Soyuz 4 Solar PV Park such as natural ridges, rocky outcrops and wetlands does limit the occurrence of specialist invertebrate species. Many of the species observed belong to the Order Lepidoptera (Butterflies and Moths), with these species often being transitory/migratory species, moving over large expanses of land. Some species of butterflies are known to move en masse through areas, following the early summer rains and accompanied floral blooms, on which they rely for food resources, obtaining energy requirements from the nectar in flowers. Many other insects follow similar life cycles, coinciding with peak rainfall events to ensure that there has been sufficient plant growth to sustain them. This emergence of insects also provides an important increase in food resources for a diversity of insectivorous species from other faunal classes. In addition to serving as important food resources, insects provide other important ecological functions, notably removal of waste material (carrion and dung), often cycling the material back into the earth which increases soil fertility. Conversely, a decreased abundance of insect species will have a notable knock-on effect on other species, due to the diminishing of available food resources.

Although several arachnid species were observed at the time of assessment, it is likely that the abundance thereof will be higher, given the secretive and often nocturnal nature of such species. As expected, spiders appeared to be the most abundant arachnids in the Soyuz 4 Solar PV Park, with numerous *Stegodyphus mimosarum* (Community Nest Spider) being observed. The recent good rainfall resulted in a notable increase in plant growth, insect populations species and comparatively, an increase in arachnid numbers. This increase in available food resources was likely a contributing factor for the increased observation rate of arachnid species during the site assessment.

INVERTEBRATE SCC

Species	Habitat and Resources in the project boundary	RSA Status	POC
Opistophthalmus sp (Burrowing Scorpion)	This species can often be found under rocks and fallen trees/dead wood where it excavates a burrow under these structures for refuge. This species will stay enclosed in its burrow during the day, emerging to hunt at night. This species may also burrow into the softer sands wherever present.	P	Medium

CONCLUDING REMARKS

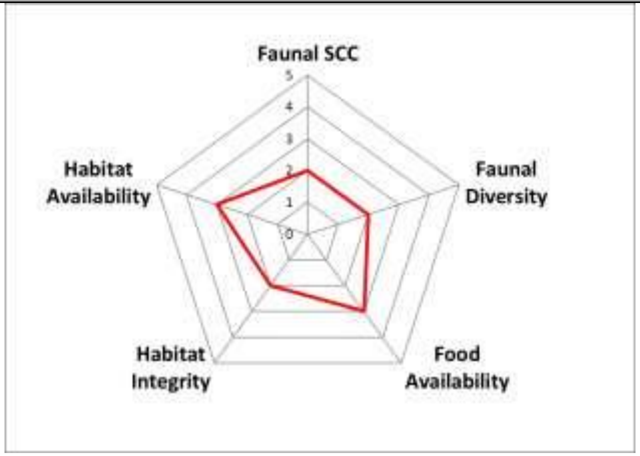
The Soyuz 4 Solar PV Park was largely homogenous in terms of habitat provisioning for invertebrate species, lacking notably unique or niche habitat for invertebrate species. Habitat loss and the resultant loss of ecological connectivity are considered to be the main impacts that will occur, along with the inevitable displacement of species from the footprint areas. For a full list of observed invertebrate species of the Soyuz 4 Solar PV Park, refer to Appendix C.

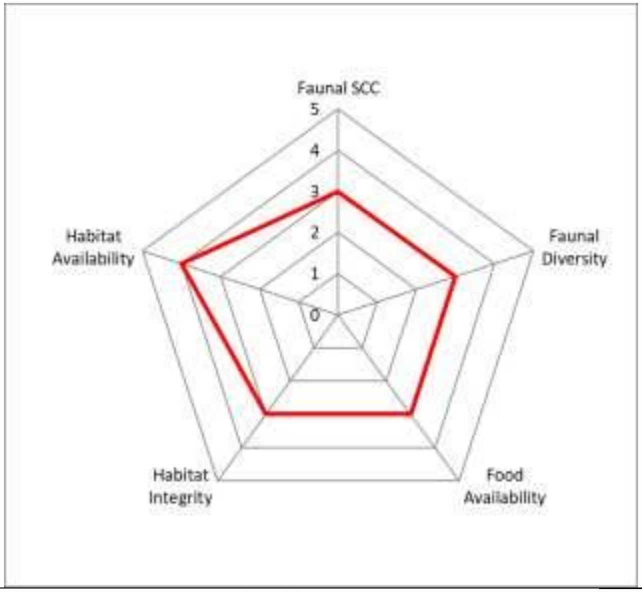
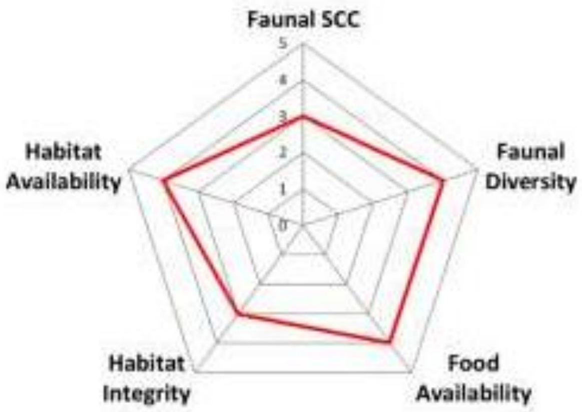
The Screening Tool indicated a medium sensitivity for the Animal Species Theme for the Soyuz 4 Solar PV Park. Following the assessment of the site, it is the opinion of the specialist that the sensitivity rating is correct and aligns with the field results.

11.3.6 SENSITIVITY MAPPING

Figure 41 conceptually illustrates the faunal ecological sensitivity for the various areas. The areas are depicted according to their sensitivity in terms of the presence or potential for faunal SCC, habitat integrity, levels of disturbance and overall levels of diversity. **Table 20** presents the sensitivity of each habitat along with an associated conservation objective and implications for the proposed activities.

Table 20: A summary of the sensitivity of each habitat unit and the implications for the proposed Soyuz 4 Solar PV Park.

Habitat Unit	Habitat Sensitivity Graph	Sensitivity	Key Habitat Characteristics
Low Open Shrubland		**MODERATELY LOW** <u>Conservation Objective</u> Optimise development potential while improving biodiversity integrity of surrounding natural habitat and managing edge effects.	- No faunal SCC were observed within this habitat unit at the time of the assessment although SCC may utilize this habitat; - Historic grazing has drastically reduced the suitability of the habitat for most fauna; - Lowered species richness was noted within this unit when compared to the more natural habitats; and - Development within these areas will result in loss of habitat and the displacement of common faunal species, however no notable loss of species diversity is expected.

Open Karoo Veld		**INTERMEDIATE** <u>Conservation Objective</u> Preserve and enhance biodiversity of the habitat unit and surrounds while optimising development potential	- Habitat remains largely intact with minimal disturbances to faunal habitat. - Ecological connectivity has not been impacted upon and faunal species are able to readily move through and in and out of the Soyuz 4 Solar PV Park. - Habitat comprises natural vegetation, providing food resources and shelter to faunal species common to the region. - One mammal SCC observed on site. - Several other SCC have medium POCs for the Soyuz 4 Solar PV Park.
Freshwater Ecosystem Habitat		**MODERATELY HIGH** <u>Conservation Objective</u> Preserve and enhance the biodiversity of the habitat unit, limit development and disturbance.	- Habitat remains largely intact with minimal disturbances to faunal habitat. - Ecological connectivity has not been impacted upon and faunal species are able to readily move through and in and out of the Soyuz 4 Solar PV Park. - Habitat comprises natural vegetation, providing food resources and shelter to faunal species common to the region. - One mammal SCC observed on site. - Several other SCC have medium POCs for the Soyuz 4 Solar PV Park.

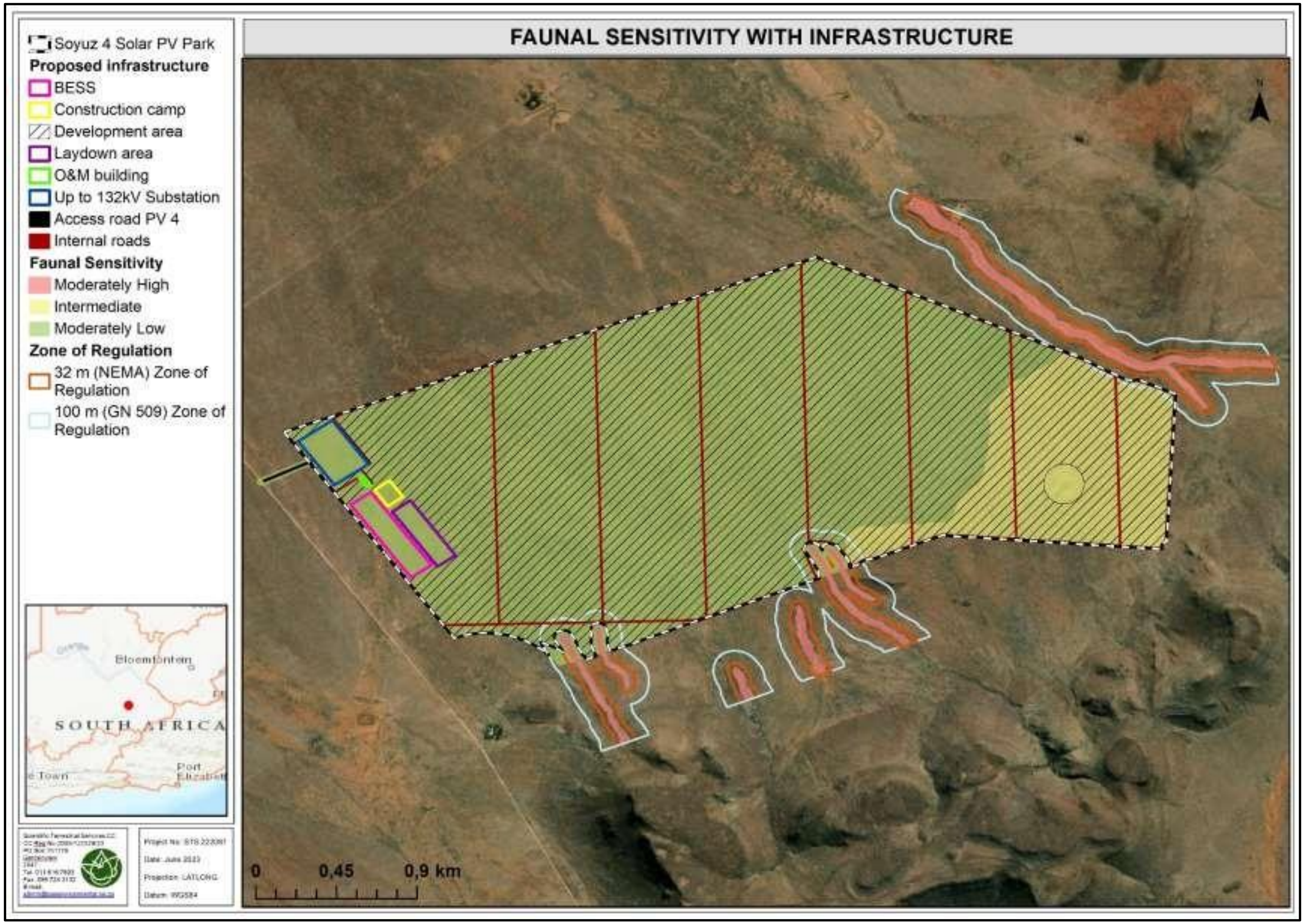


Figure 41: Habitat sensitivities associated with the Soyuz 4 Solar PV Park

11.3.7 International Finance Corporation (IFC) Performance Standard 6 Habitat Description

This section serves to address the application of Performance Standard 6 (Biodiversity Conservation and Sustainable Management of Living Natural Resources) of the International Finance Corporation (IFC) and to categorise the observed habitats and faunal component as described in Section 3 above into the relevant IFC defined habitat categories. **Table 21** lists the various habitat units as identified with reference to the IFC habitat categories.

Table 21: Habitat Units and Faunal Classes as they relate to the IFC Habitat Categories and considerations

Habitat Units As per Biodiversity Reports	Applicable IFC Habitat and applicable Criteria (General Notices)	IFC Habitat Unit Discussion
		Natural Habitat These units are in a natural condition with minimal disturbances through landscape altering activities. Although grazed, the overall level of habitat provision as well as species diversity still qualifies this habitat unit as a natural habitat in terms of the IFC descriptions where habitat of suitable structure will be favoured by four SCC. Whilst some areas have been subjected to higher levels of impact than others, on a landscape level the overall ecological functioning has not been impaired to an extent that would classify this habitat as modified.

Habitat Units As per Biodiversity Reports	Applicable IFC Habitat and applicable Criteria (General Notices)	IFC Habitat Unit Discussion
Freshwater Ecosystems Habitat, Upper Karoo Habitat, Upper Karoo footslope Habitat,	**Natural Habitat** Natural habitats consist of 99.98% of the proposed project footprint area. 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. **Additional Considerations:** One mammal SCC was confirmed and several other faunal SCC have a medium POC within these habitats, however, the Soyuz 4 Solar PV Park is not anticipated to be an important foraging or breeding location for these species.	**Additional Considerations:** • These units may provide habitat for SCC, however, these species have wide ranges and although they may forage and breed here this area is not considered critical habitat for breeding or foraging and as such do not meet the requirements for this habitat unit to be considered Critical Habitat as per the IFC definitions; • Consideration needs to be given to GN37 as it indicates that in some instances "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". With this in mind grazed portions of the Freshwater Ecosystems Habitat, Upper Karoo Habitat and Upper Karoo footslope Habitat can be considered as Natural Habitat as per the IFC standards; • GN51 Long-term biodiversity monitoring may be required to validate the accuracy of predicted impacts and risks to biodiversity values, especially for the large scale loss of natural habitat; • GN52. Specific thresholds should be set for monitoring results that will trigger a need to adapt the management plan(s) to address any deficiencies in performance. The results of the monitoring program should be reviewed regularly; • GN56. To facilitate decision-making, numerical thresholds have been defined for the first four critical habitat criteria (i.e., CR/EN species; endemic/ restricted-range species; migratory/ congregatory species; threatened and unique ecosystems). The thresholds presented in this Guidance Note were obtained from globally standardized numerical thresholds published in the IUCN's *A Global Standard for the Identification of Key Biodiversity Areas* and *Red List Categories and Criteria*. The thresholds are indicative and serve as a guideline for decision-making only; • GN57. For Criterion 5, there are no numerical thresholds. Best available scientific information and expert opinion should be used to guide decision-making with respect to the relative "criticality" of a habitat in these cases;

11.3.8 POTENTIAL FAUNAL IMPACTS

The following potential faunal impacts have been identified by the specialist:

- **Loss of faunal habitat and potential species diversity:** The most significant impact to faunal species in the proposed Soyuz 4 Solar PV Park will result from the clearance of vegetation within the solar farm footprint area during the construction phase. As a result of the loss of habitat, faunal species abundances and diversity will also be impacted upon, as the footprint area will no longer be able to support faunal species. As a result of the habitat loss and the construction of the proposed Soyuz 4 Solar PV Park and boundary fences, habitat connectivity and the movement of fauna through the Soyuz 4 Solar PV Park will also be impacted upon. The loss of habitat and connectivity may have a negative impact on faunal species in the region and consequently a potential decrease in species carrying capacity. Decreased habitat connectivity may further impact on breeding populations, limiting gene flow (breeding) opportunities for faunal species inhabiting the natural areas around the solar farm footprint. Unlike the solar farm footprint, the proposed access road will have a notably lower impact in terms of habitat loss with limited impact on habitat connectivity as the access road will make use of an existing route.

- **Loss of faunal Species of Conservation Concern:** Only one SCC was confirmed for the proposed Soyuz 4 Solar PV Park and access road, namely *Orycteropus afer* (Aardvark). Several other faunal SCC POCs ranging from low to medium for the proposed Soyuz 4 Solar PV Park and access road. With most of these SCC likely to be associated with the solar farm footprint area. Vegetation clearance activities and earth works will place many SCC at risk, not only from a loss of habitat but also potential mortalities. This is of increased importance when considering invertebrate SCC, as many of these species are slow moving and live in burrows and under rocks. As such, these species are unlikely to be able to escape ahead of ground clearing activities. As such, it is essential that these species be actively searched for ahead of earth works. Where this is not feasible, as species are observed when vegetation clearance takes place, they are to be appropriately rescued and relocated. Provided that mitigation measures are implemented, the overall impact to faunal SCC because of the construction and operation activities is unlikely to significantly impact SCC populations in the region.

- **Probable Residual Impacts:** Even with extensive mitigation, residual impacts on the receiving faunal ecological environment may persist. The following points highlight the key residual impacts that have been identified:

  - Continued, long-term decline of faunal species diversity;
  - Long-term loss of faunal SCC abundance in the local area;
  - Further habitat fragmentation and AIP proliferation; and
  - Disturbed areas are highly unlikely to be rehabilitated to baseline levels of ecological functioning and as such loss of faunal habitat, species diversity and faunal SCC will most likely be long term (life of operation).

11.3.9 CONCLUSION OF THE FAUNA SPECIALIST

Impacts stemming from the construction of the proposed Soyuz 4 Solar PV Park and access road will likely result in high to medium impacts to faunal species. Through the implementation of mitigation measures as stipulated in Section 24, along with sound environmental management, impacts can be reduced.

Although the proposed development will likely impact on faunal species as a result of habitat loss, the habitats within the proposed Soyuz 4 Solar PV Park and access road are not deemed to be of increased sensitivity for fauna, nor does they contain niche / unique habitat types or features that support range restricted SCC. Although several SCC are likely to occur within (permanently or temporarily) the proposed Soyuz 4 Solar PV Park and access road, they are equally likely to be found in the same abundance in the surrounding natural areas. From a faunal ecological perspective, provided that all mitigation measures are implemented and that sound environmental management takes place, the proposed Soyuz 4 Solar PV Park and access road are not expected to pose a significant threat to faunal populations in the region. As such, it is the opinion of the specialists that there is no foreseeable reason why this development should not be authorised.

11.4 FLORA ASSESSMENT

11.4.1 Assessment Approach

The purpose of the flora assessment and outcomes are as follows:

- To determine and describe habitat types, communities and the ecological state of the sites associated with the Soyuz 4 Solar PV Park and to rank each habitat type based on conservation importance and ecological sensitivity;
- To provide inventories of floral species as encountered within the Soyuz 4 Solar PV Park;
- To identify and consider all sensitive landscapes such as indigenous forests, rocky ridges, wetlands and/ or any other special features such as Critical Biodiversity Areas (CBAs) and Ecological Support Areas (ESAs);
- To conduct a Red Data Listed (RDL) floral species assessment as well as an assessment of other SCCs, including the potential for such species to occur within the Soyuz 4 Solar PV Park;
- To provide detailed information to guide the activities associated with the proposed development within the Soyuz 4 Solar PV Park; and
- To ensure the ongoing functioning of the ecosystem in such a way as to support local and regional conservation requirements, to allow regional and national biodiversity targets to be met, and the provision of ecological services in the local area is sustained.

An on-site visual investigation of the assessment areas was conducted during summer to confirm and ground-truth the assumptions made during the consultation of the background maps

The vegetation surveys are based on the subjective sampling method, which is a technique where the specialist chooses specific sample sites within the area of interest based on their professional experience in the area and background research done prior to the site visit. This allows representative recordings of floral communities and optimal detection of SCC.

The steps followed during the preparation for and the conduction of the field assessments were as follows:

- To guide the selection of appropriate sample sites, background data and digital satellite images were consulted before going to site, during which broad habitats, vegetation types and potentially sensitive sites were identified. The results of these analyses were then used to focus the fieldwork on specific areas of concern and to identify areas where targeted investigations were required (e.g., for SCC detection and within the direct footprint of the proposed mining project);

- All relevant resources and datasets as presented by the SANBI's Biodiversity Geographic Information Systems (BGIS) website (http://bgis.sanbi.org) and the Environmental Geographical Information Systems (E-GIS) website (https://egis.environment.gov.za/), including the Northern Cape CBA Map (2016) and the Screening Tool, were consulted to gain background information on the physical habitat and potential floral diversity associated with the assessment areas;

- Based on the broad habitat units delineated before going to site and the pre-identified points of interest, which is updated based on on-site observations and access constraints, the selected sample areas were surveyed on foot, following subjective transects, to identify the occurrence of the dominant plant species and habitat diversities, but also to detect SCC which tend to be sparsely distributed. The SCC assessment included the below aspects:

    - Threatened species. In terms of Section 56(1) of the National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004) (NEMBA), threatened species are Red Data Listed (RDL) species falling into the following categories of ecological status: Critically Endangered (CR), Endangered (EN), Vulnerable (VU) or Protected in terms of the NEMBA Threatened or Protected Species (TOPS) Regulations (Government Gazette 47984 (GN 3012) dated 3 February 2023)). Removal, translocation and/or destruction of these species require authorisation from the Department of Forestry, Fisheries, and the Environment (DFFE); and

    - Protected Species. Species that do not necessarily fall in the above categories of ecological status, but that are deemed important from a provincial biodiversity perspective, e.g., Specially Protected Species (Schedule 1) (Section 49(1)) and Protected Species (Schedule 2) (Section 50(1)) of the Northern Cape Nature Conservation Act, 2009 (Act No. 9 of 2009) (NCNCA). Activities are restricted for these species and may not occur without permits from the relevant provincial authorities. The List of Protected Tree Species (GN No. 536) as published in the Government Gazette 41887 dated 7 September 2018 as it relates to the National Forest Act, 1998 (Act No. 10 of 1998) (NFA) was also considered for the SCC assessment; and

- Photographs were taken of each vegetation community that is representative of typical vegetation structure of that community, as well as photographs of all detected SCC (except for sensitive species as identified by the DFFE's Screening Tool).

11.4.2 Broad-scale Vegetation Characteristics

The Soyuz 4 Solar PV Park and access road occurs within the Northern Upper Karroo vegetation type. This was based on spatial data from the 2018 Final Vegetation Map of South Africa, Lesotho and Swaziland, in which these vegetation types are currently considered to be of Least Concern (LC) in terms of threat status. In terms of their protection level (as per the 2018 National Biodiversity Assessment), the Northern Upper Karroo vegetation type is currently not protected (NP). This vegetation type was used as the reference states against which the ground-truthed vegetation communities were compared (descriptions as per Mucina and Rutherford, 2006).

11.4.3 Ground-truthed Vegetation Characteristics

Based on the results of the field investigations undertaken in January 2023, two habitat units were identified within the Soyuz 4 Solar PV Park. The one habitat unit was divided into three subunits, namely:

- Plains vegetation: Three subunits were distinguished:
  - Open Karoo veld (94.51 ha): This subunit was found throughout the Soyuz 4 Solar PV Park footprint area.
  - Low open shrubland (474.84ha): This subunit is dominated by dwarf shrubland.
- Freshwater ecosystems, which comprise of an episodic drainage line3, were identified on the north-eastern boundary of the Soyuz 4 Solar PV Park footprint area . Although the extent of the freshwater ecosystem and its regulated buffers are not located within the Soyuz 4 Solar PV Park footprint area, it is located within the regulated areas as defined by the Nation Water Act, 1998 (Act 35 of 1998) under Section GN 509 of 2016. Further discussions on this freshwater ecosystem can be reviewed in the freshwater EIA report (SAS 22-1182).

Figure 42 depict the full extent of the habitat units associated with the Soyuz 4 Solar PV Park.

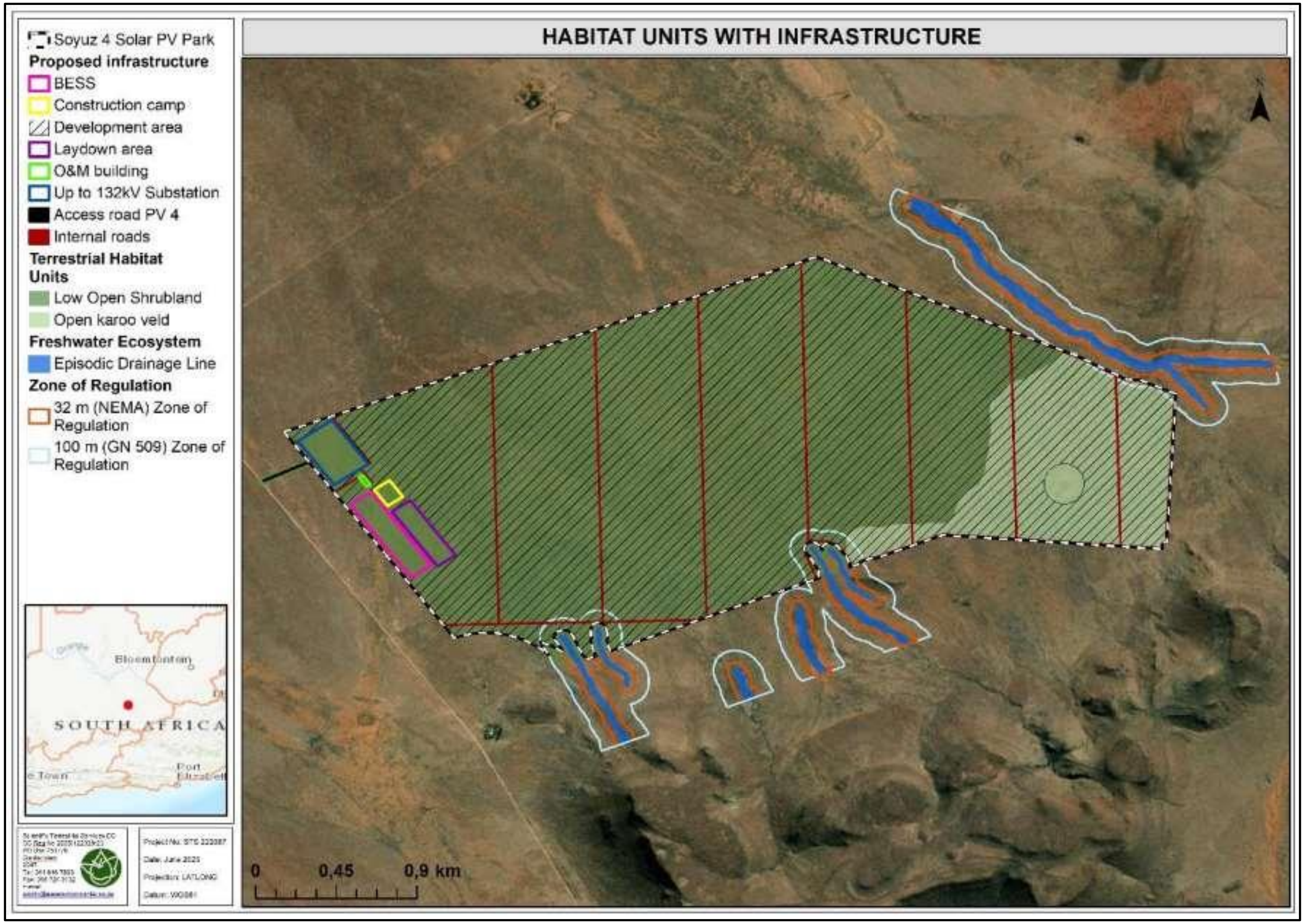


Figure 42: Conceptual illustration of the habitat units associated with the Soyuz 4 Solar PV Park and access road.

11.4.4 Plains Habitat Unit

Table 22:: Field assessment results pertaining to the Plains Habitat Unit within the Soyuz 4 Solar PV Park

LOWER OPEN SHRUBLAND	OPEN KAROO VELD
The majority of the Soyuz 4 Solar PV Park were representative of this habitat subunit. This subunit is dominated by shrubland. Grazing and overutilisation rapidly increase the relative abundance of shrubs. *Nassella trichotoma* (an alien grass species) and *Rhigozum obovatum* was noted within the overutilised areas due to overgrazing of palatable indigenous grasses. Very little indigenous vegetation was present due to the overutilisation of the veld from sheep grazing the area. The lower open shrubland habitat still represents the reference vegetation type (i.e., Northern Upper Karroo vegetation type). Mucina and Rutherford (2006) describes the Northern Upper Karroo as Shrubland dominated by dwarf karoo shrubs, grasses and *Senegalia* (previously known as Acacia) *mellifera subsp. detinens* and some other low trees. The lower open shrubland habitat is in fair ecological condition (i.e., areas that are moderately modified, seminatural, and associated with an ecological condition class in which ecological function is maintained even though composition and structure have been compromised.	This subunit covered around 15-20% of the Soyuz 4 Solar PV Park within the north eastern portions. The vegetation consisted of both good vegetation cover and species diversity with a good mix of grasses and short shrubs. Dominant grass species include *Eragrostis lehmanniana*, *E. obtusa*, *Stipagrostis cilliata*, *Aristida congesta* and *A. diffusa*. Shrubs included *Atriplex spongiosa*, *Aptosimum marlothii* and *Galenia exigua*. Some herbs were also present namely *Hermannia comosa*, *Indigofera alternans* and Hermannia spinosa. The Upper Karoo Footslope habitat still represents the reference vegetation type (i.e., Northern Upper Karroo vegetation type). The habitat unit is of dense to open shrubland. The Upper Karoo Footslope habitat was in a good ecological condition (i.e., areas that are natural or near natural and are associated with an ecological condition class in which composition, structure and function are still intact or largely intact).

Figure 43: Representative photographs of the sub vegetation habitat unit types. a) Open Karoo veld and b-c) Low open shrubland

FLORAL SCC OVERVIEW
The Screening Tool identified the Soyuz 4 Solar PV Park to be in a **medium sensitivity** area for the Plant Species Theme (triggering species included the sensitive species). This species was not found during the site assessment, and habitat for this species to occur is improbable. For the Terrestrial Biodiversity Theme, the Soyuz 4 Solar PV Park has an overall low sensitivity, which was supported form the finding of the field assessment. A very small section identified as very high sensitivity in the southeastern most corner of the Soyuz 4 Solar PV Park. The very high sensitivity was triggered by the presence of an ESA. During the site assessment, area

associated with the ESA within the Soyuz 4 Solar PV Park was not confirmed to be representative for the targets set for an ESA. No other threatened SCC (i.e., RDL plants or TOPS), in terms of Section 56(1) of the NEMBA, were recorded during the site assessment. No protected tree species, as per the NFA, were identified during the site assessment for the Soyuz 4 Solar PV Park footprint area. However, the Upper Karoo footslope is species-rich in terms of the NCNCA Schedule 2 protected species list (see below). Several provincially protected species (both Schedule 1 and Schedule 2) were associated with the Plains Habitat unit. The below list presents the species recorded on site as well as species that have obtained a high probability of occurrence (POC) score due to suitable habitat within the plains habitat unit. ➢ *Boophone disticha* (Schedule 2, LC, POC = High); ➢ *Crinum sp*. (Schedule 2, LC, POC = Medium); ➢ *Lessertia frutescens* (Schedule 1, LC, POC = High); ➢ *Moraea pallida* (Schedule 2, LC, POC = Medium); ➢ *Nemesia fruticans* (Schedule 2, LC, POC = Medium); ➢ *Nerine sp.* (Schedule 2, LC, POC = Medium); ➢ *Pergularia daemia* (Schedule 2, LC, POC = High); ➢ *Ruschia sp*. (Schedule 2, LC, POC = High); ➢ Within the protected Aizoaceae family*, Mesembryanthemum species*, *Drosanthemum species* were abundant; and ➢ From the protected Euphorbiaceae family, *Euphorbia species* located within the western portion of the Soyuz 4 Solar PV Park. The above-mentioned species are all of LC in terms of threat status and are not locally restricted in their distribution. Permits from Northern Cape Department: Agriculture, Environmental Affairs, Rural Development and Land Reform (DAEARDLR) and from the DFFE should be obtained to remove, cut, or destroy the above-mentioned protected species before any vegetation clearing may take place.

11.4.5 Freshwater Ecosystem Habitat Unit

Table 23:: Field assessment results pertaining to the Plains Habitat Unit within the Soyuz 4 Solar PV Park

FRESHWATER ECOSYSTEMS
Eight (8) Freshwater ecosystem were identified within Soyuz 4 Solar PV Park and within the regulated area (**Figure 42**). The drainage lines located in the Soyuz 4 Solar PV Park are all located on the southern-most part of the site, draining off the higher-lying hilly terrain to the south. These drainage lines are typically narrow channelled fluvial features which are not characterised by either a distinct riparian vegetation response in the form of woody vegetation / herbaceous vegetation of different vegetation to the surrounding areas, or of the presence of alluvium within the channel bed – being reflective of their small catchments and limited hydroperiod. This part of the site is characterised by a dense growth of *Rhigozum trichotomum*. as well as Aristida spp. grasses, with a relatively sparse vegetation cover. As with all other drainage lines in the wider area these drainage lines flow for very short periods in response to precipitation events of sufficient duration and intensity to generate surface water runoff. Further discussions on this freshwater ecosystem can be reviewed in the freshwater scoping report (SAS 22-1182).

A shallowly-channelled drainage line in the southern part of the study, looking upgradient towards the hills in its catchment.

The catchment of the drainage line is located in a shallow valley head between areas of localised, higher-lying topography (koppies) and is mostly characterised by livestock rearing. The landcover in the catchment is thus characterised by grassy Karroid vegetation, with sheet and gulley erosion appearing to be reasonably prominent. As with most of the drainage line freshwater features in the footprint area, drainage is expressed in a channelised form where it occurs in areas of increased slope, dissipating (and ceasing to be a freshwater feature) where the channelised feature enters an area of flat topography (plains) that characterise most of the wider area. This is true of the drainage line crossed by the access road, along which the channel becomes increasingly less defined until it dissipates into a longitudinal band of wide sandy deposits to the north of the investigation area.

The drainage line is highly episodic in nature, not characterised by any form of baseflow and only fed by surface water flows from the surrounding catchment area during and after rainfall events of sufficient volume and intensity to generate surface runoff. Soils in the catchment of the drainage line appear to be shallow sandy soils that are underlain by a calcrete layer that occurs near the surface, and which outcrops in places, thus hindering vertical movement of runoff water into the soil profile, and thereby increasing surface runoff volumes. As such this drainage line is likely to be ‘flashy’ in nature, being characterised by surface flows for very short duration. Due to the very low occurrence of rainfall events in a semi-arid setting twinned with the limited duration of flows, the two smaller drainage lines do not display any moisture dependent biota, and only in certain places at the lower part of the reach of the larger drainage line does the graminoid Stipagrostis namaquensis occur – a grass species that typically only occurs in drainage lines in semi-arid Karoo settings.

FLORAL SCC OVERVIEW

The online Screening Tool identified the Soyuz 4 Solar PV Park to be in a medium sensitivity area for the Plant Species Theme (Triggering species included Sensitive species). This species was not found during the site assessment, and habitat for this species to occur is improbable. For the Terrestrial Biodiversity Theme, the Soyuz 4 Solar PV Park has an overall low sensitivity, which was supported form the finding of the field assessment. An ESA was assigned to a portion of the access road due to the National Freshwater Ecosystem Priority Areas (NFEPA) database indicating that an unnamed tributary of the Ongers River was present. From the freshwater assessment, this system was verified to be present and therefore the ESA was also considered to be present, as such the low sensitivity (as per the Terrestrial Biodiversity

Theme) is not supported for this portion of the access road where it crosses the ESA area.

No threatened SCC (i.e., Red Data Listed plants or Threatened and Protected Species (TOPS)), in terms of Section 56(1) of the National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004) (NEMBA), were recorded during the site assessment. No protected tree species, as per the National Forest Act, 1998 (Act No. 84 of 1998) (NFA), were identified during the site assessment for the Soyuz 4 Solar PV Park footprint area. The Upper Northern Karoo veld is species-rich in terms of the Northern Cape Nature Conservation Act, 2009 (Act No. 9 of 2009) (NCNCA) Schedule 2 protected species list.

Several provincially protected species (both Schedule 1 and Schedule 2) were associated with the Freshwater Habitat unit. The following presents the species recorded on site as well as species that have obtained a high POC score due to suitable habitat within this habitat unit:

- *Boophone disticha* (Schedule 2, LC, POC = High);
- *Crinum sp*. (Schedule 2, LC, POC = Medium);
- *Moraea pallida* (Schedule 2, LC, POC = Medium);
- *Ruschia sp*. (Schedule 2, LC, POC = High); and
- Within the protected Aizoaceae family, *Mesembryanthemum species*, *Drosanthemum species* can be present.

The above-mentioned species are all of LC in terms of threat status and are not locally restricted in their distribution. Permits from Northern Cape DAEARDLR and from the DFFE should be obtained to remove, cut, or destroy the above-mentioned protected species before any vegetation clearing may take place.

11.4.6 Alien and Invasive Plant Species (AIP)

A total of six AIPs (listed and non-listed) were found within the Soyuz 4 Solar PV Park. Of the six species encountered on site, two species are listed under NEMBA Category 1b, two species is listed under the NEMBA Category 2, and the remaining two species are not listed under NEMBA; however, these species are considered problem plants that often establish in disturbed sites or previously cultivated areas. These species can often become problematic and pose a threat to biodiversity as these species compete with indigenous native floral species and often replace native floral species.

Due to the extent of AIPs within the Soyuz 4 Solar PV Park, especially those falling in the Category 1b and which occur within the Freshwater Ecosystem, it is highly recommended that an Alien and Invasive Species Control and Management Plan be set up and implemented (by the proponent) to ensure further loss of indigenous floral communities do not occur, and that the freshwater ecosystems are not placed under additional pressure due to the presence of AIPs. Refer to **Table 24** for more information on the AIPs recorded on site.

Table 24: Dominant alien floral species identified during the field assessment with their invasive status as per NEMBA: Alien and Invasive Species Lists, GN R1003 of 2020

Scientific name / Common name	Origin	NEMBA Category	Open karoo	Freshwater Ecosystems	Low Open Shrubland
Woody Species					
Melia azedarach	India, Australia	1b			X
Eucalyptus camaldulensis	Australia	1b			X
Atriplex nummularia	Australia	2	X		X
Herbaceous Species					
Lepidium aficanum	South America	Not listed	X		X
Pseudognaphalium luteo - album	Europe	Not listed	X		X
Succulents					
Agave sisalana	North America	2			X

11.4.7 Sensitivity

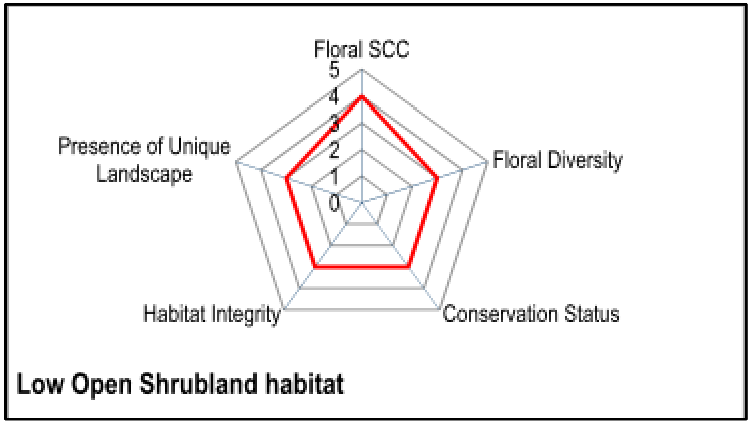
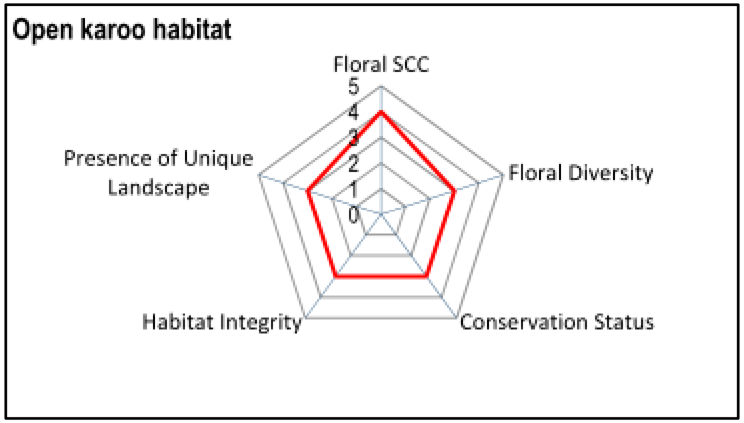
The Screening Tool identified the Soyuz 4 Solar PV Park is considered medium sensitivity for the Plant Species Theme (i.e., areas where no threatened flora are known or expected to occur). The medium sensitivity of the Screening Tool outcome is not supported as the floral species and habitat was not found during the site assessment and heavily over utilised by grazing activities. Suitable habitat is unlikely for other protected species as listed under the NCNCA to occur. For the Terrestrial Biodiversity Theme, the Soyuz 4 Solar PV Park has an overall low sensitivity. The low sensitivity was confirmed and supported during the site assessment. Soyuz 4 Solar PV Park does not fall within any protected ecosystems, CBA’s or ESA’s.

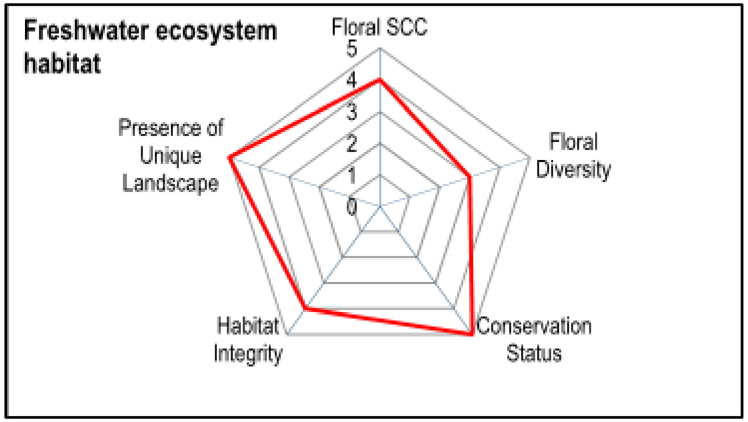
Based on the ground-truthed results of the site visit, **Table 25** presents the site sensitivity of each identified habitat unit along with an associated conservation objective and implications for development.

These sensitivities consider aspects such as the presence or potential for floral SCC (both threatened species as well as protected species), habitat integrity and levels of disturbance, threat status of the habitat type, the presence of unique landscapes and overall levels of diversity (compared to a reference type).

Figure 44 conceptually illustrates the areas of varying ecological sensitivity and how they will be impacted by the proposed infrastructure development.

Table 25: A summary of the sensitivity of each habitat unit and implications for development.

Habitat Unit and Sensitivity	Conservation objective	Key habitat characteristics
	**MODERATELY LOW** **<u>Conservation Objective</u>** Optimise development potential while improving biodiversity integrity of surrounding natural habitat and managing edge effects.	No threatened SCC (i.e. RDL plants or TOPS) were recorded during the site assessment; - No protected tree species as per the NFA, were identified during the site assessment for the Soyuz 4 Solar PV Park footprint area; and - Potential habitat for protected species in terms of the NCNCA Schedule 2 protected species list can be present within the footprint area of the Soyuz45 Solar PV Park.
	**INTERMEDIATE** **<u>Conservation Objective</u>** Preserve and enhance biodiversity of the habitat unit and surrounds while optimising development potential	- The Open Karoo habitat subunits are representative of the reference state; - Species richness for the Open Karoo species richness was moderate; - None of the subunits are associated with RDL species, nor are such anticipated to establish viable populations within these subunits. The medium sensitivity assigned by the Screening Tool for the Plant Species Theme is not supported for these subunits. - The Open Karoo has the potential to host some of the NCNCA- protected species; - No significant biodiversity features were confirmed for the habitat associated with the Soyuz 4 Solar PV Park or access road. The very low sensitivity assigned by the Screening Tool for the Terrestrial Biodiversity Theme is supported for this subunit.

	**MODERATELY HIGH** **Conservation Objective** Preserve and enhance the biodiversity of the habitat unit, limit development and disturbance.	- No threatened SCC (i.e. RDL plants or TOPS) were recorded during the site assessment. - No protected tree species as per the NFA, were identified during the site assessment for the Soyuz 4 Solar PV Park footprint area. - Freshwater ecosystems (i.e. watercourses as defined in the NWA) were identified within the Soyuz 4 Solar PV Park footprint were excluded from the development footprint.

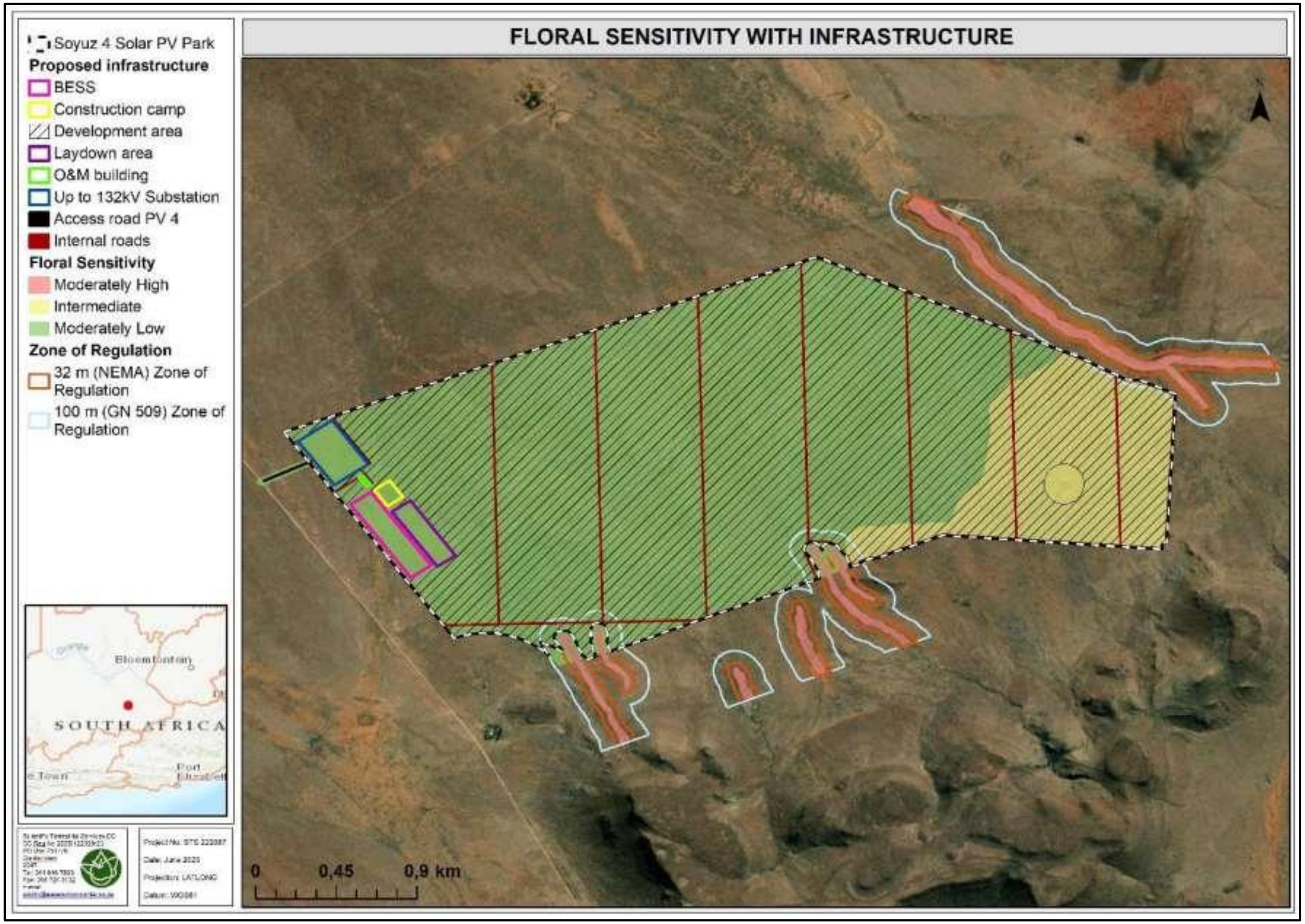


Figure 44: Conceptual illustration of the habitat sensitivities associated with the Soyuz 4 Solar PV Park or access road

11.4.8 International Finance Corporation (IFC) Performance Standard 6 Habitat Description

This section serves to address the application of Performance Standard 6 (Biodiversity Conservation and Sustainable Management of Living Natural Resources) of the International Finance Corporation (IFC) and to categorise the observed habitats and faunal component as described above into the relevant IFC defined habitat categories. **Table 26** lists the various habitat units as identified with reference to the IFC habitat categories.

Table 26: Habitat Units and Floral Classes as they relate to the IFC Habitat Categories and considerations

Habitat Units asper Biodiversity Reports	Applicable IFC Habitat and applicable Criteria (General Notices)	IFC Habitat Unit Discussion
Freshwater Ecosystems Habitat, Open Karoo veld	**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. **Additional Considerations:** Protected floral species from the protected Aizoaceae family, *Mesembryanthemum species*, *Drosanthemum species* were abundant; and from the protected Euphorbiaceae family, *Euphorbia species* located within access road of the Soyuz 4 Solar PV Park**.**	**Natural Habitat** These units are in a natural condition with minimal disturbances through landscape altering activities. Although grazed, the overall level of habitat provision as well as species diversity still qualifies this habitat unit as a natural habitat in terms of the IFC descriptions where suitable habitat are likely for six SCC (protected species, not RDLs) and where from the protected Aizoaceae family, *Mesembryanthemum species* and *Drosanthemum species* were abundant; and from the protected Euphorbiaceae family, *Euphorbia species* located within access road of the Soyuz 4 Solar PV Park. Whilst some areas have been subjected to higher levels of impact than others, on a landscape level the overall ecological functioning has not been impaired to an extent that would classify this habitat as modified. **Additional Considerations**: • Consideration needs to be given to GN37 as it indicates that in some instances "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". • GN51 Long-term biodiversity monitoring may be required to validate the accuracy of predicted impacts and risks to biodiversity values, especially for the large-scale loss of natural habitat; • GN52 Specific thresholds should be set for monitoring results that will trigger a need to adapt the management plan(s) to address any deficiencies in performance. The results of the monitoring program should be reviewed regularly; • GN56. To facilitate decision-making, numerical thresholds have been defined for the first four critical habitat criteria (i.e., CR/EN species; endemic/restricted-range species; migratory/congregatory species; threatened and unique ecosystems). The thresholds presented in this Guidance Note were obtained from globally standardized numerical thresholds published in the IUCN's A Global Standard for the Identification of Key Biodiversity Areas and Red List Categories and Criteria. The thresholds are indicative and serve as a guideline for decision-making only; • GN57 For Criterion 5, there are no numerical thresholds.

Habitat Units asper Biodiversity Reports	Applicable IFC Habitat and applicable Criteria (General Notices)	IFC Habitat Unit Discussion
		Best available scientific information and expert opinion should be used to guide decision-making with respect to the relative “criticality” of a habitat in these cases; • GN89. A biodiversity monitoring and evaluation program (BMEP) is a fundamental aspect of demonstrating compliance; • GN102. Preventive and mitigation measures are essential when the project includes a linear infrastructure, such as a pipeline, transmission line, road, or rail development, as the right-of-way will likely traverse and link several habitats through one corridor, providing optimal means for a species to quickly spread through the region; • GN104 states that all measures must be put in place to ensure the adequate control of alien plant species proliferation, ensuring that natural habitats are not further degraded to such a state that they will be considered modified; and • As per GN106, this habitat unit is considered important in terms of “Provisioning ecosystem services, regulating ecosystem services and Supporting services”. These habitats do offer a suitable movement corridor, habitat for game and wild foods.

Habitat Units asper Biodiversity Reports	Applicable IFC Habitat and applicable Criteria (General Notices)	IFC Habitat Unit Discussion
Low open Habitat	**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.	**Modified Habitat** This habitat unit is modified as per the IFC guidelines due to the increased levels of alien plant proliferation, loss of native species and the continuous ground disturbances associated with agricultural activities. The ecological functions of this habitat unit have been significantly altered from their natural state, providing limited habitat for flora species associated with the region. Additional Considerations: • GN51 Long-term biodiversity monitoring may be required to validate the accuracy of predicted impacts and risks to biodiversity values; • GN52. Specific thresholds should be set for monitoring results that will trigger a need to adapt the management plan(s) to address any deficiencies in performance. The results of the monitoring program should be reviewed regularly; • GN89. A biodiversity monitoring and evaluation program (BMEP) is a fundamental aspect of demonstrating compliance; • GN102. Preventive and mitigation measures are essential when the project includes a linear infrastructure, such as a pipeline, transmission line, road, or rail development, as the right-of-way will likely traverse and link several habitats through one corridor, providing optimal means for a species to quickly spread through the region; and • GN104 states that all measures must be put in place to ensure the adequate control of alien plant species proliferation, ensuring that surrounding natural habitats are not further degraded to such a state that they will in turn be considered modified.

11.4.9 POTENTIAL FLORAL IMPACTS

The following potential faunal impacts have been identified by the specialist:

- **Loss of faunal habitat and potential species diversity:** The most significant impact to floral species in the proposed Soyuz 4 Solar PV Park and access road will result from the clearance of vegetation within the solar farm footprint area during the construction phase. As a result of the loss of habitat, species abundances and diversity will also be impacted upon, as the footprint area will no longer be able to support indigenous species and potentially SCC species. As a result of the habitat loss associated with the construction of the proposed Soyuz 4 Solar PV Park, habitat connectivity will also be impacted upon. The loss of habitat and connectivity may have a negative impact on floral species diversity in the region and consequently a potential decrease in species carrying capacity. Unlike the solar farm footprint, the proposed access road will have a notably lower impact in terms of habitat loss with limited impact on habitat connectivity as the access road will make use of an existing route.

- **Loss of floral Species of Conservation Concern:** The exact impact on floral SCC will only be determined after the floral walkdown of the authorised footprints have been undertaken. However, following the site assessment, no floral SCC of increased significance is anticipated to be lost due to habitat clearance (no RDL species anticipated, and only commonly occurring and widespread protected species were recorded). The proposed activities can attempt to avoid destruction of floral SCC through footprint walkdowns and developing of a rescue and relocation plan (where feasible). The direct impact of the Soyuz 4 Solar PV Park's activities on the floral SCCs is not anticipated to result in the significant loss of SCCs. Without mitigation measures implemented, the impact significance varies from medium (construction, operational and maintenance phases) to low (for the rest of the development phases for all habitat areas).

- **Probable Residual Impacts**: Even with extensive mitigation, residual impacts on the receiving floral ecological environment may persist. The following points highlight the key residual impacts that have been identified:

  - Degradation of ecologically intact habitat outside of the authorised footprint due to edge effects;
  - Permanent loss of and altered floral species diversity outside of the footprint area, including loss of favourable habitat for protected species, mainly resulting from a fragmented landscape and modified ecological corridors;
  - Permanent loss of floral habitat and diversity due to poorly executed rehabilitation efforts, AIP control, and lack of monitoring during operational and maintenance of the project;
  - Loss of SCC (i.e., provincially protected species and TOPS) resulting from increased harvesting in the region; and
  - Ongoing AIP proliferation and potential native bush encroaching in the adjacent natural vegetation communities.

11.4.10 Conclusion of the Flora Specialist

No threatened SCC (i.e., RDL plants or TOPS), in terms of Section 56(1) of the NEMBA, were recorded during the site assessment. No protected tree species, as per the NFA, were identified during the site assessment for the Soyuz 4 Solar PV Park footprint area. The Upper Northern Karoo veld is species-rich in terms of the NCNCA Schedule 2 protected species list.

The most significant impact to floral species in the proposed Soyuz 4 Solar PV Park and access road will result from the clearance of vegetation within the solar farm footprint area during the construction phase. As a result of the loss of habitat, species abundances and diversity will also be impacted upon, as the footprint area will no longer be able to support indigenous and potentially SCC species. As a result of the habitat loss and the construction of the proposed Soyuz 4 Solar PV Park, habitat connectivity will also be impacted upon. The loss of habitat and connectivity may have a negative impact on floral species diversity in the region and consequently a potential decrease in species carrying capacity.

During the **operational and maintenance phase**, monitoring of the biodiversity surrounding the project footprint must take place to ensure no unplanned, adverse impacts to biodiversity occurs – especially edge effects that result in habitat loss or degradation beyond the project footprint. Erosion, stormwater, and AIP control forms an essential part of these maintenance activities.

Unlike the solar farm footprint, the proposed access road will have a notably lower impact in terms of habitat loss with limited impact on habitat connectivity as the access road will make use of an existing route.

12 CLIMATE CHANGE ASSESSMENT

TMG, on behalf of the Applicant appointed Airshed (C/O MS Hanlie Liebenberg – Enslin) (hereinafter referred to as the "Climate Specialist") to undertake a Climate Impact report for the proposed Soyuz 4 Solar PV Park.

12.1 OBJECTIVE AND SCOPE OF ASSESSMENT

The climate change and GHG assessment (CCA) assesses whether the proposed Soyuz 4 Solar PV Park complies with the legal and policy context, as well as impacts and risks of the proposed project using a defensible and defined methodology, and identify measures to avoid, minimise or otherwise manage identified impacts and monitor residual risks.

The above objective was achieved by applying the following scope of work:

- Identification of the Transitional and Physical Risks associated with the project (as per the Task Force on Climate- related Financial Disclosures).
- GHG emissions during the construction and operation of the project covering Scope1 and Scope 2 emissions.
- Comparison of GHG emissions to the global and national emission inventories, and to international benchmarks for the project.
- The robustness of the project in terms of forecasted climate change impacts to the area over the lifetime of the project.
- The vulnerability of communities in the immediate vicinity of the project to climate change.
- Proposed management and mitigation strategies.

12.2 STUDY APPROACH AND METHODOLOGY

GHG emissions for the project were calculated and compared to the global and national emission inventory and compared to international benchmarks for the project. The following methodology was applied:

- **Project and information review:** A review of the project from an air quality perspective to identify sources of GHG emission.
- **Carbon footprint calculation:** The Carbon Footprint is an indication of the GHGs estimated to be emitted directly and/or indirectly by an organisation, facility, or product. It can be estimated from:

  $$Carbon\ emissions = Activity\ information * emission\ factor * GWP$$

  Where

  - Activity information relates to the activity that causes the emissions.
  - emission factor refers to the amount of GHG emitted per unit of activity.
  - GWP or global warming potential is the potential of an emitted gas to cause global warming relative to CO_2[2]. This converts the emissions of all GHGs to the equivalent amount of CO_2 or carbon dioxide equivalent (CO_2-e). GWPs over a 100-year time horizon for CH_4 emissions with a multiplier of 23; and N_2O emissions with a multiplier of 296 and are aligned with those stipulated in the recent Methodological Guidelines for Quantification of Greenhouse Gas Emissions (DFFE, 2022).
- **Scope of Carbon Footprint:** The three broad scopes for estimating GHG are:
  - Scope 1: All direct GHG emissions.
  - Scope 2: Indirect GHG emissions from consumption of purchased electricity, heat, or steam.
  - Scope 3: Other indirect emissions, such as the extraction and production of purchased materials and fuels, transport- related activities in vehicles not owned or controlled by the reporting entity, electricity-related activities not covered in Scope 2, outsourced activities, waste disposal, etc.

  This study considered Scope 1 emissions, which are the emissions directly attributable to the project and Scope 2 emissions, which are the emissions associated with bought-in electricity. Scope 3 emissions which consider the “embedded” carbon in bought-in materials and transport as well as the use of exported materials, which does not form part of the assessment. Only Scope 1 emissions need to be quantified to be in line with the DFFE guidelines. The inclusion of Scope 2 places the assessment in line with the guidelines provided by the International Finance Corporation (IFC, 2012).

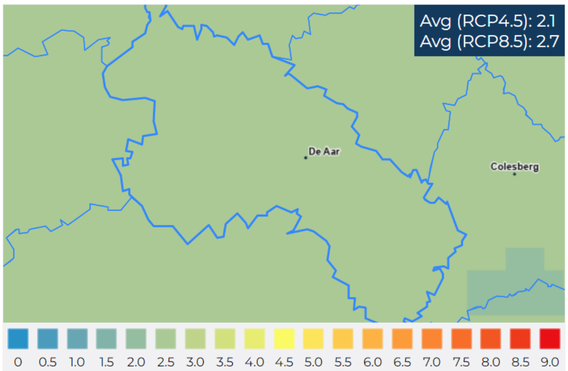
- **Impact Assessment Methodology:** As the emission of greenhouse gases has a global impact, it is not feasible to follow the normal impact assessment methodology viz. comparing the state of the physical environment after implementation of the project to the condition of the physical environment prior to its implementation. Instead, this study assessed the following:

  - The GHG emissions during the construction, operation and decommissioning of the project compared to the global and South African emission inventory and to international benchmarks for the project.
  - The impact of climate change over the lifetime of the project taking the robustness of the project into account.
  - The vulnerability of communities in the immediate vicinity of the project to climate change.

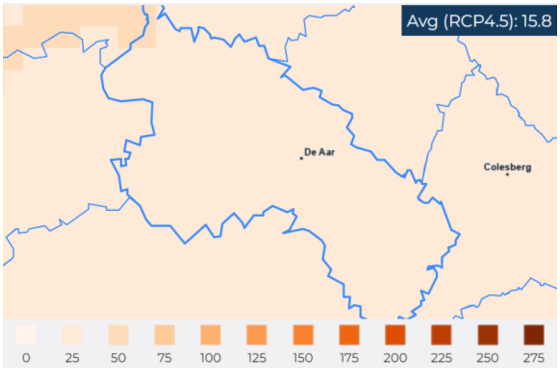
12.3 PHYSICAL RISK OF CLIMATE CHANGE ON THE REGION

The climate change projections in this report discuss results from the South Africa ‘Green Book’8 (CSIR, 2019). The Green Book provides information on the baseline (1961 to 1990) temperature; rainfall; extreme rainfall events; and, very hot days, with two future Representative Concentration Pathways (RCPs); i.e. RCP4.5 and RCP8.5 for the year 2020 to 2050.

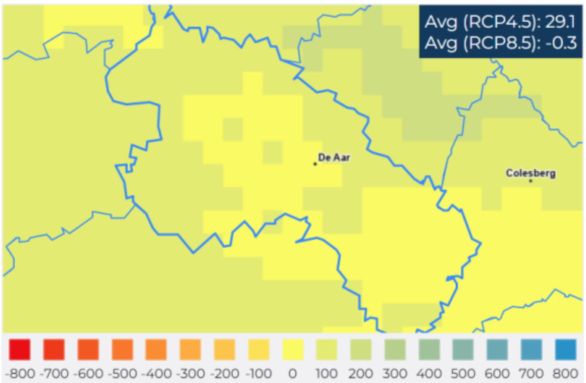
Based on modelled Climate Change Trajectories for the region in which the proposed Soyuz 4 Solar PV Park and communities are situated, the annual average near surface temperatures (2 m above ground) are expected to increase by between 1.78 – 2.89°C for RCP4.5, and between 2.4 - 3.2°C for RCP8.5. At the project site the increase is 2.1°C for RCP4.5 and by 2.7°C for RCP8.5 (Figure 6). Very hot days are expected to increase from 8.2 days (baseline) to 15.8 days (RCP4.5) at the project site, ranging between 4.3 – 35.86 days for RCP4.5 and between 9.38 – 44.52 days for RCP8.5. The total annual rainfall is expected to increase by 29.1 mm (RCP4.5) but could decrease by 0.3 mm when considering RCP8.5. Extreme rainfall days is likely to increase by between 0.2 days for RCP4.5, and 0.5 days for RCP8.5.



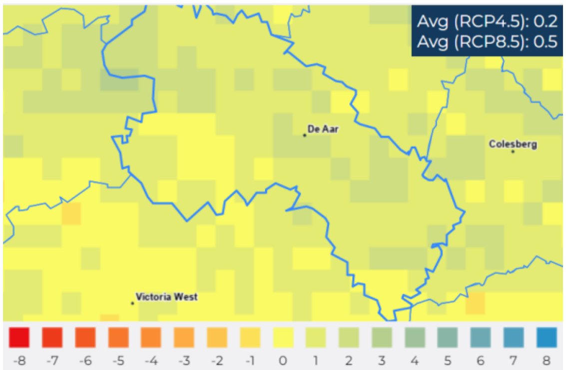
Projected change in annual average temperature for the RCP4.5 trajectory and RCP8.5 trajectory (2030 – 2050)



Projected change in very hot days for the RCP4.5 trajectory (2030 – 2050)



Projected change in annual average rainfall for the RCP4.5 trajectory and RCP8.5 trajectory (2030 – 2050)



Projected change in annual average number of extreme rainfall days (>20 mm in <24 hours) for the RCP4.5 trajectory andRCP8.5 trajectory (2030 – 2050)

Figure 45: Projected Climate Change (2030 -2050) for the Region

12.4 CLIMATE HAZARDS AND VULNERABILITIES

The Green Book (CSIR, 2019); was developed to be an online platform providing quantitative scientific evidence on the likely impacts that climate change and urbanisation will have on South Africa's cities and towns. A profile for each local municipality, including individual settlements and neighbourhoods, was built in terms the rates of socio-economic, economic, physical and environmental risks associated with urbanisation, population growth and climate change (Le Roux, et al., 2019). The risk profile was accessed for the Emthanyeni Municipality. The present Emthanyeni Municipality socio-economic risk index is 3, ranking 9th out of 26 in the province and 47th out of 213 in the country. The baseline (2011) economic vulnerability (3.4) for the Emthanyeni Municipality was rated 3rd out of all (213) municipalities in the country. The physical vulnerabilities (5.7) ranked 7th out of all municipalities in the country behind. The environmental vulnerability (3.9) for the Emthanyeni Municipality was rated 24th out of 213 municipalities.

The Green Book risk profile includes an assessment of projected risk to Emthanyeni Municipality up to 2050, mostly based on the low mitigation RCP8.5 climate simulations, and highlights the following:

- Change up to 2050 in extreme rainfall days based on the 95th percentile of daily rainfall is shown in Figure 10, and compared with those under the current rainfall where a value of more than 1 indicates an increase in extreme daily rainfalls. For the project area it is just under 1 (0.963) thus no increase in extreme daily rainfall is expected.

- The projected change in drought tendencies (i.e. the number of cases exceeding near-normal per decade) for the period 2050 relative to the baseline period, for RCP 8.5. A negative value of -0.1 at the project area indicates an increase in drought tendencies per 10 years (more frequent than baseline). The settlement of Britstown is at a medium risk of increases in drought tendencies. There are isolated pockets of medium increased risk of wildfires within the municipality. For the project area, however, the fire danger day is 63 which exceeds the McArthur fire-danger index value of 24.

In addition to the hazards identified in the Green Book, Hofste, et al., (2019) currently describe the area as arid with low water use, with a projection for the future (2040 based on a conservative low mitigation trajectory) of low water stress. South Africa is known to be a water stressed country (Kusangaya, Shekede, & Mbengo, 2017) where climate change, through elevated temperatures, is likely to increase evaporation rates which may decrease water volumes available for dryland and irrigated agriculture (Davis-Reddy & Vincent, 2017).

Extreme weather events affecting southern Africa, including heat waves, flooding due to intensified rainfall due to large storms and drought, have been shown to increase in number since 1980 (Davis-Reddy & Vincent, 2017). Projections indicate (Davis- Reddy & Vincent, 2017):

- with high confidence, that heat wave and warm spell duration are likely to increase while cold extremes are likely to decrease, where up to 80 days above 35°C are projected by the end of the century;
- with medium confidence, that droughts are likely to intensify due to reduced rainfall and/or an increase in evapotranspiration; and
- with low confidence, that heavy rainfall events (more than 20 mm per 24 hours) will increase.

12.5 PROJECT IMPACT: THE PROJECTS CARBON FOOTPRINT

12.5.1 Scope 1 GHG Emission Sources

- **Construction phase:** The project includes the installation of Solar PV modules covering an area of 615 Ha. Even though it is likely that vegetation clearance will be avoided and obstacles below piling locations for tracker structures will be removed only if required, the areas covered by the solar panels will avoid sunlight to the vegetation below, and subsequently it will die off. This will result in decreased carbon sequestration by plants. This area was therefore included in the land clearing calculation. In addition, GHG will be emitted through operating diesel-powered mobile equipment such as mobile drilling or ramming rigs, road building equipment, concrete trucks, mobile cranes, forklifts, light duty transport vehicles.

- **Operational Phase**: The main sources of GHG due to the proposed operations are the mobile (maintenance vehicles and equipment) and stationary equipment (generators).
- **Decommissioning Phase:** As operations progress, the previously cleared areas that form part of the project will be rehabilitated resulting in a carbon sink gain. Even assuming rehabilitation uses the same indigenous vegetation, the carbon balance will not be completely restored. The Solar PV modules cover the vegetation, which may impact on species that prefer sunlight. However, there is insufficient data at this point to determine the decommissioning GHG emissions. This is likely to be equivalent or less than the construction phase, with the reestablishment of a carbon sink in the revegetation of the site.

12.5.2 Scope 2 GHG Emission Sources

Scope 2 GHG emissions apply to consumption of purchased electricity, heat, or steam. From the information provided, no Eskom generated electricity will be used during construction or operational phases.

12.5.3 Summary of Scope 1 and Scope 2 Emissions Sources

The total CO_{2eq} emission rate from the Soyuz 4 Solar PCV Park construction phase 4 717 tpa (Scope 1) and no Scope 2 emissions. For a single operational year, the Scope 1 GHG emissions will be 42 tpa.

Assuming the facility operates at the contracted capacity for an average of 6.2 hours a day, the project could potentially avoid emissions of approximately 692 478 tonnes of CO_{2eq} per annum. Over the lifetime of the project, given as 30 years, the avoided emissions are 20.77 $MtCO_2$-e.

12.5.4 The Projects GHG Emissions Impact

- **Impact on the National Inventory:** The operational phase of Soyuz 4 Solar PCV Park will likely result in a slight increase in Scope 1 emissions and a decrease in Scope 2 emissions. The annual operational CO_2-e emissions from the Soyuz 4 Solar PCV Park operations is less than 0.00001% to the South African “energy” sector total and 0.000009% of the National GHG inventory total, based on the published 2017 National GHG Inventory (DFFE, 2021). The annual CO_2-e emissions from the construction phase would contribute approximately 0.0012% to the South African “energy” sector total and represent a contribution of 0.001% to the National GHG inventory total (DFFE, 2021).

- **Alignment with National Policy:** Regulations pertaining to GHG reporting using the NAEIS were published in 2017 (Republic of South Africa, 2017) (as amended by GN R994, 11 September 2020) where mandatory reporting guidelines focus on reporting of Scope 1 emissions only. The DFFE is working together with local sectors to develop country specific emissions factors in certain areas; however, in the interim the IPCC default emission figures may be used to populate the SAAQIS GHG emission factor database. With the operational Scope 1 CO_2-e emissions below 100 000 t/a, Soyuz 4 Solar PCV Park does not have to compile a pollution prevention plan (PPP). Photovoltaic plants also do not have to report on SAGERS (Annexure 1 of the GG No.43712 of 11 September 2020).

12.6 PROJECT IMPACT: PHYSICAL RISKS OF CLIMATE CHANGE

- **Physical Risks of Climate Change on the Project's Construction and Operations:** With the increase in temperature, including heat waves, there is the likelihood of an increase in discomfort, possibility of heat related illness (such as heat exhaustion, heat cramps, and heat stroke). Both these have the potential to negatively affect staff process performance and productivity. From a process point of view, elevated ambient temperatures (up to 45°C) may slightly reduce the fuel requirements needed to meet the generating capacity required. However, water use as a dust control measure during construction, and to keep the Solar PV panels clean, may increase. The impact of intense rainfall events on the Solar PV Plant cannot be ruled out, where the frequency of intense rainfall events could increase from the long-term baseline. These events could affect production capacity during high cloud cover events. High rainfall events could result in flooding affecting site access, safe operation of equipment, delivery of fuel, as well as physical damage to infrastructure during high wind speed events associated with intense storms.

- **Potential Effect of Climate Change on the Community:** With the increase in temperature, including heat waves, there is the likelihood of an increase in discomfort and possibility of heat related illness (such as heat exhaustion, heat cramps, and heat stroke). There is also the possibility of increased evaporation which in conjunction with the decrease in rainfall can result in water shortage. This does not only negatively affect the community's water supply but can reduce the crop yields and affect livestock resulting in compromised food security. The projected increased risk of wildfires is medium at Britstown, but with an increased number of fire danger days within the project area which could potentially damage the PV Solar panels and infrastructure.

12.7 PROJECT ADAPTATION AND MITIGATION MEASURES

Climate change management includes both mitigation and adaptation. The main aim of mitigation is to stabilise or reduce GHG concentrations because of anthropogenic activities. This is achievable by lessening sources (emissions) and/or enhancing sinks through human intervention. Mitigation measures are typically the focus of the energy, transport, and industry sectors (Thambiran & Naidoo, 2017). Adaptation measures focus on the minimising the impact of climate change, especially on vulnerable communities and sectors. Inclusion of the climate change adaptation in business strategic implementation plans is one of the outcomes defined in the Draft National Climate Change Adaptation Strategy (Government Gazette No.42466:644, May 2019).

Project specific mitigation measures, may include:

- GHG emissions from vehicles and equipment: maintain vehicles and machinery in accordance with manufacturers standard specifications.
- GHG emissions from generators: minimization of events that require the use of a diesel-powered generator.

Carbon offset options could include restoring and increasing vegetation cover where possible, rehabilitating ecosystems and maintain ecological infrastructure, and develop agricultural programmes that can support the surrounding community. With the main agricultural activities around Britstown including wool production and livestock farming, the Solar PV sites could provide shade to grazing sheep and other livestock, thus reduce heat stress.

From an adaption perspective, additional support infrastructure can reduce the climate change impact on the employees. For example, improving the thermal and electrical efficiency of buildings to reduce electricity consumption for air conditioning, ensuring adequate water supply for staff drinking water, amending summer operating hours to avoid the hottest part of the day and potential health and safety impacts for employees, having shaded green rest areas for employees during their shift breaks.

12.8 IMPACT ASSESSMENT: SIGNIFICANCE RATING

The calculated CO_2-e emissions from the project are calculated at 1 262 tonnes for the entire project life and 42 tonnes per average operational year. The Construction phase will have the highest annual contribution at 4 717 tonnes. In addition, the operations will have 20.77 $MtCO_2$-e saving over the life of the project. The project Category 1 and 2 emissions due to operations would contribute approximately 0.000009% to the National GHG inventory total (based on the 2017 National inventory).

GHG threshold may be based on the classification of projects by the European Bank for Reconstruction and Development (EBRD), in which projects contributing more than 25 Gg CO_2-e per year to have significant GHG emissions14 (EBRD 2019).

The proposed intensity rating for annual emissions is as follows:

25 Gg CO_2-e :	Very Low (i.e., threshold used by EBRD, IFC and Equator Principals)
25 – 100 Gg CO_2-e:	Low (i.e., DFFE PPP requirement threshold is 100 Gg CO_2-e)
100 – 500 Gg CO_2-e:	Medium (i.e., DFFE PPP to 0.1% of the total gross SA GHG emissions
500 – 5 000 Gg CO_2-e:	High (i.e., 0.1% to 1.0% of the total gross SA GHG emissions)
>5 000 Gg CO_2-e:	Very High (i.e., more than 1.0% of the total gross SA GHG emissions)

The combined GHG emissions (construction and operations) for the project operations per annum of 4 758.8 tonne CO_2-e are below the threshold used by EBRD. The impact significance is therefore considered to be **Very Low**.

12.9 CONCLUSION AND RECOMMENDATION OF THE CLIMATE SPECIALIST

The conclusions and recommendations of the assessment are summarised below:

- The region around Britstown where Soyuz 4 Solar PV Park project is proposed to be developed is likely to experience increased temperatures and rainfall events in the future. Climate change impacts will disproportionately affect under-developed communities that lack the physical and financial resources to cope with the physical effects of climate change, such as droughts, floods and increases in diseases.

- Cumulatively, assuming the Solar PV Park replaces generative capacity from other fossil fuel sources, the facility could contribute to lowering South Africa's GHG emissions from the

Energy sector. This is since the PV arrays and BESS provide renewable energy at a lower carbon dioxide equivalent (CO2-e)1[22] emission per unit electricity.

- Based on Soyuz 4 Solar PV Park Scope 1 and Scope 2 GHG emissions, it is the Climate Specialist opinion that the project may be authorised due to its low impact significance, and the positive cumulative downstream impact since the Solar PV facility will have a lower emission per unit compared with the Eskom which is largely dependent on coal fired power stations.

- Provided that the Soyuz 4 Solar PV Park will result in long-term vegetation loss (30 years), the loss should be offset by restoring and increasing vegetation cover where possible, rehabilitating ecosystems and maintain ecological infrastructure, and develop agricultural programmes that can support the surrounding community, also allowing livestock to graze in the PV Solar parks which would provide shade resulting in lower heat stress to the animals.

13 FRESHWATER IMPACT ASSESSMENT

TMG, on behalf of the Applicant appointed SAS (C/O Mr Stephen van Staden) (hereinafter referred to as the “Freshwater Specialist”) to undertake a Freshwater Ecological Impact Assessment for the proposed Soyuz 4 Solar PV Park.

13.1 ASSESSMENT METHODOLOGY

The following summarises the assessment methodology applied:

- A background study of relevant national, provincial, and municipal datasets (such as National Freshwater Ecosystem Priority Areas [NFEPA] (2011), and the National Biodiversity Assessment 2018: South African Inventory of Inland Aquatic Ecosystems (SAIIAE) databases was undertaken to aid in defining the Ecological Importance and Sensitivity (EIS) of the freshwater ecosystems;

- All freshwater ecosystems within the investigation area were delineated using desktop methods in accordance with GN 509 of 2016 as it relates to activities as stipulated in the NWA and verified where possible according to the “Department of Water Affairs and Forestry (DWAF)2 (2005)3: A practical field procedure for identification of wetlands and riparian areas”. Aspects such as terrain setting, hydrological characteristics, vegetation indicators (e.g. vegetation species composition and structure), and soil wetness were used to verify the freshwater ecosystems;

- The freshwater ecosystem classification assessment was undertaken according to the Classification System for Wetlands and other Aquatic Ecosystems in South Africa. User Manual: Inland systems (Ollis et al., 2013);

- The EIS of the freshwater ecosystems were determined according to the method described by Rountree and Kotze (2013);

[22] *A CO_2 equivalent, abbreviated as CO_2-e is a metric measure used to compare the emissions from various GHGs based on their global-warming potential (GWP), by converting amounts of other gases to the equivalent amount of CO2 with the same global warming potential.*

- The PES of the freshwater ecosystems were assessed according to the resource directed measures guideline as advocated by Macfarlane et al. (2008);

- The ecological service (EcoService) provision of the identified freshwater ecosystems was determined using the WET-EcoServices (Version 2) tool developed by Kotze et. al. (2020);

- The freshwater ecosystems were mapped relation to the study area. In addition to the freshwater ecosystem boundaries, the appropriate provincial recommended buffers and legislated zones of regulation were depicted where applicable;

- Allocation of a suitable Recommended Ecological Category (REC) and Recommended Management Objective (RMO) to the freshwater ecosystems based on the results obtained from the PES and EIS assessments;

- The DWS Risk Assessment Matrix (2016) and the impact assessment methodology as applied by the EAP was applied to identify potential impacts that may affect the freshwater ecosystems because of the proposed activities and infrastructure associated with the Soyuz 4 Solar PV Park, and to aim to quantify the significance thereof; and

- Management and mitigation measures which should be implemented during the various development phases to assist in minimising the impact on the receiving freshwater ecosystem environment have been presented.

13.2 DESKTOP ANALYSIS

The results of the Desktop Analysis are presented in a summary “dashboard” (**Table 27**). important to note that although all data sources are used to provide useful and often verifiable, high-quality data, the various databases used do not always provide an entirely accurate indication of the proposed Soyuz 4 Solar PV Park’s actual site characteristics at the scale required to inform the EIA process. Nevertheless, this information is considered useful as background information to the study, is important in legislative contextualisation of risk and impact, and was used as a guideline to inform the assessment and to focus on areas and aspects of increased conservation importance.

Table 27: Desktop data relating to the characteristics of the freshwater ecosystems associated with Soyuz 4 Solar PV Park and investigation area [Quarter Degree Square (QDS) 3023DA and 3023DC]

Aquatic ecoregion and sub-regions in which the Soyuz 4 Solar PV Plant falls	
Ecoregion	Nama Karoo
Catchment	Orange
Quaternary Catchment	D62A
WMA	Lower Orange
SubWMA	Orange Tributaries
Dominant characteristics of the Nama Karoo Ecoregion Level 2 (Kleynhans *et al.*,	
Ecoregion Level 2	26.02
Dominant primary terrain morphology	Closed Hills, mountains; moderate and high relief
Dominant primary vegetation types	Upper Nama Karoo
Altitude (m a.m.s.l)	500 to 1300
MAP (mm)	0 to 300
Coefficient of Variation (% of MAP)	35 - >40
Rainfall concentration index	45 to 65
Rainfall seasonality	Very late summer, Winter
Mean annual temp (°C)	16 to 20
Winter temperature (°C)	-2 to 20
Summer temperature (°C)	14 to 32
Median annual simulated runoff (mm)	
Ecological Status of the most proximal sub-quaternary reach (DWS, 2014)	
Sub-quaternary reach	D62A - 05344
Proximity to Solar PV Facility 4	~4,63 km north west of the PV Facility
Assessed by expert?	No (Data deficient)

Details of the Solar Soyuz 4 Solar PV Plant area in terms of the National Freshwater Ecosystem Priority Area (NFEPA) (2011)	
FEPACODE	The Soyuz 4 Solar PV Plant and associated investigation area fall within a sub quaternary catchment currently not considered important in terms of fish or freshwater conservation. River FEPAs achieve biodiversity targets for river ecosystems and threatened fish species and were identified in rivers that are currently in a good condition.
Wetland Vegetation Type	The Soyuz 4 Solar PV Plant and associated investigation area falls within the Upper Nama Karoo wetland vegetation type and is considered Least Threatened (**LT**) according to Mbona *et al* (2015).
NFEPA Wetlands	According to the NFEPA Wetlands database, a river feature is located west of the proposed Soyuz 4 Solar PV Plant study area within the investigation area. An artificial dam is indicated to be north-east of the proposed Soyuz 4 Solar PV Plant.
NFEPA Rivers	According to the NFEPA database, no river line is indicated to traverse the proposed Soyuz 4 Solar PV Plant study area and the investigation area.
Strategic Water Source Areas (SWSA) 2017	
The proposed Soyuz 4 Solar PV Plant study area and associated investigation area are not indicated to be within a surface or groundwater Strategic Water Source Area by the SWSA Database.	
National Web Based Environmental Screening Tool (Accessed 2022)	
The Screening Tool is intended to allow for pre-screening of sensitivities in the landscape to be assessed within the EA process. This assists with implementing the mitigation hierarchy by allowing developers to adjust their proposed development footprint to avoid sensitive areas.	
The proposed Soyuz 4 Solar PV Plant study area has an overall low sensitivity for aquatic biodiversity according to the screening Tool. The investigation area shows very high sensitivity for the area identified as a wetland, west of the Soyuz 4 Solar PV Plant footprint.	
Land Type Data	
All of the Soyuz 4 Solar PV Plant study area and most of the associated investigation area are located within the Ae297 land type. The remaining small portions of the investigation area to the south of the Soyuz 4 Solar PV Plant are located within the Ic162. The Ic land type grouping is characterised by rock or very shallow soils above rock or weathered bedrock. Ic land type groupings are characterised by exposed rocks covering more than 80 % of the area. The Ae Land Type refers to red, high-base status, freely-drained soils, of which the depth varies from 0.1 to > 0.3 m.	

Details of the Soyuz 4 Solar PV Plant and associated area in terms of the National Biodiversity Assessment (2018): South African Inventory of Inland Aquatic Ecosystems (SAIIAE)
According to the NBA (2018) (SAIIAE) database, one artificial dam is indicated to be in the eastern portion of the investigation area associated with the Soyuz 4 Solar PV Plant. The database also indicates a channelled valley bottom wetland east of the Soyuz 4 Solar PV Plant, within the investigation area. The valley bottom wetland is indicated by the database as natural to largely natural (Wetcon A/B). An unnamed tributary of the Ongers River is located to the west, outside of the proposed Soyuz 4 Solar PV Plant study area and its investigation area. The tributary is indicated by the database to be in a heavily to critically modified (RIVCON Z) ecological condition according to the SAIIAE (2018).

Detail of the Assessment area in term of the Northern Cape Critical Biodiversity Areas (CBA) (2016)	
Ecological Support Area (ESA)	No areas within the proposed Soyuz 4 Solar PV Plant study area and its associated investigation area are indicated as ESA. According to the Technical Guidelines for CBA Maps document, ESAs are areas that must retain their ecological processes in order to meet biodiversity targets for ecological processes that have not been met in CBAs or protected areas; meet biodiversity targets for the representation of ecosystem types or Species of special concern when it's not possible to meet them in CBAs; support ecological functioning of protected areas or CBAs or a combination of these.
Other Natural Area (ONA)	The proposed Soyuz 4 Solar PV Plant study area and associated investigation area are indicated as ONAs. According to the Technical Guidelines for CBA Maps document, ONA consist of all those areas in good or fair ecological condition that fall outside the protected area network and have not been identified as CBAs or ESAs.

Note: CBA = Critical Biodiversity Area; DWS = Department of Water and Sanitation; EI = Ecological Importance; EPL = Ecosystem Protection Level; ES = Ecological Sensitivity; ESA = Ecological Support Area; ETS = Ecosystem Threat Status; LT = Least Threatened; m amsl = Meters Above Mean Sea Level; MAP = Mean Annual Precipitation; NBA= National Biodiversity Assessment; NFEPA = National Freshwater Ecosystem Priority Areas; NP = Not Protected; ONA = Other Natural Areas; PES = Present Ecological State; SAIIAE = South African Inventory of Inland Aquatic Ecosystems; WMA = Water Management Area; OHPL = Overhead Powerline.

13.3 FRESHWATER ECOSYSTEM CHARACTERISATION & DELINEATION

The site assessment confirmed the presence of eight (8) freshwater ecosystems associated with the study and investigation areas:

- Six (6) episodic drainage lines are located in the southern part of the investigation area but do not drain into the study area;
- An episodic drainage and a tributary drainage line drain north-westwards through the north-eastern part of the investigation area.

The freshwater ecosystems identified were classified according to the Classification System (Ollis et al., 2013) as Inland Systems. The freshwater ecosystems fall within the Nama Karoo Aquatic Ecoregion and the Upper Nama Karoo WetVeg (wetland vegetation) group, classified by Mbona et al. (2015) as "Least Threatened". At Levels 3 (Landscape Unit) and 4 (HGM Type) of the Classification System, the systems were classified as per the summary in **Table 28**.

Table 28: Levels 3 and 4 Characterisation of the Freshwater Ecosystem

Freshwater Ecosystem HGM Type	Level 3: Landscape unit	Level 4: Hydrogeomorphic (HGM) Type
River (Episodic Drainage Line)	Valley floor—the base of a valley, situated between two distinct valley side-slopes, where alluvial or fluvial processes typically dominate.	linear landform with clearly discernible bed and banks, which permanently or periodically carries a concentrated flow of water. A river is taken to include both the active channel and the riparian zone as a unit.

An important component of the delineation and ground-truthing of desktop delineations of freshwater ecosystems as undertaken during the field assessment was the confirmation of whether certain parts of the study and investigation areas that were indicated as being freshwater features in desktop databases, including 1 in 50 000-scale topo-cadastral maps, comprised freshwater ecosystems. It is important to note that certain such drainage systems in the study and investigation areas were confirmed to **not qualify as freshwater ecosystems** (watercourses) in terms of the definition in the NWA and GN509.

Each part of the study area where drainage was indicated in either national or provincial databases or on the topo-cadastral maps was carefully investigated to confirm the presence or absence of indicators of freshwater ecosystems, as defined above. Certain longitudinal bands of sandy soils on the Soyuz 4 Solar PV Park development footprint, and along the proposed access road alignment displayed the above absence of definitive freshwater ecosystem characteristics and were accordingly not classified as freshwater ecosystems.

The delineated (field verified) extent of the freshwater ecosystems relative to the proposed Soyuz 4 Solar PV Park and associated investigation area are depicted in **Figure 46** and key information pertaining to the characteristics of the systems are presented in dashboard style reports in **Table 29**.

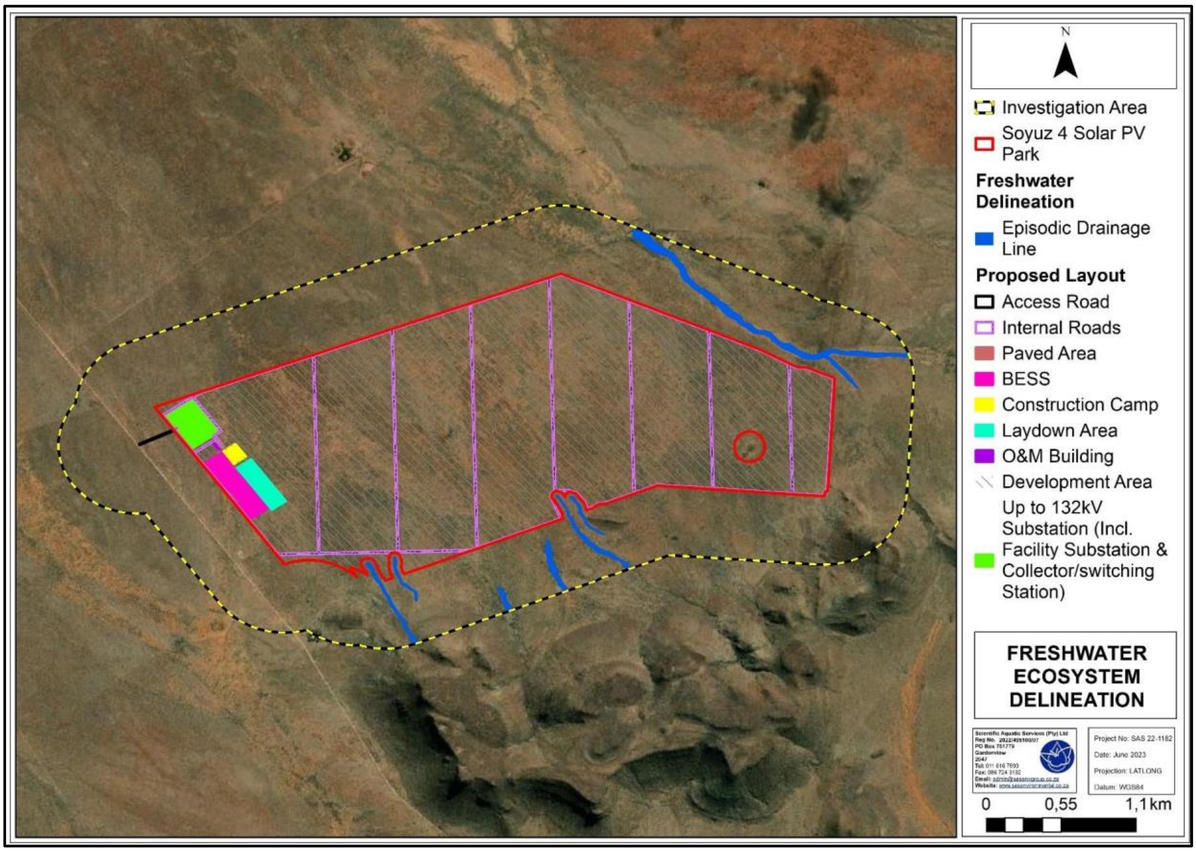
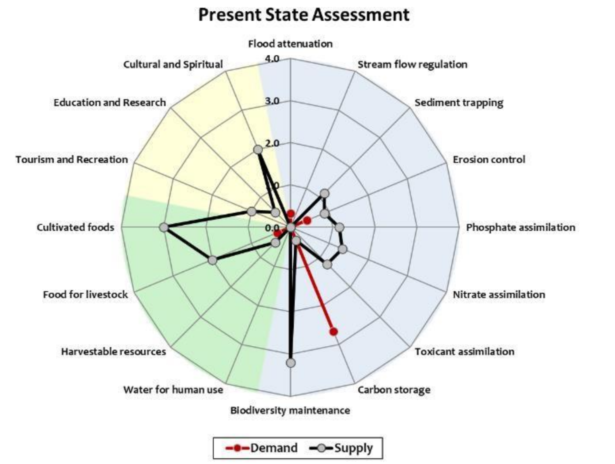


Figure 46: Delineated freshwater ecosystems associated with the proposed Soyuz 4 Solar PV Park

13.4 FRESHWATER ECOSYSTEM: SITE VERIFICATION

The dashboard-style tables (**Table 29**) summarise the findings of the field verification in terms of relevant aspects (hydrology, geomorphology, and vegetation components) of freshwater ecology of the potentially directly affected freshwater ecosystems.

Table 29: Summary of the assessment of the southern EDLs located in the investigation area.

<table>
<tr><td colspan="2">Ecological & socio-cultural service provision graph:

</td><td rowspan="2">
Photograph notes: Top: The narrow channels of two of the EDL’s; Bottom left – area where one of the EDL’s dissipates; Bottom right – Example of bank erosion along one of the EDLs.</td></tr>
<tr><td>Ecoservice provision</td><td>Biodiversity Maintenance - Moderate
Cultivated Foods – Moderately Low
All other services = Very Low
The EDLs area responsible for ensuring biodiversity maintenance, but to a relatively low degree due to their very limited spatial extent and position in the drainage network as first order drainage features. In addition the EDLs dissipate after a very short length and are not characterised by woody riparian vegetation. Due to their limited hydroperiod and small catchment there are very limited hydrological ecoservices provided by the EDLs. The natural state of the of the catchment entails that there are no pollutant sources that would need to be trapped or assimilated. No significant socio-cultural ecoservices are associated with the EDLs.</td></tr>
<tr><td>PES/ discussion</td><td colspan="2">Riparian IHI PES Category: A/B
Due to the relatively small size and landscape position of the EDL’s, they have not been dammed or impounded – the most prevalent and arguably the most significant impact on freshwater ecosystems (EDLs) in the wider area. The EDL’s are characterised by a relatively natural catchment that is comprised largely of increasingly steep-sloping ground, with the only landuse practised being livestock rearing. Accordingly the hydrology of the EDL’s appears to be a relatively natural state. No areas of vegetative alteration were noted and vegetation within the EDLs was assessed to be representative of short EDLs with a very limited hydroperiod. The only visible impact on the EDL’s was that of erosion, with some incision related to bank erosion present.</td></tr>
</table>

EIS discussion	**EIS Category: Low** The most important aspect of the EIS of the EDL's relates to biodiversity aspects. Despite their relatively short length and lack of connectivity to the wider drainage system (as the EDL's dissipate before entering the study area), they provide an element of biodiversity importance by providing a source of food and shelter for biota, related to a partially elevated degree of moisture availability. Due to their very limited length and spatial extent the drainage lines are not significant or sensitive from a hydrological perspective providing very few hydrological functions. The only aspect of direct human benefit provided is the limited degree of livestock grazing provision.	**REC, RMO & BAS Category**	**REC Category: A/B** **RMO: Maintain** **BAS: A/B (Maintain)** Since the EDLs have been assessed to be in a largely state, but with a low EIS rating, the ecological condition of the EDLs must be maintained. This entails that landuse change in the catchment of the drainage lines should carefully consider the impact on the EDLs to ensure that the ecological state of the EDLs does not become degraded. In the context of the proposed development, the exclusion of the EDLS from the development area and their landscape position upgradient of the development site entails that the development will not risk the impacting of the EDLs.

Watercourse drivers and receptors discussion (hydraulic regime, geomorphological processes, water quality and habitat and biota):
The catchment of the EDLs is comprised of increasingly steeply sloping terrain on the footslopes and slopes of mountainous terrain and is mostly characterised by livestock rearing. The landcover in the catchment is thus characterised by grassy and dwarf-shrub Karroid vegetation, with sheet and gulley erosion appearing to be reasonably prominent in localised areas. As with most of the drainage line freshwater features in the study area, drainage is expressed in a channelised form where it occurs in areas of increased slope, dissipating (and ceasing to be a freshwater feature) where the channelised feature enters an area of flat topography (plains) that characterise most of the wider area. This is true of all of the EDLs located to the south of the Soyuz 4 development site. The EDLs are highly episodic in nature, not characterised by any form of baseflow and only fed by surface water flows from the surrounding catchment area during and after rainfall events of sufficient volume and intensity to generate surface runoff. As such these short EDLs are likely to be 'flashy' in nature, being characterised by surface flows for very short duration. No impounding features are located along the EDLs and accordingly during periods of flows, overland flows will be channelled along the EDLs to the point at which they dissipate, thereby discharging the flows into the flatter terrain. Due to their very limited extent, the EDLs do not typically demonstrate any woody riparian vegetation species. Rather the riparian zone of the EDLs is characterised by wiry Karroid grass species and dwarf shrubs, particularly *Rhigozum spp.* (which are invasive invaders), and which predominate the surrounding area. Due to their limited spatial extent, the EDL's do not provide, and are not characterised by a significantly altered biological assemblage as compared to the surrounding terrestrial habitats.

Extent of modification anticipated	The EDLs are not located within the footprint of the solar PV arrays and are also located upgradient of the solar PV development site. Accordingly no direct impacts on the EDL's are anticipated, and indirect impacts in the form of stormwater are very unlikely to materialise due to their landscape position in relation the development site. The level of modification on these EDLs is thus expected to be low.
Impact Significance & Business Case:	
Low	As the Soyuz 4 Solar PV Park's solar array footprint is not located in or in very close proximity to any of the EDL freshwater ecosystem, the development of the solar arrays has been determined pose a very low quantum of impact on the EDLs located to the south of the development site boundary, especially considering that the EDLs are all located upgradient of the development site and thus have no potential to be affected by stormwater inflows. Provided all mitigation measures are implemented, in particular ensuring no vehicle access to the EDLs is permitted, the risk can be maintained at a "Low" degree of risk.

13.5 APPLICATION OF BUFFER ZONES

The following Zones of Regulation (ZoR) are applicable to the Soyuz 4 Solar PV Park development site and access roads (**Figure 47**):

- NEMA 32 m ZoR as it relates to the National Environmental Management Act, 1998 (Act No. 107 of 1998);
- GN 509 100m ZoR as it relates to the National Water Act, 1998 (Act No. 36 of 1998).

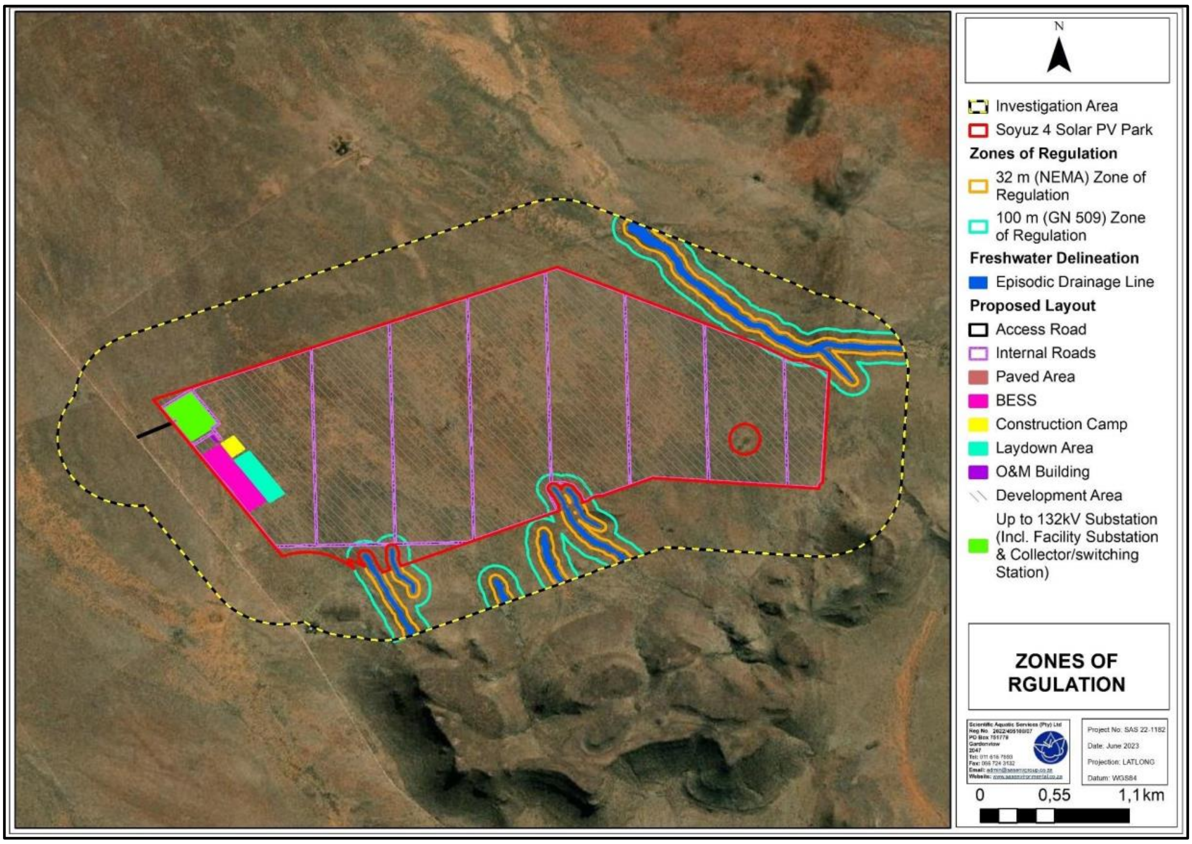


Figure 47: Conceptual presentation of the zones of regulation applicable to the Soyuz 4 Solar PV Park in relation to the delineated freshwater ecosystems

13.6 POTENTIAL FRESHWATER IMPACTS

There are **five key ecological impacts** on freshwater ecosystems that may potentially occur in relation Soyuz 4 Solar PV Park:

- Altered freshwater ecosystem habitat and ecological structure;
- Changes to sociocultural and service provision;
- Altered biotic integrity and disturbance to ecosystem function;
- Impacts on the hydrology and sediment balance of the freshwater ecosystems; and
- Altered water quality.

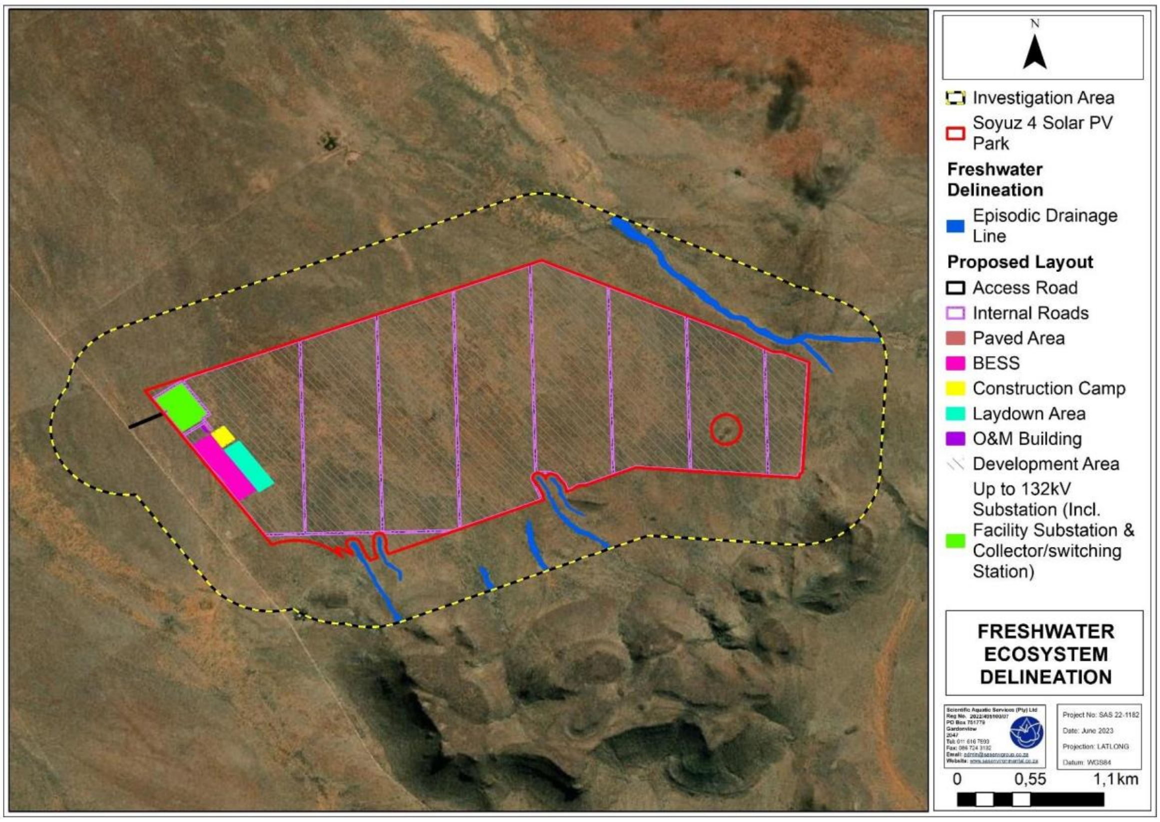


Figure 48: Freshwater Ecosystem Delineation

Direct impacts could occur should the footprint of the Soyuz 4 Solar PV Park encroach on the delineated extent of the freshwater ecosystems, thereby resulting in direct transformation or degradation of freshwater habitat. In the context of the proposed development's initial layout, this would materialise if the footprint of the solar arrays encroached on the drainage lines that occur within the study area boundaries. Indirect and cumulative impacts to the receiving freshwater environments could also occur. Direct impacts will be able to be avoided on the Soyuz 4 Solar PV Park development site should the footprint of the solar arrays be placed outside of the delineated extent of the drainage lines located on the site (Avoidance). Indirect impacts can be minimised with the implementation of a suitable buffer surrounding the drainage lines.

Greater detail on the potential risks related to indirect impacts and direct impacts associated with project components are as follows:

- Site clearing and preparation prior to commencement of any construction related activities for the proposed project may result in the potential for an increased degree of runoff and erosion, thus leading to increased sedimentation of adjacent / downgradient freshwater ecosystems. This may further contribute to smothering of freshwater biota due to increased sedimentation and decreased ecological service provisioning. The impacts of site clearing are anticipated to be relatively localised however, any impacts on the freshwater ecosystems will likely affect neighbouring areas further downstream;
- The potential exists for construction activities associated with the proposed project to generate dust through the removal of vegetation and topsoil, especially if injudicious, large scale clearing of vegetation across the entire development site were to occur. This could result

in large volumes of dust being transported into nearby freshwater systems, thereby smothering vegetation and other biota;

- Altered drainage patterns (related to stormwater in the event of precipitation events) due to increased impermeable surfaces or surfaces cleared of vegetation could adversely affect downgradient / adjacent freshwater ecosystems. In turn, this may contribute to increased alien vegetation proliferation and possible incision and sedimentation of the freshwater ecosystems;
- Cement mixing (batching) during construction could adversely affect downgradient freshwater ecosystems if polluted stormwater from the batching / mixing areas is transported into freshwater ecosystems. Such polluted stormwater could alter the pH of surface water, thereby posing a risk to freshwater biota;
- It is considered likely that the development of operational stormwater infrastructure will occur as part of the proposed development and may lead to loss of catchment yield from stormwater containment, thereby leading to altered vegetation community structure and diversity due to moisture stress and reduction in volume of water entering the freshwater environment, leading to reduced recharge. The intensity of the impact will be reduced if stormwater generated from the operational components of the development, if not used for stormwater recycling purposes, be discharged into the receiving freshwater environments in a manner that does not result in scouring and erosion of freshwater ecosystems and alterations to freshwater ecosystem hydrology;
- The operation and maintenance of the proposed infrastructure associated with the Soyuz 4 Solar PV Park may result in increased risk of pollution of surface water, increased risk of sediment transport in surface runoff from impermeable surfaces, altered vegetation community composition, increased risk of erosion and altered runoff patterns within the landscape.

13.7 CONCLUSION OF FRESHWATER SPECIALIST

The results of the field verification indicated that no freshwater ecosystems are located within the updated boundaries of the Soyuz 4 Solar PV Park development site, but that six EDLs are located in relatively close proximity to the southern boundaries of the development site and that a further two EDLs are located in the investigation area to the north-east of the development site.

The proposed development would thus not have the potential to directly impact any freshwater ecosystems in the context of the PV arrays. Indirect impacts on the six EDLs located to the south of the development site and the two EDLs to the north-east of the site are possible, however the six EDLs to the south of the site are located upgradient of the site and provided that construction and operational impacts are limited to the development site, the probability for impacts would be greatly reduced. In addition, the distance between the development site and the two EDLs to the north-east would greatly minimise or even negate potential indirect impacts, with the intervening area acting as an effective buffer.

Following the freshwater ecosystem assessment, the DWS Risk Assessment Matrix (2016) was applied to determine the significance of impacts of the proposed Soyuz 4 Solar PV Park on the receiving freshwater environment. The activities associated with the construction and operation of the proposed development pose a "Low" risk significance to the freshwater ecosystems within the investigation areas, provided that the mitigation and control measures specified are adhered to.

In the context of these findings and assessment of low impacts, it is the professional opinion of the freshwater specialist that the development can be considered for approval by the relevant authorities in terms of the Water Use Authorisation and EIA processes.

14 GEOTECHNICAL RECONNASAINCE ASSESSMENT

TMG, on behalf of the Applicant appointed GEOSS South Africa (C/O Louis Jonk) (hereinafter referred to as the "Geotech Specialist") to undertake the Geotechnical Impact Assessment the proposed Soyuz 4 Solar PV Park.

14.1 TOPOGRAPHY AND SITE FEATURES

The Soyuz Solar PV Park Cluster 1-6 development lies within are characterised mostly by topographically-subdued, flat to very gently hilly terrain with localised topographic highs in the form of butts or ridges formed from negative weathering of more competent Karoo dolerites. All the proposed sites for the Soyuz Solar PV Park development are situated on topographical lows in the area, with Soyuz 4 Solar PV Park located at an elevation of 1249 to 1312m above mean sea level. Although agriculture is the dominant industry within the area, the landscape in the area has remained relatively unchanged as the regional farming practices are dominated by livestock development. During the summer months, the vegetation is dominated by medium-length grasses and small brushes of the Upper Karoo Bioregion with numerous scattered domical termitaria The study area displays very little bedrock outcrop, except for the margins of local topographic highs, the outward dipping edge of localised ridges, and occasional small borrow pits exploiting Quaternary-age deposits The topography in the region has been classified in terms of development based on classes suggested by Stiff et al. (1996),[20] . Most of the region is classified as "intermediate" followed by "favourable" due to the flat nature of the site.

14.2 GEOLOGY

The Council for Geoscience (CGS) has mapped the area at a scale of 1:250 000 scale (2824 Kimberly, GCS 1993). The geological setting is shown in **Figure 49** and the main geology of the area is listed in **Table 30**.

The site is mostly underlain by shale, siltstone and sandstone of the Karoo-aged Tierberg Formation of the Ecca Group, which have been intruded by Jurassic-aged dolerites, and overlain by quaternary-aged surficial cover.

Table 30: Geological Formations

CODE	FORMATION	GROUP	LITHOLOGY
	Quaternary-aged sediments		Alluvium
Jd	Jurassic aged intrusives		Dolerite
Pa	Abrahamskraal	Adelaide	Red and greenish-grey mudstone, subordinate siltstone and sandstone

CODE	FORMATION	GROUP	LITHOLOGY
Pwa	Waterford	Ecca	Sandstones, rhythmites, shales, and mudstones. Structures include wave ripples and slumping
Pt	Tierberg	Ecca	Grey shale with interbedded siltstones in the upper part

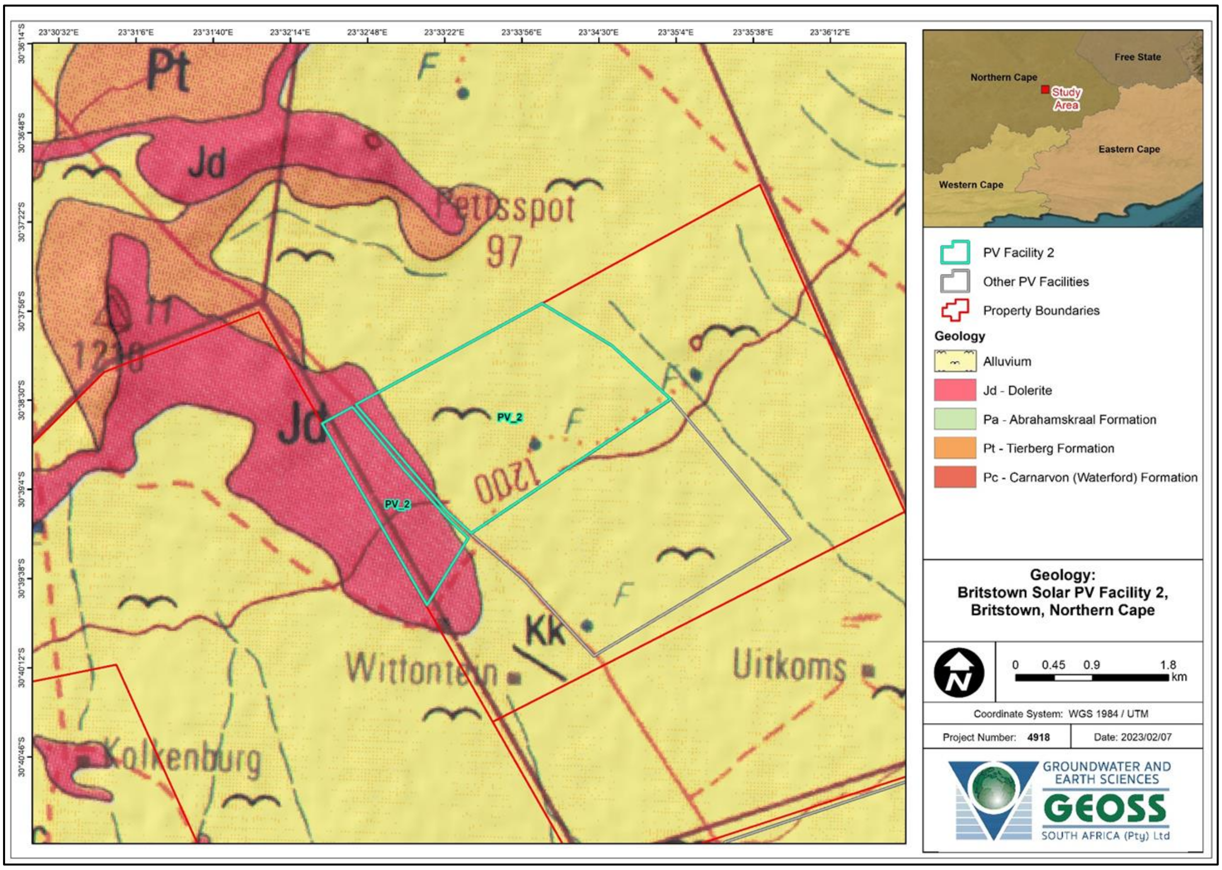


Figure 49: Geological Setting

14.3 SOIL TYPE DISTRIBUTION

Soils refer to the uppermost layer of sediments found within a specific area. Although all soils consist of essentially the same five elements i.e., organic matter, minerals, gasses, liquids, and organisms, varying pedogenic (soil forming) processes can lead to a wide diversity of soil types with large variation in both chemical and engineering properties.

Following the soil distribution maps of Fey (2010)[23] the Soyuz Solar PV Park Cluster 1-6 is located within the following five main soil type distributions (**Figure 50**).

- Calcic soils – Soft or hardpan, marked carbonate or gypsum enrichment
- Cumulic soils – Incipient soil formation in colluvial, alluvial or aeolian sediment
- Lithic soils - Incipient soil formation on weathered rock or saprolite

[23] *Fey, M., (2010) Soils of South Africa. Cambridge University Press.*

- Duplex soils – Marked textural contrast through clay enrichment
- Oxidic soils – Residual iron enrichment through weathering, typically uniform in colour.

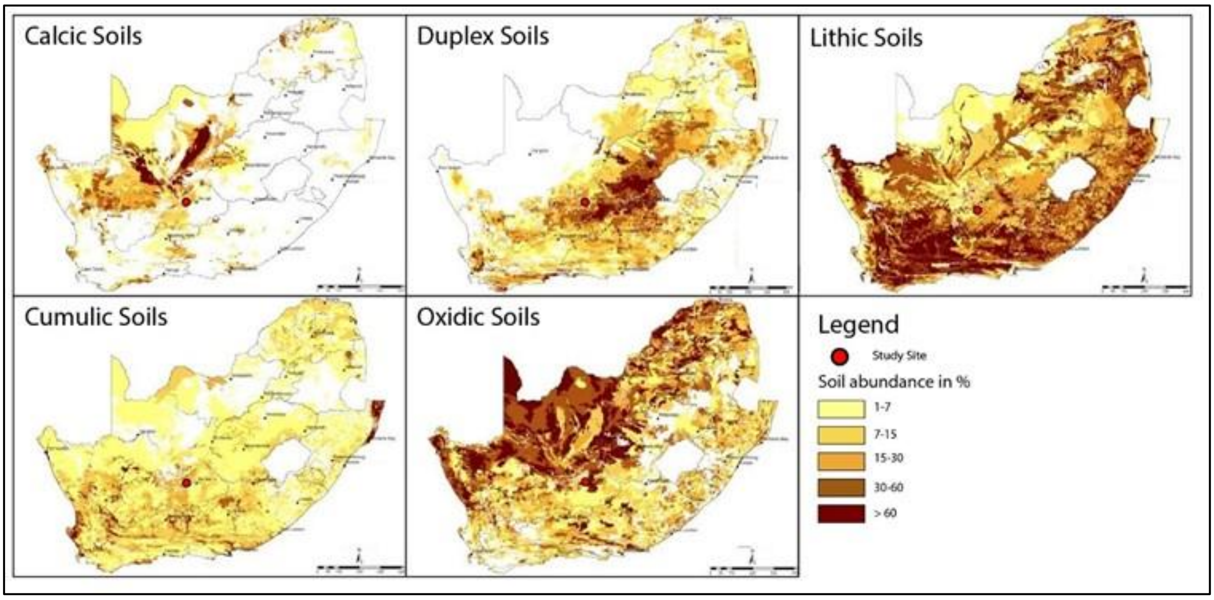


Figure 50: Soil Type Distributions across South Africa

A reconnaissance visit to the site at the end of January confirmed that the major soil types present at the Soyuz 4 PV Solar Park were Cumulic soils and Calcic soils with a strongly developed calcium carbonate horizon within the first-meter depth of the subsoil

14.4 PEDOCRETE DEVELOPMENT

Pedocretes describe materials that have formed *in situ* due to the cementation or replacement of soils by authigenic minerals such as iron or calcium carbonate from direct precipitation out of soil or from groundwater. Pedocretes are fairly common throughout southern Africa and are classified as either indurated (hardpans, honeycombs, nodules) or non-indurated (soft or powdery forms). Brink (1985)[24] compiled a general map of pedocretes distribution across southern Africa, which shows that the Soyuz Solar PV Park Cluster 1-6 is located well within the common distribution of calcrete soils (Figure 51).

The generalised soil profile is provided in **Table 31**.

Table 31: Generalised Soil Profile

DEPTH (mbgl)	EXPECTED SOIL PROFILE
0.0 to 0.5/1.0	Dry, red to reddish brown, loose to medium dense, fine to medium grained silty **SAND** containing rounded calcrete pebbles. This horizon potentially represents the topsoil and transported alluvium.
0.5/1.0 to 1.2/1.5	Laterally discontinuous, hard yet brittle, white calcrete, variably interbedded with 0.1 to 0.2 m thick layers of fine to medium grained red **SAND**
1.2/1.5 to 2.0	Dry, dark grey, highly fractured and friable, unweathered, fine-grained **SHALES** of the Tierberg Formation. Note: Fractures are infilled by calcium carbonate to form a characteristic calcrete-shale honeycomb structure.

[24] *Brink, A. B. A., (1985). Engineering Geology of Southern Africa Volume 4. Building Publications, South Africa. Building Publications, 1985.*

DEPTH (mbgl)	EXPECTED SOIL PROFILE
2.0 to 3.0 (end of profile)	Dry, dark grey, highly fractured and friable, unweathered, fine-grained **SHALES** of the Tierberg Formation.

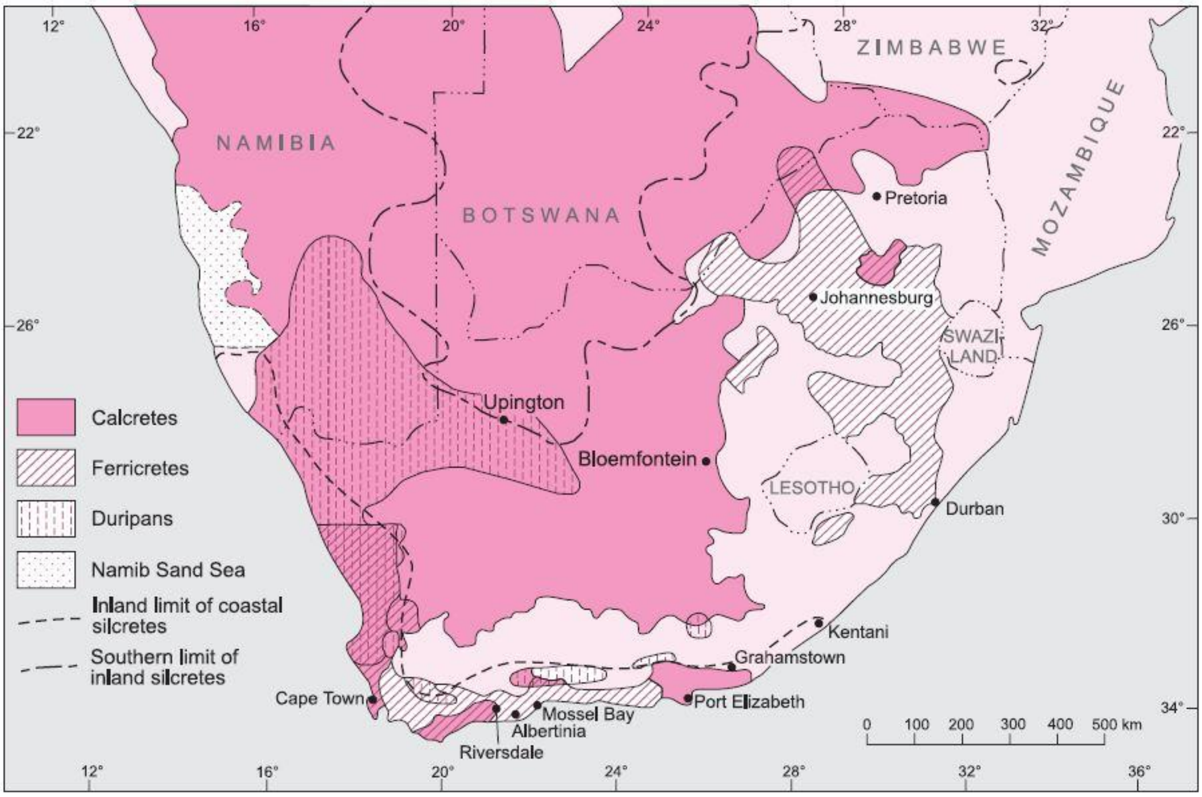


Figure 51: Distribution of Pedocretes across Southern Africa

14.5 HYDROGEOLOGY

In the region earmarked for development, two aquifer types occur namely intergranular and fractured, and fractured aquifers, with fractured aquifers dominating the area. Both the intergranular and fractured aquifer as well as the fractured aquifer are shown to have an indicative yield potential of 0.5 to 2.0 L/s (DWAF, 2002).[25]

The regional groundwater quality is classified following DWAF (1998) as “marginal” directly underlying the study area with an associated electrical conductivity (EC) of 70 – 300 mS/m (DWAF, 2002).

It should be noted that the above classifications are based on regional datasets, and therefore only provide an indication of conditions to be expected. In field testing will be required to confirm the local water quality and yield potential.

14.6 SEISMICITY

It is common practise to design structures for seismic loads when the nominal peak horizontal ground acceleration (NPGA) exceeds a 0.1 g once every 475 years[26].

[25] *DWAF (2002). The hydrogeological map series of the republic of South Africa. Beaufort West, 3122. Scale: 1:500 000.*
[26] *Retief, J., V., and Dunaiski, P., E., (2009). Background to SANS 10160: Basis of structural design and actions for buildings and industrial structures. Published by SUN MeDIA Stellenbosch.*

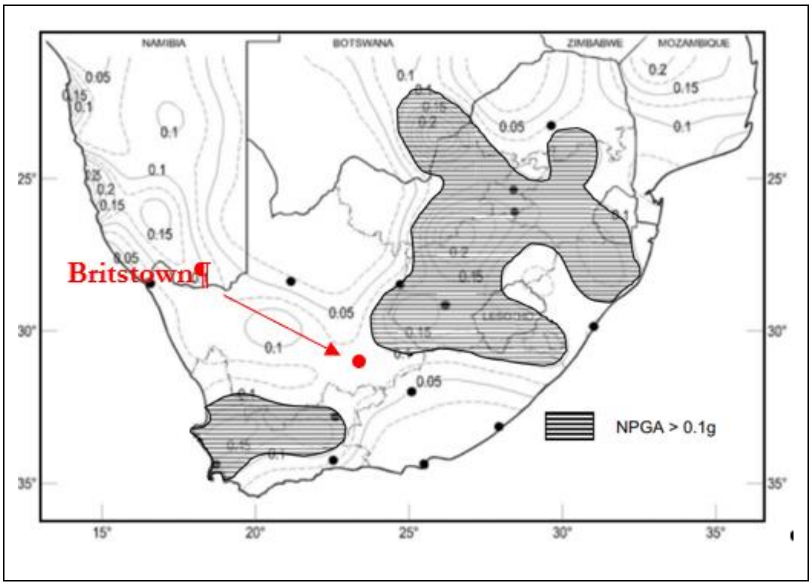


Figure 52: Nominal Peak Ground Acceleration Zones

Retief and Dunaiski, (2009) delineated such regions in southern Africa, the approximate position of Britstown is shown in red on Figure 52 relative to these regions.

The region surrounding Britstown is shown to have a nominal peak ground acceleration of less than 0.1g.

14.7 POTENTIAL IMPACTS

The impact of the project alternatives on the geological environment will predominantly relate to the impact that the development will have on the soils/rock units beneath the site. The impact of the development and construction, and operation of the proposed Soyuz 4 Solar PV Park activity on the geological environment is limited to topsoil stripping, excavations for pad foundations (if required), trenching, the construction of access roads, and associated light infrastructure. Bulk earthworks, where required for the construction of platforms and access roads, may generate a significant impact on the soils and rocks where construction takes place.

The primary concern associated with geotechnical works is increased soil erosion on site, due to the stripping of vegetation during the construction phase of the project. Removal of vegetation reduces infiltration, thereby increasing runoff yielding increased erosion. Further, compaction during earthworks reduces rainwater infiltration and increases surface runoff and increasing erosion. The construction of paved and/or hard-surfaced areas increases runoff and often localises discharge of stormwater, which may lead to increased erosion and consequently loss of topsoil. Disturbance of the soil may extend beyond the footprint of the structures should such conditions persist for long periods, e.g., more than 10 years.

15 HERITAGE IMPACT ASSESSMENT

TMG, on behalf of the Applicant appointed (ACO Associates) (C/O Mr John Gribble) (hereinafter referred to as the “Heritage Specialist”) to undertake a Heritage Impact Assessment (HIA) for the proposed Soyuz 4 Solar PV Park.

15.1 METHODOLOGY

The HIA aims to identify heritage resources which may be impacted during the *construction*, *operation* and *decommissioning* phases of the project, assess their significance and provide recommendations for mitigation.

This assessment included the following:

- A desktop level literature review to assess the potential for archaeological, cultural and historic sites in the proposed development area;
- Archaeological field work to identify and document (collect GPS coordinates and photograph) heritage resources, that may be affected by the project, on the ground. A physical heritage survey of the Soyuz 4-6 SPV project areas was over five days between 7 and 11 January 2023;
- A desktop palaeontological impact assessment (PIA) to assess whether palaeontological features will be affected by the project.
- An assessment of the sensitivity and significance of any heritage resources, an evaluation of the potential impacts on them of the construction, operation and decommissioning of the project, and
- Determination of measures to mitigate any negative impacts of the project on them.

15.2 RECEIVING ENVIRONMENT

The property on which the Soyuz 4 Solar PV Park is being proposed is rural farmland and is zoned agricultural. Historically the land has been and continues to be used for stock farming.

The Soyuz 4 SPV project site is situated on a largely flat plain which slopes gently from west to east

The Soyuz 4 SPV development site is almost entirely covered in the red alluvial sands typical of this part of the Northern Cape. Although the depth of the sand varies, animal burrows noted during the survey indicate that it can be more than a metre thick., No exposures of bedrock were noted during the ACO walkover survey.

The vegetation is the grassy, dwarf shrubland typical of the Nama-Karoo biome as can be seen in **Figure 53**.

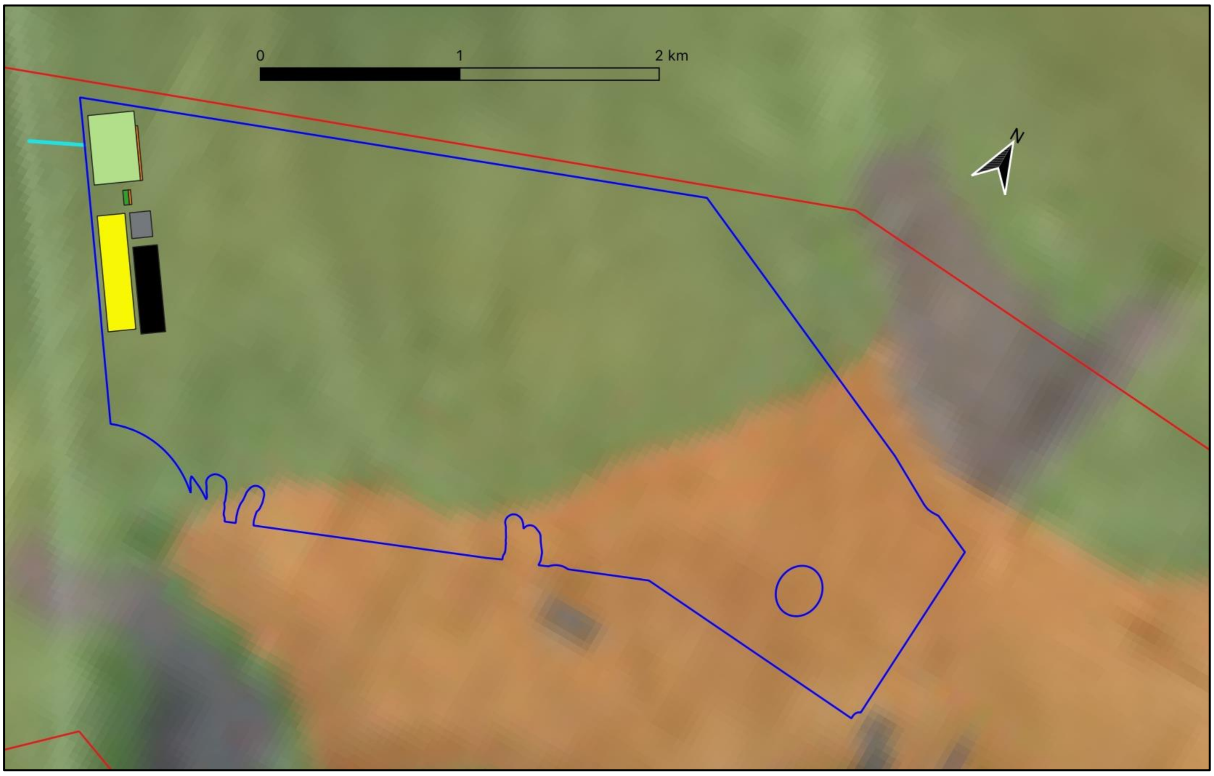
Figure 53: View across the western side of the Soyuz 4 SPV park showing the nature of the vegetation on the site

15.3 PALAEONTOLOGY

According to palaeontologist Dr Marion Bamford of the University of the Witwatersrand, the Soyuz 4 SPV park lies in the north-western part of the main Karoo Basin where fossiliferous Ecca and lower Beaufort Group rocks are exposed. The SPV development area lies partly on sedimentary shales and sandstones of the Tierberg Formation of the lower Karoo Supergroup and partly on much younger Quaternary sands, both of which can preserve fossils.

Sands of the Quaternary period do not preserve fossils but might obscure fossil traps such as palaeo-pans, palaeo-springs or tufas. Most pans in the Kalahari Basin are filled by a layer of clayey sand or calcareous clays and are flanked by lunette dunes formed as a result of deflation of the pan floor during arid periods. The Quaternary sand and alluvium may also contain transported fossils that originated in the source area of the sediments or have been trapped in palaeo-channels along the modern river valleys. This fossil material will be fragmentary and out of its original context but may, nevertheless preserve important palaeontological information.

According to SAHRA's palaeo-sensitivity map (see https://sahris.sahra.org.za/map/palaeo) (**Figure 54**), the proposed Soyuz 4 Solar PV Park development site is an area of moderate palaeontological sensitivity corresponding with the presence of the Tierberg Formation bedrock and Quaternary sands respectively.



Note: shading Red = very high sensitivity, orange = high, green = moderate, grey = zero (Source: : https://sahris.sahra.org.za/map/palaeo).

Figure 54: Palaeontological sensitivity of the proposed Soyuz 4 Solar PV Park development site

15.4 ARCHAEOLOGY

The survey of the Soyuz 4 project area found only a single archaeological lithic scatter site and possibly associated rock gong in the flat grasslands that comprise the development area but did record several other archaeological occurrences south and west of the development area.

JG005 is an ephemeral scatter of LSA hornfels lithics located at the base of a low dolerite outcrop near the eastern edge of the development area. The scatter consists of only a handful of "fresh" hornfels lithics, including a backed "adze". Occasional pieces of grey patinated hornfels were noted, as was a large "sidescraper". A single piece of Khoi grass-tempered pottery was found.

On the opposite side of the same dolerite outcrop a rock gong (G007) was recorded. The gong comprises of a dolerite boulder has several worn patches, which if struck, produce a ringing sound. Rock gongs are fairly common in the Karoo with other examples known to the author outside Loxton, outside Hanover and at Nelspoort (see Rusch, 2022).

The dominant site type found in the dolerite koppies south of the SPV boundary was rock engravings. Pre-colonial engravings of ostriches were recorded at JG006, JG008 and G008 (see for example, **Error! Reference source not found.**), while the engravings at JG017-JG019, JG021, G008, G015 and G017 are colonial in date and consist of names, dates, and some scratched images

Two circular stone structures (JG022 and G016) were recorded on the dolerite koppie adjacent to and behind the Windpoort farm complex. These structures may the remains of historical shepherds' huts that are common across the Karoo.

The locations of the archaeological material found are shown on **Figure 55**. The survey tracks (yellow) are overlaid with the proposed Soyuz 4 Solar PV development footprint area (blue polygons) and the farm portion (red polygon). The numbered points represent the archaeological and other heritage occurrences recorded during the January 2023 survey.

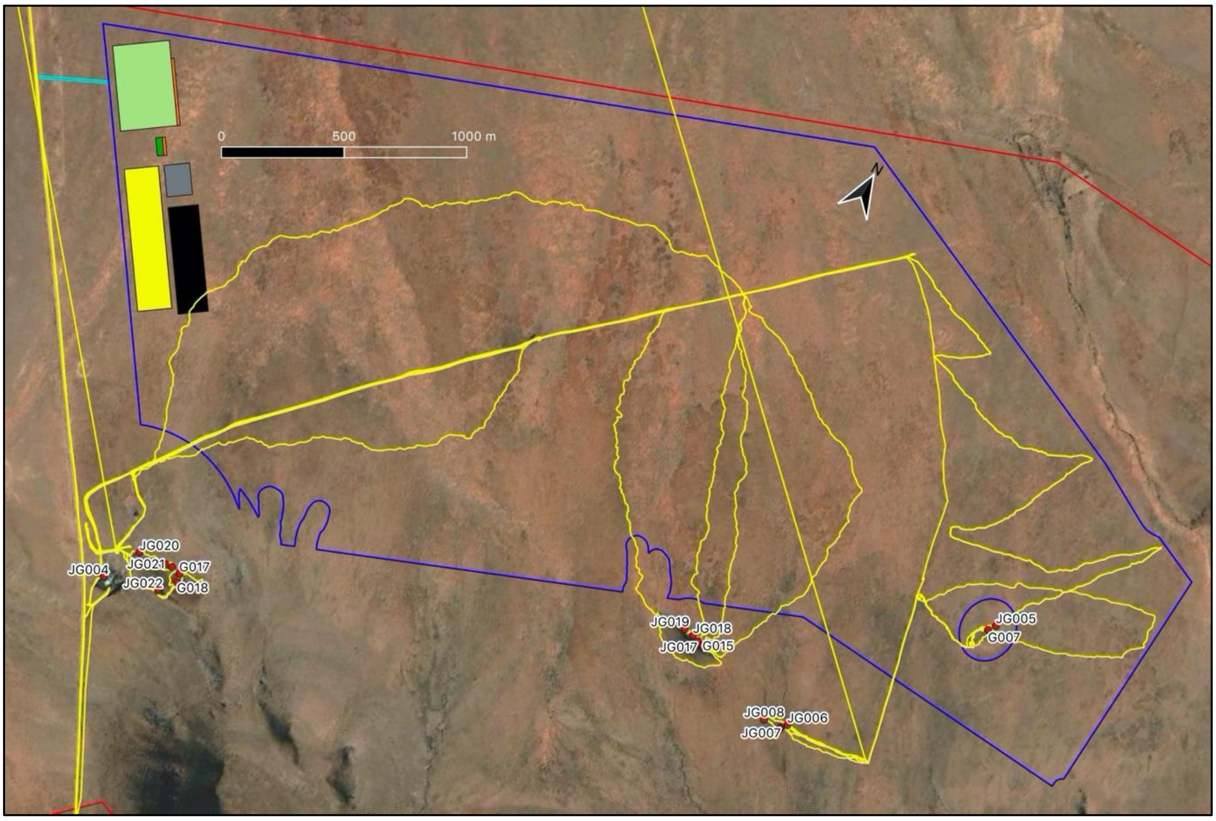


Figure 55: Survey tracks overlaid with the Soyuz 4 Solar PV Park development footprint

15.5 HISTORICAL BUILT ENVIRONMENT

A comparison of the earliest 1:250,000 topographic map for the area, which dates from 1966, with modern satellite imagery in a GIS indicates that there are no historical built structures within the proposed development footprint. The historical Windpoort farmstead is located outside the south-western corner of the Soyuz 4 Solar PV Park development area (**Figure 56**).

Figure 56: Location of historical Windpoort Farmstead outside the south-western corner of the Soyuz 4 Solar PV Park

15.6 GRAVES AND BURIALS

No graves or burial grounds were recorded within the proposed development footprint.

15.7 CULTURAL LANDSCAPE

In respect of the landscape within which the Soyuz 4 Solar PV Park will be developed, the climate of the area and its geology has resulted in rugged landforms with low-growing, Karoo shrub and grasses extending over an expansive, undulating landscape broken by rocky intrusions.

The uninhabited nature of the wide-open spaces gives a feeling of remoteness and isolation.

The current land-use of the proposed development site and in the surrounding area also does not significantly alter the natural character. The area is remote and sparsely populated and the patterns created by fences, farm tracks and windpumps, with few dwellings or other humanly-made structures add to the sense of remoteness and isolation.

The paucity of natural landscape features that could have served as foci for pre-colonial human activities and the apparent lack of archaeological and other heritage sites on the project site suggest that the landscape of the proposed development site was of limited significance to, and thus lightly used and occupied by, a succession of pre-colonial and, more recently, to colonial people.

The cultural landscape within which the proposed development site will be located is not well developed but reflects the recent historical use of the land for livestock farming. Its main features are fences, water troughs, wind pumps and occasional farm complexes and it can be described as a lightly used, organically evolved, largely relict landscape.

The development of the Soyuz 4 Solar PV Park on the proposed site will alter the character of this rural landscape, and will contrast with the typical land use and historical form of human elements that are present in the landscape.

15.8 VISUAL ASSESSMENT

A Visual Impact Assessment (VIA) of the proposed Soyuz 4 Solar PV Park development on the proposed site was conducted by Scientific Aquatic Services as part of the EIA process. In its comments on the heritage Scoping report, SAHRA requested reference to the visual assessment in the HIA.

The proposed development site is situated in an area whose arid nature restricts livestock densities. This has led to relatively large farms with a sparse human population.

The VIA identified six farm complexes and the local gravel road south from Britstown, which is used mostly only by the farmers, within 5 km of the development area. Because visual impacts are only experienced when there are receptors present to experience the impact, only the Windpoort farm complex and the local road are likely to be subject to impacts (**Figure 57**).

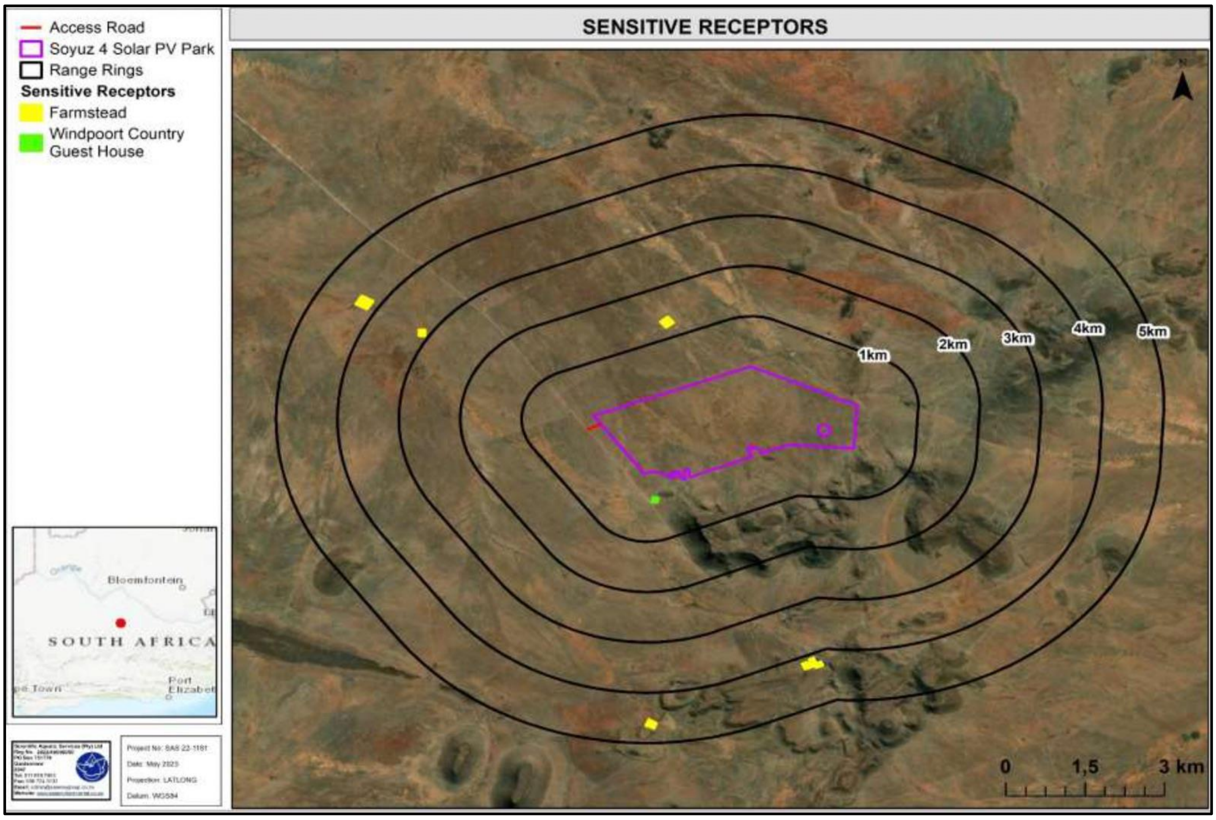


Figure 57: Map indicating the location of potential sensitive receptors within 5km of the proposed Soyuz 4 Solar PV Park. Note the Windpoort farmstead (green polygon) closest to the SPV development area

The Windpoort farm complex is 500 m of the south-western edge of the Soyuz 4 SPV park, but the complex is mainly oriented to the west so does not look towards the SPV park. In addition, a small koppie at the edge of the farm complex, the line of larger koppies behind it running away to the south-east, and the presence of screening trees around the complex will largely obscure the view of the Soyuz 4 SPV park.

The visual field assessment did indicate that from a distance of more than 1 km, the gently sloping topography does have an effect on the visibility of the Soyuz 4 SPV park, and the Visual Absorption Capacity of the area is therefore considered moderately low, indicating that the proposed PV structures will stand out, to a degree.

15.9 POTENTIAL HERITAGE IMPACTS

The main concerns related to the proposed development of the Soyuz 4 Solar PV Park on the proposed site are impacts to palaeontological resources and impacts to the cultural landscape. Although the proposed development footprint appears to contain no significant archaeology. There is the very small chance that significant archaeological sites and/or material could occur within the proposed development footprint. Although no graves have been identified within the proposed development footprint, it is possible that unmarked burials could be present. The built environment has been scoped out of this assessment.

The following impacts have been identified:

- **Construction Phase**
  - Potential impacts on palaeontology
  - Potential impacts on archaeology
  - Potential impacts on graves and burials
  - Potential impacts on the cultural landscape.
- **Operational Phase**
  - Potential impacts on the cultural landscape.
- **Decommissioning Phase**
  - Potential impacts on the cultural landscape.
- **Cumulative Impacts**
  - Potential impacts on palaeontology
  - Potential impacts on archaeology
  - Potential impacts on graves and burials
  - Potential impacts on the cultural landscape.

15.9.1 Potential impacts on palaeontology

Bamford (2023d) states that it is extremely unlikely that any fossils would be preserved in the overlying sands and alluvium of the Quaternary that are present across the Soyuz 4 Solar PV Park development area because there are no fossil traps such as palaeo-pans or palaeo-springs evident in the satellite imagery. There is a very small chance that the sands might obscure such fossils traps. The Tierberg Formation shales in the south-east of the development areas are covered by the Quaternary sands. This, combined with the general scarcity and random distribution of fossils within fossiliferous bedrocks suggests that impacts arising from the construction of the Soyuz 4 Solar PV Park are unlikely.

Because the potential for fossils in the sediments is both low and very variable, the significance of impacts to palaeontological resources would be **low, negative**, but **very low, positive** with the implementation of mitigation measures.

15.9.2 Potential impacts on archaeology

The recommendation made in the heritage scoping report and associated constraints mapping exercise that the two sites (G005 and JG005) are excluded from the development area by the implementation of the no-go buffer of 100 m has been included in the final proposed Solar PV park layout.

There are thus unlikely to be impacts on the known archaeological sites and this receptor can be screened out of this assessment.

There is a possibility that the development of the Soyuz 4 Solar PV Park may disturb currently unknown archaeological sites and material. Given our knowledge of the type of archaeological sites and material that is prevalent in this area of the Karoo, the significance of impacts on such material would be **low negative**, but **very low negative** with the implementation of mitigation measures.

15.9.3 Potential Impacts on the Historical Built Environment

Historical buildings in the Windpoort farm complex immediately south of the Soyuz 4 Solar PV Park development area will not be directly affected by the proposed SPV facility and have been screened out of this assessment.

15.9.4 Potential impacts on graves and burials

The heritage survey identified no graves within the Soyuz 4 Solar PV Park development area, but it is possible that unmarked burials could be present on the site.

The probability of graves being encountered during activities earthworks associated with the construction and decommissioning of the Soyuz 4 Solar PV Park is extremely low and the significance rating is thus very low negative, both without and with the implementation of mitigation measures.

15.9.5 Potential impacts on the cultural landscape.

The cultural landscape is likely to be the heritage resource most affected by the construction of the Soyuz 4 Solar PV Park, but given that it is of low cultural significance, the potential impact is assessed to be low negative.

15.9.6 Visual Impacts

According to Van Staden and Erwee (2023d), buffers recommended in the Scoping phase of the project around the gravel road and the Windpoort farm complex that may be affected by the Soyuz 4 Solar PV Park have been implemented in the optimised design of the layout of the Solar PV park.

The VIA found that with the optimised layout and the dense vegetation associated with the four farmsteads, including the Windpoort farm complex, the view towards the Soyuz 4 Solar PV Park is largely obscured and the potential visual impact may be considered moderate.

With regard to the visual impacts on users of the gravel road between Britstown and Windpoort, Van Staden and Erwee (2023d) state that while they will have a temporary view of the Solar PV park, the visual impact is considered moderate to be low.

15.10 FINDINGS AND MITIGATIONS MEASURES

The Heritage Specialist concludes the following findings and recommendations to avoid and minimise impacts to heritage resources:

- **Palaeontology**
  The palaeontological sensitivity of the Soyuz 4 Solar PV Park is moderate to high with the Solar PV development area lies partly on high sensitivity sedimentary shales and sandstones of the Tierberg Formation of the lower Karoo Supergroup and partly on much younger, moderately sensitive Quaternary sands, both of which can preserve fossils.

  The palaeontologist states that "based on experience and the lack of any previously recorded fossils from the area, it is extremely unlikely that any fossils would be preserved in the overlying sands and alluvium of the Quaternary because there are no palaeo-pans evident in the satellite imagery". The palaeontologist recommends that:
  - A Fossil Chance Find Protocol is included in the Environmental Management Programme (EMPr);
  - If fossils are found during construction then they should be rescued and a palaeontologist called to assess and collect a representative sample.
- **Archaeology**
  The archaeological sensitivity of the Soyuz 4 Solar PV Park development area is low. The two sites recorded by ACO Associates have been excluded from the development area by the placement of a 100 m no-go buffer.

  It is possible, however, that currently unknown archaeological sites and material may be present either on or below the surface within the development area and it is recommended that:

  - Any chance finds of archaeological material must be reported to SAHRA and/or an archaeologist.

- **Historical Built Environment**
  Historical buildings in the Windpoort farm complex immediately south of the Soyuz 4 Solar PV Park development area will not be directly affected by the proposed SPV facility and have been screened out of this assessment.

- **Graves and Burials**
  No graves or burial grounds have been recorded within the Soyuz 4 Solar PV Park development area, but it is possible that unmarked burials could be present on the site. Such, usually pre-colonial graves, are an extremely sensitive and often contested heritage resource, and it is generally impossible to predict their presence in advance of development.

  It is recommended therefore that the following measures are included in the EMPr:

  - In the event of the discovered of human remains, work in the immediate area must cease, the remains must be made safe and left in situ and the find must be reported immediately to SAHRA and/or an appropriately experienced archaeologist so that a decision can be made about how to mitigate with the discovery.

- **Cultural Landscape**
  The cultural landscape within which the Soyuz 4 Solar PV Park park will be located is likely to be the heritage resource most affected by its construction. However, it is of low cultural significance and the impacts will be low. To mitigate potential impacts, it is recommended that:
  - The disturbance footprint of the project during construction is kept to a minimum and all disturbed areas that will not be needed during operation are rehabilitated;
  - At decommissioning, all areas are rehabilitated following an approved rehabilitation plan.

- **Visual**
  The Windpoort farm complex is 500 m of the south-western edge of the Soyuz 4 Solar PV park, but the complex is mainly oriented to the west so does not look towards the Solar PV park. In addition, a small koppie at the edge of the farm complex, the line of larger koppies behind it running away to the south-east, and the presence of screening trees around the complex will largely obscure the view of the Soyuz 4 Solar PV Park. Visual Impacts to this farm complex are, therefore assessed to be moderate.

  While users of the gravel road between Britstown and Windpoort will have a temporary view of the Solar PV park, the visual impact is assessed to be moderate to low.

- **Cumulative Impacts**
  Although the region is generally palaeontologically sensitive, the occurrence of fossils is not consistent. While impacts across the area are possible, the mixed nature of the regional geology, and the low level of surface and near surface exposure of fossil-bearing rocks where they do occur, means that cumulative impacts on palaeontological resources are not likely.

  Archaeological material and sites are potentially at risk from cumulative impacts, given their widespread occurrence and exposure across the area but their relatively thin spread suggests that while impacts are possible, they are unlikely to be cumulatively significant.

  The implementation of measures at individual project level can do much to mitigate and reduce cumulative impacts to heritage resources.

  Cumulative impacts to the cultural landscape are likely as industrial elements are introduced into the generally lightly used, organically evolved, and largely relict cultural landscape of the region. The construction of the Soyuz 4-6 SPV cluster and other mainly renewable energy projects in the region will alter the character of the rural landscape and will contrast with the typical land use and historical form of human elements that are present in the landscape.

15.11 CONCLUSION OF HERITAGE SPECIALIST

This assessment has found that the area identified for the proposed Soyuz 4 Solar PV Park is a heritage environment of relatively low sensitivity and that significant impacts to heritage resources arising from the construction of the project are unlikely.

If the project were not implemented, the site would stay as it currently is with a neutral impact significance.

It is our considered opinion, therefore, that provided the recommended mitigation measures are implemented, the overall impact and significance of the proposed Soyuz 4 Solar PV Park on heritage resources will be low and the proposed activity is acceptable from a heritage perspective.

16 ENVIRONMENTAL NOISE IMPACT ASSESSMENT

TMG, on behalf of the Applicant appointed dbAcoustics (C/O Mr Barend van der Merwe) (hereinafter referred to as the "Noise Specialist") to undertake a Noise Impact Assessment report for the proposed Soyuz 4 Solar PV Park.

16.1 OBJECTIVES AND METHODOLOGY

The objectives of the specialist study were to:

- Gain a detailed understanding of the baseline noise environment at the proposed Solar PV plant and infra-structure areas and at the residential areas (farmhouses);
- Identify areas that should be avoided due to irreplaceable environmental sensitivity or irreversible environmental impact, or identification of mitigation measures to replace/rehabilitate impacted sensitivities;
- Determine and assess the impacts (including cumulative impacts) to receptors and resources in the vicinity of the proposed PV plant;
- Identify if there are any fatal flaws in terms of noise associated with the proposed development;
- Develop environmental management measures so that negative impacts may be mitigated, and positive benefits enhanced;
- Provide guidance with regard to any further legal requirements/licenses or permits that may be needed.

16.2 CURRENT SITE NOISE PROFILE

The following observations were made in and around the proposed Soyuz 4 Solar PV Park development site:

- There was a continuous flow of traffic along the N12 main road and intermittent traffic along N10;
- Distant seasonal agricultural activity noise was audible at some of the measuring points;
- The wind and weather conditions play an important role in noise propagation;
- Domestic noise and intermittent traffic on the eastern side of Britstown City;
- Intermittent traffic along gravel road between Britstown and Twyfelhoek Farm.

16.2.1 Current Noise Sources

The following are noise sources in the vicinity of proposed development site were identified:

- Traffic noise along main roads;
- Intermittent traffic noise along gravel road;
- Agricultural type noises;
- Insects - seasonal;
- Birds;
- Wind noise

16.2.2 Current Ambient Noise Levels

Noise monitoring was undertaken at the monitoring sites shown on **Figure 58**. The monitoring points were selected taking into consideration the site and its location to identified sensitive noise receptors as shown on **Figure 59**.

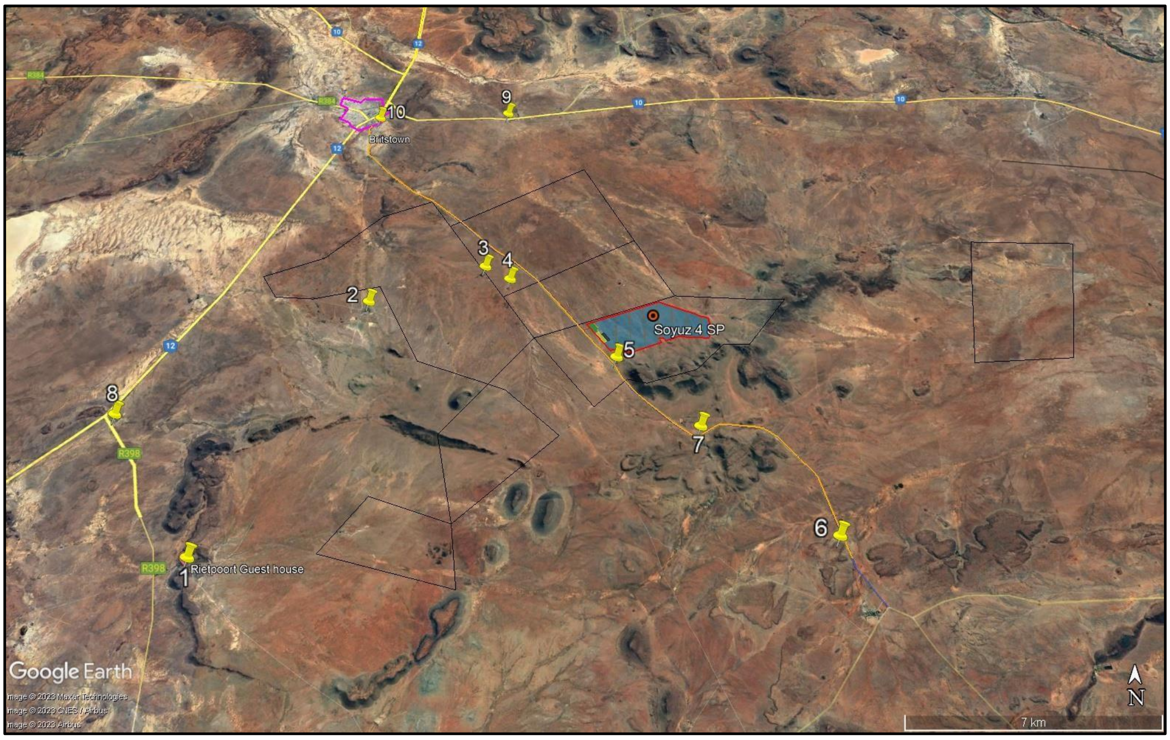


Figure 58: Noise Monitoring points for the study area

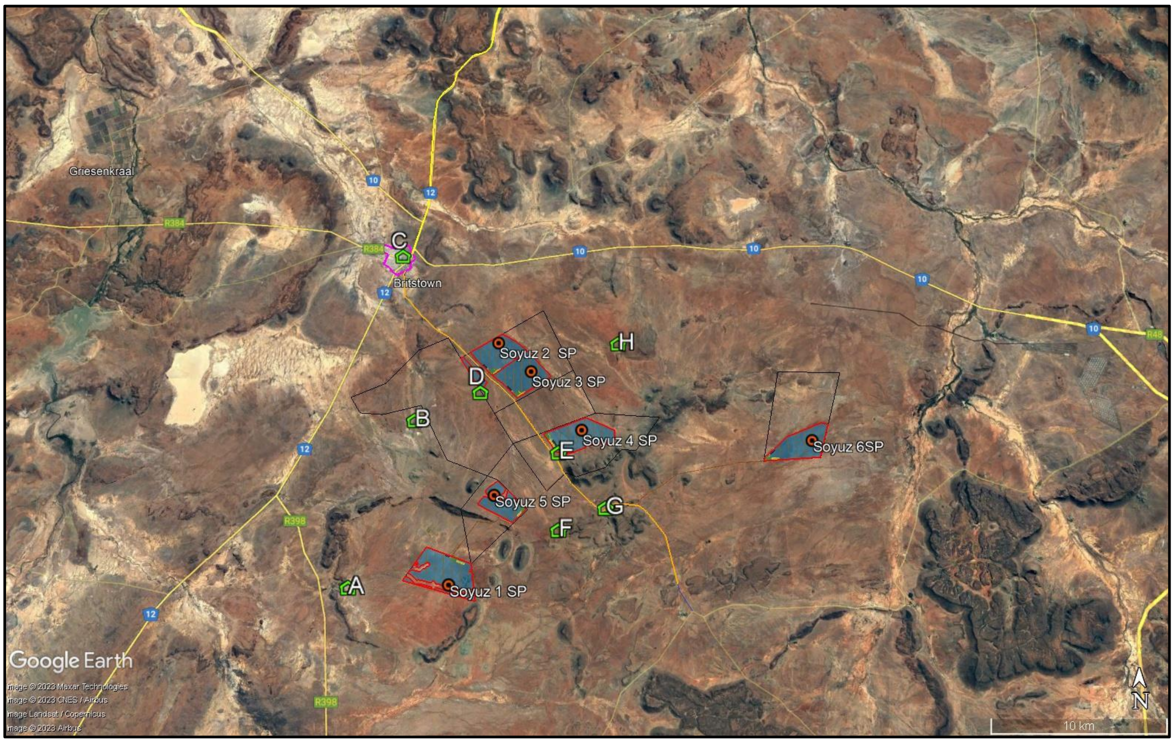


Figure 59: Noise receptors in the study area

The distances between the identified sensitive receptors (residential / tourism) to the potential noise source within the boundaries of the PV plant are presented in **Table 32**. The distances between the potential noise sources were calculated by means of the direct line of site.

Table 32: Distances (in m) between the noise receptors and the potential noise sources in meters

Noise Receptors	Soyuz 4 Solar PV Park						
	BESS	Central Inverter	O&M Building	Substation	PV Modules	Lay down area	Construction Area
A	14327	14327	14553	14415	15837	14655	14674
B	8138	8138	8089	8134	9676	8343	8283
C	14734	14734	14184	14054	15210	14653	14262
D	5303	5303	5206	4765	5989	5287	1077
E	590	590	675	1234	1354	389	5019
F	4889	4889	5207	5473	5697	4827	5512
G	5075	5075	4920	5520	4753	4765	5362
H	7165	7165	6983	7142	6152	7270	6903

The ambient noise levels measured are presented in **Table 33**.

Table 33: Day and night-time noise levels (L_{Aeq})

Position	Daytime in dBA		Night-time 1 in dBA		Night-time 1 in dBA	
	Ambient L_{Aeq} - dBA	Remarks	Ambient L_{Aeq} - dBA	Remarks	Ambient L_{Aeq} - dBA	Remarks
1	38.7	Rietpoort Guesthouse noises	40.4	Insects, wind	41.5	Insects, wind noise and trees
2	38.2	Kalkenburg farm	37.1	noise and trees	30.2	Wind noise and
3	42.7	noise	29.9	Wind noise and	31.3	insects
4	42.7	Wind noise	29.9	insects	31.3	Natural noises
5	42.2	Wind noise	32.2	Wind noise	31.9	Natural noises
6	37.0	Natural noises	30.9	Natural noises	31.7	Natural noises
7	32.9	Natural noises	29.9	Natural noises	31.3	Natural noises
8	40.1	Natural noises	31.1	Natural noises	29.2	Natural noises
9	60.6	Distant N12 noise	48.4	Natural noises	37.1	Distant N12 noise
10	38.1	Distant N10 noise	42.2	Distant N12 noise	42.9	Distant N10 noise

16.3 PREDICTED NOISE LEVELS

The different noise levels of machinery and/or equipment which may be used during construction activities at the PV plant footprint are illustrated in **Table 34**.

Table 34: Noise levels of standard construction machinery

Equipment	Reduction in the noise level some distance from the source – dBA (Cumulative distance from source in m)								
	2 m	15m	30m	60m	120m	240m	480m	960m	1920m
Dump truck	91.0	62.5	56.5	50.4	44.4	38.4	32.4	26.4	20.3
Backhoe	85.0	56.5	50.5	44.4	38.4	32.4	26.4	20.4	14.3
Drilling Equipment	100.0	71.5	65.5	59.4	53.4	47.4	41.4	35.4	29.3
Flatbed truck	85.0	56.5	50.5	44.4	38.4	32.4	26.4	20.4	14.3
Pickup truck	70.0	41.5	35.5	29.4	23.4	17.4	11.4	5.4	-0.7
Tractor trailer	85.0	56.5	50.5	44.4	38.4	32.4	26.4	20.4	14.3
Crane	85.0	56.5	50.5	44.4	38.4	32.4	26.4	20.4	14.3
Pumps	70.0	41.5	35.5	29.4	23.4	17.4	11.4	5.4	-0.7
Welding Machine	72.0	43.5	37.5	31.4	25.4	19.4	13.4	7.4	1.3
Generator	90.0	61.5	55.5	49.4	43.4	37.4	31.4	25.4	19.3
Compressor	85.0	56.5	50.5	44.4	38.4	32.4	26.4	20.4	14.3
Pneumatic tools	85.0	56.5	50.5	44.4	38.4	32.4	26.4	20.4	14.3
Cumulative noise levels from the construction activities	101.5	72.9	66.9	60.9	54.9	48.9	42.8	36.8	30.8

16.4 NOISE IMPACTS TO SENSITIVE RECEPTORS

The following formula was used to calculate the noise levels at the sensitive receptors during the construction, operational and decommissioning phases respectively:

$$Lp = Lw - 20\log R - \alpha$$

where, Lp is the sound level at a distance from the source in dBA;
Lw is the sound level at the source in dBA;
R is the distance from the source;
α is the noise reduction factor of 5 for air density and ground conditions.

The noise levels at the noise sensitive areas are added in a logarithmic manner to determine the overall sound exposure at the sensitive receptor. The increase in the prevailing ambient noise level is calculated in the following manner:

$$\Delta LReq,T = LReq,T\ (post) - LReq,T\ (pre)$$

where,
LReq,T (post) – noise level after completion of the phase – projected or calculated noise levels;
LReq,T (pre) – noise level before the proposed project – ambient noise level.

The noise levels at the sensitive receptors were added in a logarithmic manner to determine the overall sound exposure at the receptor. The criteria for assessing the magnitude of a noise impact are illustrated in **Table 35**.

Table 35: Noise intrusion level criteria

Increase Δ -dBA	Assessment of Impact Magnitude	Colour code
0<Δ≤1	Not audible	
1<Δ≤3	Very Low	
3<Δ≤5	Low	
5<Δ≤10	Medium	
10<Δ≤15	High	
15< Δ	Very High	

16.4.1 Predicted Construction Phase Noise Levels

The arithmetic calculated noise levels (dBA) during the construction phase for the different activities in the vicinity of the residential areas, when these activities will occur along the nearest boundary to the residential areas, are presented in

Table 36.

Table 36: Noise Intrusion levels during construction phase – Soyuz 4 Solar PV Park

Residential property	Clearing and grubbing of topsoil and vegetation	Construction activities at the PV PLANT	Construction activities at the PV PANELS	Installation of the INFRA-STRUCTURE	Construction activities of the OHP LINE	Cumulative Levels	Cumulative noise level - Daytime	Cumulative noise level - Nighttime	Intrusion noise level - daytime	Intrusion noise level - nighttime
A	7.8	7.3	7.5	6.8	8.2	14.6	38.7	40.7	0.0	0.0
B	4.7	4.2	4.8	3.7	1.9	11.0	38.2	44.7	0.0	0.0
C	-1.8	-2.3	-2.0	-2.8	-4.7	4.4	38.1	42.4	0.0	0.0
D	3.5	3.0	3.0	2.5	0.4	9.6	42.7	30.6	0.0	0.0
F	8.1	7.6	6.5	7.1	4.5	13.9	33.0	30.7	0.1	0.1
G	4.5	4.0	3.4	3.5	1.0	10.4	32.9	30.6	0.0	0.0
H	-0.5	-1.0	-1.1	-1.5	-3.7	5.6	32.9	30.6	0.0	0.0

*Calculated ambient noise level is the prevailing ambient noise level measured plus the cumulative noise level from the different activities at the residential areas; and
*The noise intrusion level is the difference between the existing prevailing ambient noise level and the calculated noise level during the construction phase.

16.4.2 Predicted Operational Phase Noise Levels

The arithmetic calculated noise levels (dBA) during the operational phase for the different activities in the vicinity of the residential areas are illustrated in **Table 37**.

Table 37: Calculated noise intrusion level during operational phase – Soyuz 4 Solar PV Park

Residential property	BESS Area	Noise from the Central Inverter	Noise from the sub-station	Noise from the O & M Building	PV Modules	Maintenance activities	Cumulative Levels	Cumulative noise level - Daytime	Cumulative noise level – night- time	Intrusion noise level - daytime	Intrusion noise level – night-time
A	7.9	9.9	6.8	1.4	0.7	-7.0	13.7	38.7	40.7	0.0	0.0
B	4.7	7.3	4.6	-0.6	-5.6	-9.7	11.0	38.2	44.7	0.0	0.0
C	-1.8	0.6	-2.1	-7.3	-12.2	-16.5	4.3	38.1	42.4	0.0	0.0
D	3.6	5.6	3.4	17.5	-7.1	-11.5	18.1	42.7	30.8	0.0	0.2
E	5.1	6.7	4.5	-0.4	-5.9	-10.4	10.8	42.2	32.1	0.0	0.0
F	8.2	9.1	7.3	2.8	-3.0	-8.0	13.5	32.9	30.7	0.0	0.1
G	4.6	5.9	3.9	-0.8	-6.5	-11.1	10.1	32.9	30.6	0.0	0.0
H	-0.4	1.4	-0.6	-5.9	-11.2	-15.6	5.5	32.9	30.6	0.0	0.0

***Calculated ambient noise level is the prevailing ambient noise level measured plus the cumulative noise level from the different activities at the residential areas; and**

*The noise intrusion level is the difference between the existing prevailing ambient noise level and the calculated noise level when the PV plant will be operational

16.4.3 Road Traffic Noise

SANS 10210 of 2004, the national standard for the calculating and predicting of road traffic noise was used to calculate the noise level to be generated by the traffic along the preferred road. The calculations to determine the noise level from the additional traffic along the preferred road are based on the following equation:

Basic Model

$$L_{Basic} = 38.3 + 10 \log (Q_r) \text{ dBA},$$

where; LBasic = basic noise level in dBA and Qr is the mean traffic flow per hour.

The calculation of the noise levels during the construction phase are based on a total of 7 vehicles per hour of which 4 will be heavy-duty vehicles and 3 will be motor-vehicles and during the operational phase 5 vehicles of which 1 will be heavy-duty vehicles and 4 will be motor vehicles.

The calculated traffic noise level at 50m from the access road will be 39.8dBA during the construction phase and 37.7dBA during the operational phase.

16.5 POTENTIAL NOISE IMPACTS

Potential noise impacts which may be associated with the development of the Soyuz 4 Solar PV Park, have been identified by the Noise Specialist as follows:

16.5.1 Construction phase

- **Site clearing and grubbing of footprint:** Noise may be generated by the construction activities and the use of construction equipment such as Graders, TLB's and Front-end loaders. The use of this equipment will create an increase in noise levels in the immediate vicinity of the construction activities and in some cases at some distance from the activities.
- **Construction activities of the PV modules at Soyuz 4 Solar PV Park:** Noise could be generated by the following activities: earth drilling, generator noise and civil construction.

- **Construction of the infrastructure:** The construction of the BESS, O&M building, Sub-station, roads may generate localised noise increase in particular the use of cranes and generators during the assembly stage of the sub-station and/or batteries.
- **Traffic noise generated by vehicles accessing the proposed development site:** Construction roads to and from the site would create a temporary linear noise source.

16.5.2 Operational phase

- BESS activities;
- Inverter noise;
- Sub-station noise;
- Additional traffic to and from the Soyuz Solar 4 PV Park;

The operations of the above infrastructure may result in low noise emissions due to the operation of fans.

16.5.3 Decommissioning phase:

- Planting of grass and vegetation at the rehabilitated areas;
- Removal of infra-structure.

16.6 RECOMMENDATIONS

16.6.1 Acoustic Screening Recommendations:

The proposed acoustic screening measures for the project are given in **Table 38**. These are based on the best practicable methods, acoustic screening techniques and the IFC's Health and Safety Regulations.

Table 38: Recommended acoustic screening measures

Activity	Recommendations
Construction phase	*Equipment and/or machinery which will be used must comply with the manufacturer's specifications on acceptable noise levels.* *Construction activities to be done during daytime periods only.*
Operational phase	*All equipment with noise levels exceeding 85.0dBA to be acoustically screened off by means of engineering control measures.* *Plenum boxes to be fitted over the mechanical fans when baseline noise level at the footprint is exceeded.* *Acoustic screens to be erected between the BESS, O&M building and the sub-station and the direction of the closest farmhouse should the noise from the activities be audible at the farmhouses.* *Reverse signal of maintenance vehicles to be replaced with vibration type signal.* *The Inverter will have to be acoustically screened off (acoustic screen on the side facing the residential areas) when the sound from the Inverter is audible at the abutting farmhouses.*
Decommissioning phase	*Equipment and/or machinery which will be used must comply with the manufacturer's specifications on acceptable noise levels.* *Removal of structures and the planting of grass activities to be done during daytime periods only.*

The following are the Environmental, Health and Safety Guidelines of the IFC of the World Bank, which should be taken into consideration during the construction, operational and decommissioning phases of the project:

- Selecting equipment with lower sound power levels;
- Installing silencers for fans;
- Installing suitable mufflers on engine exhausts and compressor components;
- Installing acoustic enclosures for equipment causing radiating noise;

- Installing vibration isolation for mechanical equipment;
- Re-locate noise sources to areas which are less noise sensitive, to take advantage of distance and natural shielding;
- Taking advantage during the design stage of natural topography as a noise buffer;
- Develop a mechanism to record and respond to complaints.

16.6.2 Noise Monitoring

It is recommended that the following noise monitoring programme be implemented for the proposed Soyuz 4 Solar PV Park:

- **Construction Phase:** Noise monitoring must be undertaken if noise complaints are received. The nature of the monitoring to be undertaken should be determined at the time based on the nature and location of the noise nuisance experienced.
- **Operational Phase:** Once the PV facility is fully commissioned, a noise monitoring survey must be undertaken to establish that the noise levels by the facility are in keeping with the levels predicted by the noise level survey and to ensure that the noise levels will not affect off-site sensitive receptors. Thereafter, for the duration of the operational phase, noise monitoring must be undertaken if noise complaints are received. The nature of the monitoring to be undertaken, including the location of the monitoring points, should be determined at the time based on the nature and location of the noise nuisance experienced.

16.7 CONCLUSION OF THE NOISE SPECIALIST

The proposed Soyuz 4 Solar PV Park will be situated in an area where there are feeder roads, seasonal agricultural activities, and residential areas. The noise impact assessment revealed that the noise impact will be negligible-positive during the operation, and low-negative during the construction and decommission phases after the implementation of the mitigatory measures. The recommended noise mitigatory measures will ensure that the proposed Soyuz 4 Solar PV Park environmentally sustainable.

17 SOCIAL IMPACT ASSESSMENT

TMG, on behalf of the Applicant appointed Tony Barbour Environmental Consulting South Africa (C/O Tony Barbour) (hereinafter referred to as the “Social Specialist”) to undertake the Social Impact Assessment for the proposed Soyuz 4 Solar PV Park.

17.1 ADMINISTRATIVE CONTEXT

The study area is located within the Emthanjeni Local Municipality (ELM), which falls within the Pixley ka Seme District Municipality (PKSDM) in the Northern Cape Province (Figure 3.1). The PKSDM is made up of eight category B local municipalities which include Emthanjeni, Kareeberg, Thembelihle, Siyathemba, Renosterberg, Ubuntu, Siyancuma and Umsobomvu municipalities. De Aar is the administrative seat of the EML and PKSDM. The site is located within Ward 8 in the ELM.

17.1.1 Population

The population of the ELM in 2016 was 45 404. Of this total, 36.4% were under the age of 18, 57.9% were between 18 and 64, and the remaining 5.8% were 65 and older. The ELM therefore has a relatively large young population. This creates challenges in terms of creating employment opportunities. In terms of race groups, Coloureds made up 60.9% of the population, followed by Black

Africans (32%) and Whites (6.9%). The main first language spoken in the ELM was Afrikaans (69.6%), followed by IsiXhosa (26.5%) and English (0.9%).

The population of Ward 8 in 2011 was 4 448. Of this total, 32.53% were under the age of 18, 61.3% were between 18 and 64, and the remaining 6.2% were 65 and older. Like the ELM, Ward 8 also had a relatively large young population. In terms of race groups, Black Africans made up 44.3% of the population, followed by Coloureds (39.2%) and Whites (15.1%). The main first language spoken in the Ward 8 was Afrikaans (55.3%), followed by IsiXhosa (34.2%) and English (2%).

The high percentage of young people in both the ELM and Ward 8 means that a large percentage of the population is dependent on a smaller productive sector. The dependency ratio is the ratio of non-economically active dependents (usually people younger than 15 or older than 64) to the working age population group (15-64). The higher the dependency ratio the larger the percentage of the population dependent on the economically active age group. This in turn translates reduced revenue for local authorities to meet the growing demand for services. The national dependency ratio in 2011 was 52.7%, similar to that of the Northern Cape Province (55.7%). The dependency ratio for the ELM (2011) was 60.4%. The traditional approach is based people younger than 15 or older than 64. The 2016 information provides information for the age group under 18. The total number of people falling within this age group will therefore be higher than the 0-15 age group. However, most people between the age of 15 and 17 are not economically active (i.e., they are likely to be at school).

Using information on people under the age of 18 is therefore likely to represent a more accurate reflection of the dependency ratio. Based on these figures, the dependency ratio for the ELM in 2016 and Ward 8 (2011) was 72.8% and 63% respectively. This figure is significantly higher than the national and provincial levels in 2011 (52.7% and 55.7% respectively). The higher dependency ratio reflects the limited employment opportunities in the area and represent a significant risk to the district and local municipality. The high dependency ratio also highlights the importance to maximising local employment opportunities and the key role played by training and skills development programmes.

17.1.2 Households and house types

Based on the information from the 2016 Community Survey there were a total of 11 992 households in the ELM and 1 200 in Ward 8 (2011). Most of the households reside in formal houses (74.2% ELM and 92.5% Ward 8). The figure for the ELM is similar to the District (78.1%) and Provincial (74.4%) figures. Approximately 17% of the households in the ELM reside in backyard flats and a further 4.2% in informal shacks. For Ward 6 only 1.2% lived in shacks. Only 1.7% of the households in Ward 8 resided in shacks in 2011.

Based on the information from the 2016 Community Household Survey 39.8% of the households in the ELM are headed by females compared to 31.3% for Ward 8 (2011). The figure for ELM was similar to the District and Provincial figures of 37% and 39% respectively. The high number of female-headed households at the local municipal and ward level reflects the lack on formal employment and economic opportunities in the ELM. As a result, job seekers from the ELM need to leave the areas to seek work in the larger centres. As indicated above, this highlights the importance to maximising local employment opportunities and the key role played by training and skills development programmes.

Most of the job seekers are likely to be males. This is due to traditional rural patriarchal societies where the role of the women is usually linked to maintaining the house and raising the children, while the men tend to be the ones that migrate to other areas in search of employment.

17.1.3 Household income

Based on the data from the 2011 Census, 9.1% of the population of the ELM had no formal income, 3.3% earned less than R 4 800, 4.9% earned between R 5 000 and R 10 000 per annum, 18.2% between R 10 000 and R 20 000 per annum and 22.4% between R 20 000 and R40 000 per annum (2011). The figures for Ward 8 were 11.1%, 1.9%, 3.5%, 19.1 and 20.6%. The poverty gap indicator produced by the World Bank Development Research Group measures poverty using information from household per capita income/consumption. This indicator illustrates the average shortfall of the total population from the poverty line. This measurement is used to reflect the intensity of poverty, which is based on living on less than R3 200 per month for an average sized household (~ 40 000 per annum). Based on this measure, in the region of 57.9% of the households in the ELM and 56.2% in Ward 8 live close to or below the poverty line. While this figure is lower than the provincial level of 62.9%, the low-income levels reflect the limited employment opportunities in the area and dependence on the agricultural sector. This is also reflected in the high unemployment rates. As indicated above, this highlights the importance to maximising local employment opportunities and the key role played by training and skills development programmes.

The low-income levels are a major concern given that an increasing number of individuals and households are likely to be dependent on social grants. The low-income levels also result in reduced spending in the local economy and less tax and rates revenue for the ELM. This in turn impacts on the ability of the ELM to maintain and provide services.

The Integrated Development Plan (IDP) for the ELM indicates that the total number of indigent households within the municipal area increased from 2 726 households as of 30 June 2014 to 2 874 as at April 2017 and about 3 594 households during January 2016/17. The COVID-19 pandemic is likely to have resulted in an increase in the number of indigent households in 2020 and 2021.

17.1.4 Employment

The official unemployment figure in 2011 for the ELM was 14.5%. The figures also indicate that the majority of the population are not economically active, namely 43.7%. These figures are similar to the official unemployment rate for the Northern Cape Province (14.5%) and Pixley ka Seme District (14.8%). This reflects the limited employment opportunities in the area, which in turn are reflected in the low income and high poverty levels. Given the impact of COVID-19 pandemic, the unemployment levels are likely to be higher in 2021. The figures for Ward 8 were 7.8% (unemployed) and 49.2% not economically active.

17.1.5 Education

In terms of education levels, the percentage of the population over 20 years of age in the ELM with no schooling was 17.4% in 2011, compared to 7.9% for the Northern Cape Province and 11.9% for the District. The percentage of the population over the age of 20 with matric was 28.3%, compared to 29.1% for the Province and 25.3% for the District. Only 1.5% and 1.4% of the population over the age of 20 years in the ELM had an undergraduate and postgraduate qualification, respectively. The relatively poor education levels in the ELM pose a potential challenge to the implementation of an effective training and skills development programme for local community members. The figures for Ward 8 (2011) were 8.6% with no schooling, 29.2% with matric and 2.3% and 1.2% with an undergraduate and postgraduate degree respectively. The figure for matric was similar to the provincial figure and higher than the district level.

17.1.6 Access to Electricity

Based on the information from the 2016 Community Survey 96.6% of households in the ELM had access to electricity. Of this total 88.4% had inhouse prepaid meters. No data was available for Ward 8.

17.1.7 Access to water

Based on the information from the 2016 Community Survey 96.7% of households in the ELM were supplied by a regional or local service provider. However, only 53.2% of the households had piped water inside their houses, while 44.3% relied on piped water inside the yard. The figures for the District were 45.8% and 44.4% respectively. Only 45.3% of households in the Northern Cape Province have piped water inside their homes. For Ward 8, 80.6% of households were supplied by the local service provider and 17% relied on boreholes, which reflects the rural nature of Ward 8.

17.1.8 Sanitation

Based on the information from the 2016 Community Survey, 95.3% of households in the ELM had access to flush toilets, 2.1% rely on pit latrines, 1.5% use bucket toilets, while 0.5% had no access to toilet facilities. The figures in terms of access to flush toilets are higher than provincial (71.4%) and District (82.8%) figures. For Ward 8 81.1% of households had access to flush toilets and 5% had no access to toilets. 8.9% relied on pit latrines.

17.1.9 Refuse collection

Based on the information from the 2016 Community Survey, 79.8% of households in the ELM had their refuse collected on a regular basis by a local authority of private company, 4.6% use their own dumps, and 8.7% are not serviced. For Ward 8, 77.8% of households were provided with a regular service while 14% relied on their own dump.

17.2 HEALTH AND COMMUNITY FACILITIES

The PKSDM is served by 3 District Hospitals, 8 Community Health Centres, 28 Primary Health Care Clinics, 4 satellite clinics and 1 mobile clinic, distributed over the district. The ELM has 1 District Hospital and 6 Primary Health Care clinics. There are no community health centres within ELM that provide a 24hour service. A new hospital was built in De Aar and was opened in 2017. The Central Karoo Hospital serves as the referral hospital for the district. Minor operations are performed at the facility. Specialists visit the district monthly from Kimberley Hospital Complex. In terms of education the ELM has 16 schools of which 13 are no-fee schools. The ELM also has libraries.

17.3 ECONOMIC OVERVIEW

17.3.1 Agriculture

Agriculture is the key economic sector in the PKSDM and ELM. Many of the towns within the district municipal area function mainly as agricultural service centres, with the level of services provided at the centres to a large extent reliable on the intensity of the farming practices in the surrounding area. Despite the largely semi-arid and arid environment in the district, the fertile land that lies alongside the Orange, Vaal and Riet Rivers supports the production of some of the country's finest quality agricultural products, including grapes and vegetables. The main livestock farming in the region include cattle, sheep, and goat farming. Game breeding has also been identified as one of the opportunities which could be linked with the tourism sector for Game reserves and hunting activities. However, despite the key role played by agriculture there is limited value adding to the farming products within the district and the area is prone to droughts and climate change.

17.3.2 Mining

The main deposits in Pixley ka Seme include alluvial diamond mining along the Orange River and various semi-precious stones, such as tiger-eye and zinc deposits. The region also has various saltpans for the potential of salt production. Uranium deposits also occur in the district.

17.3.3 Tourism

The tourism sector in the district contributes 15.6% to the provincial gross value added (GVA). The municipalities Emthanjeni, Kareeberg, Umsobomvu and Siyancuma municipalities are the biggest contributors to the provincial gross value added (GVA). The PKSDM IDP notes that the tourism opportunities in the district will increase due to the Karoo Array Telescope (KAT), a project being driven at a national level. Of relevance, the PKSDM notes that care needs to be taken with developments that have the potential to negatively impact on the Karoo landscapes.

17.3.4 Renewable energy

Of key relevance the PKSDM IDP identifies renewable energy as key economic sector and refers to the substantial socio-economic development (SED) and enterprise development (ED) contributions leveraged by the IPPPP commitments. The IDP notes that the towns of Prieska and Carnarvon have in recent years changed character from small rural towns to potentially regional hubs as a result of investments in renewable energy generation and the Square Kilometre Array (SKA) radio telescope project, respectively.

17.4 OVERVIEW OF THE STUDY AREA

The proposed Soyuz 4 Solar PV Park development site forms part of a complex of 6 Soyuz PV projects currently proposed (separate applications) in the area to the south-east of Britstown in the south-eastern Northern Cape Province (NCP). Britstown is located at the intersection of the N10 (De Aar-Prieska) and the N12 (Victoria West-Kimberley).

The proposed site is accessed off the Deelfontein Road (Britstown to Richmond). The road is primarily used by local farmers residing on properties accessed off this road.

Two 400 kV Eskom lines traverse the broader study area north-west (Britstown) to south-east (De Aar). The nearest line is located approximately 2.5 km north of the proposed site site. Other infrastructure include the Britstown-De Aar railway line located roughly parallel to the south of the N12, approximately 9 km north of the PV1 site.

The study area is located on the Great Escarpment in the arid Central Karoo region. Annual rainfall is around 250 mm, and the area is prone to droughts. The landscape is general flat, punctuated by koppies. The veld consists of karroid scrub on plains and shrubland on the slopes of koppies. The scrub is characterized by the predominance of grasses in good rainfall years, increasing the risk of veld fires. The landscape is essentially treeless, with trees confined to ephemeral drainage courses and farmyards.

The study area properties are used for livestock farming and the area is traditionally a wool farming area. Carrying capacities are modest, around 2.4 ha per sheep. Most operations rely on networks of boreholes and watering points. No significant cropping activities are associated with the study area, although a few livestock operations grow modest quantities of irrigated fodder for own use. Economic farming units are large, typically consisting of several properties. Some farmers lease additional land. The study area settlement is consequently sparse, and mainly concentrated on a few base farms, typically near public roads. Labourers typically live on the base properties. Caretaker staff reside on some properties. Farmsteads and labourers' houses on some properties have become redundant and are no longer inhabited.

No protected natural areas are in or in significant proximity to the study area. Natural and/ or introduced game occur on many study area properties. While many farmers offer limited seasonal hunting opportunities, no game farming or dedicated commercial hunting operations are located in the study area. Several of the farmers interviewed have currently suspended seasonal hunting to give the game a chance to recover from the recent drought.

Local tourism is primarily focused on accommodation. Several farm stay facilities are located in the study area south-east of Britstown. The facilities located near the PV4 site – on Rietpoort, Rooidam, Twyfelberg, Sweetfontein, and Windpoort - are all located on working livestock farms and primarily cater to passing traffic on the N12 and N10 (overnight accommodation). Sweetfontein also caters to weddings and other functions over weekends, with regular accommodation spillovers into the other guest facilities in the area (Lambrechts, pers. comm). The Karoo sense of place – open spaces and night skies – is considered a key attraction (as per internet marketing of the relevant facilities). Sweetfontein offers game drives, but the operation (which includes Twyfelberg) is not focused on game tourism.

17.5 PREFERRED SITE AND ADJACENT PROPERTIES

The Soyuz 4 Solar PV Park site is located on a portion of a single property, Twyfelhoek 127/5. The site property borders onto 8 properties (Figure 3.4). Only the site property would be affected by the proposed site access road.

The site property (127/5) and 127/RE are owned by Mr Olof Paul. Mr Paul's operation is based on 127/RE (Table 3.1). The other 7 site-adjacent properties are owned by four landowners, namely Messrs Gerard Sieberhagen (Twyfelhoek 127/3), Zachi Blomerus (127/9, Dreunfontein 126/1) Totius du Plessis (97/1), Francois Viljoen (Farm 96), and Jannie Lambrechts (Sweetfontein 92/3 and 92/4). All the relevant owners (or farm manager in case of Farm 96) are based on near-adjacent farms in the immediate study area. The site property is not inhabited. The farmstead is rented out as overnight accommodation (Windpoort Country Guest House). Twyfelhoek 127/RE (Twyfelhoek), Sweetfontein 92/3 and 92/4 (Sweetfontein) and Dreunfontein 126/1 (Witfontein) serve as base farms of larger farming operations. Labourer households reside on the relevant base properties. Only caretaker staff reside on Pettsspot 97/2.

All the relevant properties are actively farmed as sheep farms. Tourist accommodation (overnight farm stay) is associated with the Twyfelhoek 127/5 site property (Windpoort Country Guest House) and Sweetfontein 92/3 and 94/4 (Sweetfontein Lodge). Both facilities form part of primary livestock farming operations based on adjacent (Sweetfontein) or near-adjacent properties (Windpoort). Both operations cater primarily to passing traffic and local functions on weekends (Sweetfontein). While both benefit from the Karoo sense of place, neither are focused on scenic or wildlife tourism.

17.5.1 Relationship to Receptors

The Soyuz 4 Solar PV Park site would occupy approximately a third of the subject property (127/5). The property forms part of a significantly larger farming operation (Twyfelberg farm). Footprint losses to grazing associated with infrastructure could be absorbed by the larger operation, or the lease income used to lease additional grazing or otherwise support the existing farming operation (Paul, pers. comm).

As indicated, the settlement pattern is sparse. The Soyuz 4 Solar PV Park development area is located within 5 km of four residential/ tourism receptors, namely dwellings on 97/1 (1.3 km), 127/RE (4.2 km), and 126/1 (4.4 km), and the tourist accommodation facility (Windpoort Country Guest Farm) on the site property (560 m). The residential cluster on Sweetfontein is located 9.6 km north of the site. The site is not located in significant proximity to the N12 (10 km) or N10 (13 km).

All proposed construction areas as well as the proposed substation, BESS and substation sites are located 900 m-2 km of the Windpoort guest house (farmhouse). All other receptors are located >2 km of the site. The landowner, Mr Paul, indicated that the developers should sign a long-term lease on the guest house on the site property for the construction phase and, if possible, also post-construction (Paul, pers. comm).

The Deelfontein public gravel road is primarily used by local farmers. The portion between Britstown and the proposed site access road intersection would affect primary access to two permanently inhabited properties, Dreunfontein 126/1 (Witfontein) and Uitkoms (Pettsspot 971. The farmyards on Witfontein and Uitkoms are located >1 km from the road. The site access road would not affect access to dwellings on any properties. Sweetfontein 92/3 and 92/4, and Farm 96 are accessed off the N12 and would not be affected by project-related traffic. Sweetfontein 92/3 and 92/4, and Farm 96 are the only study properties currently affected by Eskom transmission line(s). Soyuz 4 Solar PV Park is proposed on a near-adjacent property which also belongs to Mr Paul. Other Soyuz projects are proposed on properties belonging to two site-adjacent landowners, namely Messrs Blomerus (Soyuz 2 and 3 Solar PV Parks) and Sieberhagen (WEF2). Pettsspot 97/2 borders onto both Soyuz 3 and 4 Solar PV Parks. The property is only inhabited by caretaker staff.

17.6 OTHER PROPOSED RENEWABLE ENERGY FACILITIES

The proposed Soyuz 4 Solar PV Park development site is not located within a REDZ. The DFFE's Renewable Energy website does not indicate any historic applications located within a 30 km radius of the proposed site. No operational REFs are currently located within a 30 km radius of the site. The 6 Soyuz PV projects and 6 Soyuz WEF projects are not reflected. The proposed site borders onto Soyuz WEF1 and WEF2 areas. Not indicated on **Figure 60**, is Solar Capital's approved Stiltevrede REF suite located between (and adjacent to) the easternmost of the proposed Soyuz Solar PV Cluster (viz, proposed Soyuz 6 Solar PV Park) and De Aar.

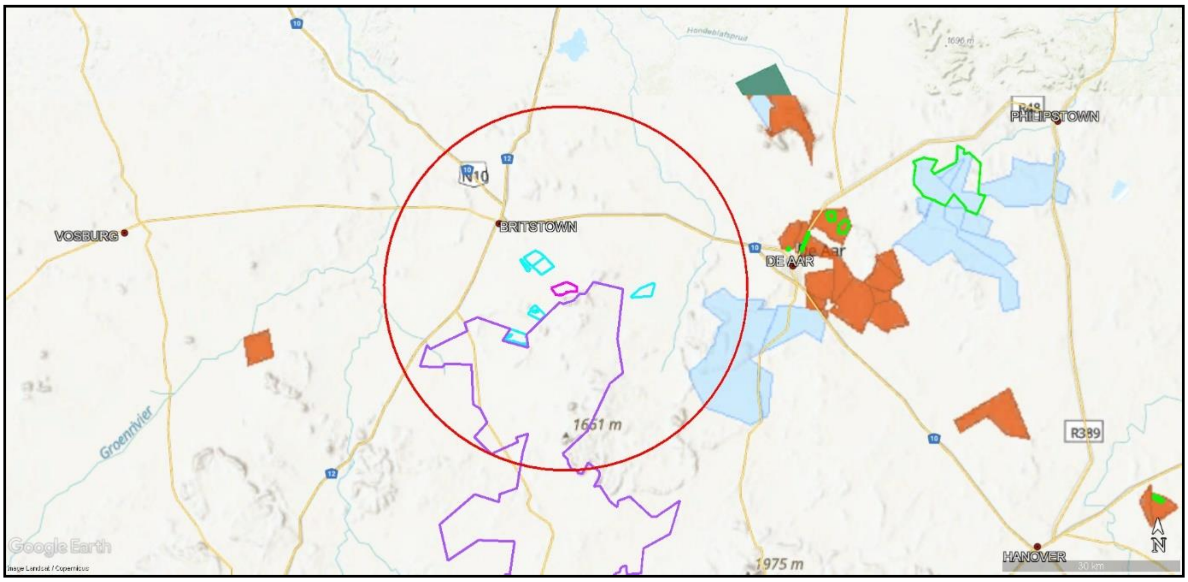


Figure 60: Proposed Soyuz 4 Solar PV Park (pink outline) in relation to historic REF applications within a 30 km radius (red circle).

Note: Also indicated are other proposed Soyuz PVs (light blue), proposed Soyuz WEF suite (purple), and operational REFs (green outlines) (Source: DFF&E).

17.7 ASSESSMENT OF POLICY AND PLANNING FIT

The development of renewable energy is strongly supported at a national, provincial, and local level. The development of and investment in renewable energy is supported by the National Development Plan (NDP), New Growth Path Framework and National Infrastructure Plan, which all refer to and support renewable energy. The PKSDM SDF and IDP and ELM IDP also support the development of renewable energy. The development of the proposed Souyz 4 PV Solar Park is therefore supported by key policy and planning documents.

17.8 POTENTIAL CONSTRUCTION PHASE IMPACTS

The following potential construction phase impacts have been identified and are discussed:

- **Potential Positive Impacts**
  - Creation of employment and business opportunities, and opportunity for skills development and on-site training.

- **Potential Negative Impacts**
  - Impacts associated with the presence of construction workers on local communities.
  - Impacts related to the potential influx of job-seekers.
  - Increased risks to livestock and farming infrastructure associated with the construction related activities and presence of construction workers on the site.
  - Increased risk of grass fires associated with construction related activities.
  - Nuisance impacts, such as noise, dust, and safety, associated with construction related activities and vehicles.
  - Impact on productive farmland.

17.8.1 Creation of local employment, training, and business opportunities

The construction phase of each the proposed Soyuz Solar PV Cluster facilities will extend over a period of approximately 18 months and create in the region of 200-250 employment opportunities. Members from the local communities in the area, specifically Britstown and De Aar, would be able to qualify for most of the low skilled and semi-skilled employment opportunities. Most of these employment opportunities will accrue to Historically Disadvantaged (HD) members of the community. Based on information from similar projects the total wage bill for the construction phase of each PV SEF will be in the region of R 25 million (2023 Rand values). A percentage of the wage bill will be spent in the local economy which will also create opportunities for local businesses in the local towns in the area.

Given relatively high local unemployment levels and limited job opportunities in the area, this will represent a significant, if localised, social benefit. The capital expenditure for each Soyuz Solar PV Cluster facility will be approximately R 1.5 billion (2022 Rand value). Due the lack of diversification in the local economy the potential for local companies is likely to be limited. Most benefits are therefore likely to accrue to contractors and engineering companies based outside the ELM. The local service sector will also benefit from the construction phase. The potential opportunities would be linked to accommodation, catering, cleaning, transport, and security, etc. associated with the construction workers on the site.

The hospitality industry in the area will also benefit from the provision of accommodation and meals for professionals (engineers, quantity surveyors, project managers, product representatives etc.) and other (non-construction) personnel involved on the project. Experience from other construction projects indicates that the potential opportunities are not limited to on-site construction workers but also to consultants and product representatives associated with the project.

The potential benefits for local communities are confirmed by the findings of the Overview of the IPPPP undertaken by the Department of Energy, National Treasury and DBSA (December 2021). The study found that to date, a total of 63 291 job years have been created for South African citizens, of which 48 110 job years were in construction and 15 182 in operations. By the end of December 2021, 85 projects had successfully completed construction and moved into operation. These projects created 44 172 job years of employment, compared to the anticipated 30 488. This was 45% more than planned.

In terms of benefits for local communities, significantly more people from local communities were employed during construction than was initially planned. For active projects, the expectation for local community participation was 13 284 job years. To date 25 272 job years have been realised (i.e. 90% more than initially planned), with 23 projects still in, or entering, construction. The number of black SA citizens employed during construction also exceeded the planned numbers by 74%.

Black South African citizens, youths and rural or local communities have been the major beneficiaries during the construction phases, as they respectively represent 81%, 44% and 48% of total job opportunities created by IPPs to date. However, woman and disabled people could still be significantly empowered as they represent a mere 10% and 0.4% of total jobs created to date, respectively. Nonetheless, the fact that the REIPPPP has raised employment opportunities for black South African citizens and local communities beyond planned targets, indicates the importance of the programme to employment equity and the drive towards more equal societies.

The share of black citizens employed during construction (81%) and the early stages of operations (85%) has significantly exceeded the 50% target and the 30% minimum threshold. Likewise, the share of skilled black citizens (as a percentage of skilled employees) for both construction (71%) and operations (82%) has also exceeded the 30% target and minimum threshold of 18%. The share of local community members as a share of SA-based employees was 48% and 70% for construction and operations respectively – exceeding the minimum threshold of 12% and the target of 20%.

While the construction phase will create local employment opportunities, incidences of labour unrest have been associated with other renewable energy projects in the area. These incidents have been linked to unmet expectations and loss of local jobs once construction activities have been completed. This is an issue that will have to be managed.

Impact of construction workers on local communities

The presence of construction workers poses a potential risk to family structures and social networks. While the presence of construction workers does not in itself constitute a social impact, the way construction workers conduct themselves can impact on local communities. The most significant negative impact is associated with the disruption of existing family structures and social networks. This risk is linked to potentially risky behaviour, mainly of male construction workers, including:

- An increase in alcohol and drug use.
- An increase in crime levels.
- The loss of girlfriends and/or wives to construction workers.
- An increase in teenage and unwanted pregnancies.
- An increase in prostitution.
- An increase in sexually transmitted diseases (STDs), including HIV.

Workers are likely to be accommodated in nearby towns of Britstown and De Aar. As indicated above, the objective will be to source as many of the low and semi-skilled workers locally. These workers will be from the local community and form part of the local family and social networks. This will reduce the risk and mitigate the potential impacts on the local community. The potential impact on the local community will therefore be negligible. The balance of semi-skilled and skilled workers will be accommodated in Britstown and De Aar.

While the risks associated with construction workers at a community level will be low, at an individual and family level they may be significant, especially in the case of contracting a sexually transmitted disease or an unplanned pregnancy. However, given the nature of construction projects, it is not possible to totally avoid these potential impacts at an individual or family level.

17.8.2 Influx of job seekers

Large construction projects tend to attract people to the area in the hope that they will secure a job, even if it is a temporary job. These job seekers can in turn become “economically stranded” in the area or decide to stay on irrespective of finding a job or not. While the proposed project on its own does not constitute a large construction project, the establishment of several renewable energy projects in the area may attract job seekers to the area. As in the case of construction workers employed on the project, the actual presence of job seekers in the area does not in itself constitute a social impact. However, the way in which they conduct themselves can impact on the local community. The main areas of concern associated with the influx of job seekers include:

- Impacts on existing social networks and community structures.
- Competition for housing, specifically low-cost housing.
- Competition for scarce jobs.
- Increase in incidences of crime.

These issues are like the concerns associated with the presence of construction workers. The findings of the SIA indicate that the potential for economically motivated in-migration and subsequent labour stranding is likely to be negligible. This is due to the isolated location of the area and the limited economic and employment opportunities in the Britstown and De Aar. The risks associated with the influx of job seekers are therefore likely to be low.

17.8.3 Risk to safety, livestock, and farm infrastructure

The presence on and movement of construction workers on and off the site poses a potential safety threat to local famers and farm workers in the vicinity of the site. In addition, farm infrastructure, such as fences and gates, may be damaged and stock losses may also result from gates being left open and/or fences being damaged, or stock theft linked either directly or indirectly to the presence of farm workers on the site. The potential risks (safety, livestock, and farm infrastructure) can be effectively mitigated by careful planning and managing the movement of construction on and off the site workers during the construction phase.

17.8.4 Increased risk of grass fires

The presence of construction workers and construction-related activities on the site poses an increased risk of grass fires that could, in turn pose, a threat to livestock, crops, wildlife and farm infrastructure. The potential risk of grass fires will be higher during the dry, windy winter months from May to October.

17.8.5 Nuisance impacts associated with construction related activities

Construction related activities, including the movement of heavy construction vehicles of and on the site, has the potential to create dust, noise and safety impacts and damage roads. The impacts will be largely local and can be effectively mitigated. The number of potentially sensitive social receptors, such as farmsteads, will also be low due to the sparse settlement patterns and small number of farmsteads in the area.

17.8.6 Impacts associated with loss of farmland

The activities associated with the construction phase and establishment of the proposed project and associated infrastructure will result in the disturbance and loss of land available for grazing. The impact on farmland associated with the construction phase can be mitigated by minimising the footprint of the construction related activities and ensuring that disturbed areas are fully rehabilitated on completion of the construction phase. Existing internal roads should be used where possible. This requires careful site planning and management of operations. If new roads are required, these roads should be rehabilitated on completion of the construction phase. In addition, the landowners will be compensated for the loss of land.

17.9 POTENTIAL OPERATIONAL PHASE IMPACTS

The following key social issues are of relevance to the operational phase:

Potential positive impacts

- The establishment of infrastructure to improve energy security and support renewable sector.
- Creation of employment opportunities.
- Benefits to the affected landowners.
- Benefits associated with the socio-economic contributions to community development.

Potential negative impacts

- Visual impacts and associated impacts on sense of place.
- Impact on property values.
- Impact on tourism.

17.9.1 Improve energy security and support the renewable energy sector

The primary goal of the proposed project is to improve energy security in South Africa by generating additional energy. The proposed Soyuz 4 Solar PV Park and the associated Soyuz Solar PV Cluster will reduce the carbon footprint associated with energy generation in South Africa. The project should therefore be viewed within the context of the South Africa's current reliance on coal powered energy to meet most of its energy needs, and secondly, within the context of the success of the REIPPPP.

Improved energy security

South Africa's energy crisis, which started in 2007 and is ongoing, has resulted in widespread rolling blackouts (referred to as load shedding) due to supply shortfalls. The load shedding has had a significant impact on all sectors of the economy and on investor confidence. The mining and manufacturing sector have been severely impacted and will continue to be impacted until such time as there is a reliable supply to energy. The Minister of Mineral Resources and Energy, Gwede Mantashe, indicated in February 2023 that the cost of load shedding was estimated at R1 billion a day. The South African Reserve Bank indicated in February 2023 that stage 3 and stage 6 loadshedding cost the South African economy between R204 million and R899 million a day.

A survey of 3 984 small business owners in 2019 found that 44% said that they had been severely affected by load shedding with 85% stating that it had reduced their revenue, with 40% of small businesses losing 20% or more or revenue during due to load shedding period.

Impact of a coal powered economy

The Green Jobs study (2011) notes that South Africa has one of the most carbon-intensive economies in the world, thus making the greening of the electricity mix a national imperative. The study notes that renewable energy provides an ideal means for reaching emission reduction targets in a relatively easy manner. In addition, and of specific relevance to South Africa renewable energy is not as dependent on water compared to the massive water requirements of conventional power stations, has a limited footprint and therefore does not impact on large tracts of land, poses limited pollution and health risks, specifically when compared to coal and nuclear energy plants.

The Greenpeace Report (powering the future: Renewable Energy Roll-out in South Africa, 2013), also notes that within a broader context of climate change, coal energy does not only have environmental impacts, it also has socio-economic impacts. These include acid mine drainage from abandoned mines in South Africa and the risk this poses on the country's limited water resources.

Benefits associated with REIPPPP

Through the competitive bidding process, the IPPPP has effectively leveraged rapid, global technology developments and price trends, buying clean energy at lower and lower rates with every bid cycle, resulting in SA getting the benefit of renewable energy at some of the lowest tariffs in the world. The price for wind power has dropped by 50% to R0.94/kWh, while solar PV has dropped with 75% to R1.14/kWh between BW1 and BW4.

Prices contracted under the REIPPPP for all technologies are well below the published REFIT prices. The REIPPPP has effectively translated policy and planning into delivery of clean energy at very competitive prices. As such it is contributing to the national aspirations of secure, affordable energy, lower carbon intensity and a transformed 'green' economy.

17.9.2 Creation of employment opportunities

Each PV SEF will create ~30-40 employment opportunities during the operational phase, of which 70% will be unskilled, 25% semi-skilled 25%, and 5% skilled 5%. Most of the unskilled and low skilled workers will be local HDI residents of Britstown and De Aar. Based on similar projects the annual operating budget will be in the region of R 30 million (2023 Rand values), including wages.

17.9.3 Generate income for affected landowner

The applicant will enter into rental agreements with the affected landowners for the use of the land for the establishment of the proposed Soyuz Solar PV Cluster facilities. In terms of the rental agreement the affected landowner will be paid an annual amount dependent upon the area affected. The additional income will reduce the risk to his livelihoods posed by droughts and fluctuating market prices for sheep and farming inputs, such as fuel, feed etc. Given the low carrying capacity of the veld the additional income represents a significant benefit for the affected landowner.

17.9.4 Benefits associated with the socio-economic development contributions

The REIPPPP has been designed not only to procure energy but has also been structured to contribute to the broader national development objectives of job creation, social upliftment and broadening of economic ownership. Socio-economic development (SED) contributions are an important focus of the REIPPPP and are aimed at ensuring that local communities benefit directly from the investments attracted into the area. These contributions accrue over the project operation life and, in so doing, create an opportunity to generate a steady revenue stream over an extended period. This revenue can be used to fund development initiatives in the area and support the local community. The long-term duration of the revenue stream also allows local municipalities and communities to undertake long term planning for the area. The revenue from the proposed SEF can be used to support a number of social and economic initiatives in the area, including:

- Creation of jobs.
- Education.
- Support for and provision of basic services.
- School feeding schemes.
- Training and skills development.
- Support for SMME's.

The minimum compliance threshold for SED contributions is 1% of the revenue with 1.5% the targeted level over the 20-year project operational life. For the current portfolio of projects, the average commitment level is 2%, which is 101% higher than the minimum threshold level. To date (across BW1-4) a total contribution of R22.8 billion has been committed to SED initiatives. Assuming an even, annual revenue spread, the average contribution per year would be R1.1 billion. Of the total commitment, R18.5 billion is specifically allocated for local communities where the IPPs operate. With every new IPP on the grid, revenues and the respective SED contributions will increase.

As a percentage of revenue, SED obligations become effective only when operations commence, and revenue is generated. Of the 91 IPPs that have reached financial close (BW1–BW4), 85 are operational. The SED contributions associated with these 85 projects has amounted to R 1.8 billion to date.

In terms of ED and SED spend, education, social welfare, and health care initiatives have a SED focus. SED spend on education has been almost double the expenditure on enterprise development. In this regard IPPs have supported 1 388 education institutions with a total of R437 million in contributions, from 2015 to the end of June 2021. A total of 1 276 bursaries, amounting to R210.8 million, have been awarded by 67 IPPs from 2015 until the end of June 2021. The largest portion of the bursaries were awarded to African and Coloured students (97.4%), with women and girls receiving 56.3% of total bursaries. The Northern Cape province benefitted most from the bursaries awarded, with 57.2%, followed by the Eastern Cape (20.2%) and Western Cape (14.1%). Enterprise development and social welfare are the focus areas that have received the second highest share of the contributions to date.

The Green Jobs study (2011) found that the case for renewable energy is enhanced by the positive effect on rural or regional development. Renewable energy facilities located in rural areas create an opportunity to benefit the local and regional economy through the creation of jobs and tax revenues.

The SED contributions do therefore create significant benefits for local rural communities. However, the funds can be mismanaged. This is an issue that will need to be addressed when allocating SED funds.

17.9.5 Visual impact and impact on sense of place

The proposed Soyuz 4 Solar PV Park has the potential to impact on the areas existing rural sense of place. The findings of the Visual Impact Assessment (VIA) (Scientific Aquatic Services, June 2023) note that with the six farmsteads and gravel roads being the only receptors within a 5 km radius, the impact is based on the view of these receptors. With the farmsteads all associated with dense tall vegetation, it acts as visual screens, as such the farmsteads will experience similar visual impacts. As such the proposed visual impact associated with the Soyuz 4 Solar PV Park is considered low.

In terms of potential nighttime lighting, the VIA notes that this is also expected to be low and will be limited to a local area. The 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.

In conclusion the VIA notes that from a visual resource aspect, there are no fatal flaws associated with the Soyuz 4 Solar PV Park. Based on the feedback from local landowners the potential impact on sense of place was not raised as an issue of concern.

17.9.6 Potential impact on property values

The potential visual impacts associated with the proposed Soyuz 4 Solar PV Park have the potential to impact on property values. Based on the results of a literature review undertaken for wind farms the potential impact on property values in rural areas is likely to be limited. The findings are also likely to be relevant to PV SEFs. In this regard a study undertaken in Australia in 2016 (Urbis Pty Ltd) found that:

- Appropriately located wind farms within rural areas, removed from higher density residential areas, are unlikely to have a measurable negative impact on surrounding land values.
- There is limited available sales data to make a conclusive finding relating to value impacts on residential or lifestyle properties located close to wind farm turbines, noting that wind farms in NSW have been constructed in predominantly rural areas.

The impact of Solar PV Parks on property values is likely to be lower than the impact of WEFs due to the reduced visual impact. As indicated above, based on the findings of the VIA the visual impacts will be low. The impact of the proposed PV SEF on property values is therefore likely to be low.

17.9.7 Potential impact on tourism

The potential visual impacts associated with the proposed Soyuz 4 Solar PV Park have the potential to impact on tourism facilities and tourism in the area. Based on the findings of the literature review there is limited evidence to suggest that the proposed Soyuz 4 Solar PV Park would impact on the tourism in the PKSDM and ELM at a local and regional level. Based on interviews with affected landowners no concerns were raised regarding the impact on guest houses in the area.

17.10 CONCLUSIONS AND RECOMMENDATIONS OF THE SOCIAL SPECIALIST

The findings of the SIA indicate that the development of the proposed Soyuz 4 Solar PV Park and associated infrastructure will create employment and business opportunities for the ELM during both the construction and operational phase of the project. All the potential negative impacts can also be effectively mitigated.

SED contributions associated with the project will also benefit the local community. The enhancement measures listed in the report should be implemented to maximise the potential benefits. The significance of this impact is rated as High Positive. The proposed development also represents an investment in clean, renewable energy infrastructure, which, given the negative environmental and socio-economic impacts associated a coal-based energy economy and the challenges created by climate change, represents a significant positive social benefit for society. The Renewable Energy Independent Power Producers Procurement Programme (REIPPPP) has resulted in significant socio-economic benefits, both at a national level and at a local, community level. These benefits are linked to foreign Direct Investment, local employment and procurement and investment in local community initiatives. The establishment of the proposed Soyuz 4 Solar PV Park is therefore supported by the findings of the SIA.

The establishment of the proposed Soyuz 4 Solar PV Park and associated infrastructure is supported by the findings of the SIA.

18 SOIL, LAND USE AND LAND CAPABILITY IMPACT ASSESSMENT

TMG, on behalf of the Applicant appointed Zimpande Research Collaborative (C/O T. Setsipane) (hereinafter referred to as the "Agricultural Specialist") to undertake the Agricultural Impact Assessment for the proposed Soyuz 4 Solar PV Park.

18.1 METHODOLOGY SUMMARY

The soil, land use and land capability assessment comprised the following aspects:

- As part of the desktop study various data sets were consulted which includes but not limited to Soil and Terrain dataset (SOTER), the Agricultural Geo-Referenced Information System

(AGIS) and Agricultural Research Council Institute for Soil Climate and Water (ARC-ISCW) to review the geology, landform and land capability to establish broad baseline conditions and sensitivity of proposed project area both on environmental and agricultural perspective;
- Compilation of various maps depicting the on-site conditions based on desktop review of existing data;
- Classification of the climatic conditions occurring within the study area;
- Conducting a soil classification survey within the proposed development footprint;
- Assessing the spatial distribution of various soil types within the proposed project area and classify the dominant soil types according to the South African Soil Classification System: A Natural and Anthropogenic System for South Africa (Soil Classification Working Group, 2018);
- Identify restrictive soil properties on land capability under prevailing conditions.

18.2 DESKTOP ASSESSMENT

The following data presented in **Table 39** is applicable to the study area, according to various data sources including but not limited to the Agricultural Geo-referenced Information System (AGIS)

Table 39: Desktop based soil background information sourced from various databases.

Parameters	Description
Mean Annual precipitation (MAP)	The Mean Annual Precipitation (MAP) within the study area is estimated to range between 201 – 400 mm per annum. These conditions have a low yield potential for a moderate range of adapted crops and planting date options may be limited for supporting rain fed agriculture, in some instances supplementary irrigation may be required if available.
Mean Annual Evaporation (MAE)	The mean annual evaporation (MAE) of the entire study area is estimated to be between 2201 – 2400 mm. The high evaporation rates pose risks to plant yield due possible plant permanent wilting resulting desiccation and lack of adequate soil moisture.
Geology	The entire Soyuz 4 Solar PV Park is underlain by the Adelaide geological formation. The Adelaide Subgroup is the lower subgroup of the Beaufort Group with mudstone dominated rocks, which contains silt and clay sized particles
Landform type	The Plain Landform type dominates the entire study area, which means the terrain is suitable to allow agricultural activities.
Soil pH	According to the AGIS database, the pH of soil medium occurring within the study area is considered alkaline with pH ranging between 7.5 – 4.4. In highly alkaline soil, phosphorus and most micronutrients become less available. This is however not considered a limitation as the soil's pH condition can be ameliorated.
Landtype detail	The entire study area is dominated by the Ae297 landtype. The Ae297 land types represent areas with mostly red soils without water tables. These red soils are deeper than 0.3m with high base status and there is an absence of dunes in the landscape. These soils can utilised for intensive agricultural purposes, however water storage limitations may limit the crop choice without supplementary irrigation.
The Soil and Terrain (SOTER) soil classification	The Soil and Terrain (SOTER) database indicates that the entire study area is dominated by Chromic Cambisols. These soils are typically encountered in young deposition areas but also in high erosion areas where they form after genetically mature soils such as Luvisols have eroded away. The B-horizon is normally a yellowish-brown colour but

Parameters	Description
	that may also be an intense red. These soils make good agricultural land and are intensively used.
Desktop land capability	The desktop land capability of the soils associated with the entire Soyuz 4 Solar PV Park is of grazing land capability (Class VII).
Grazing Capacity	According to the AGIS database, the livestock grazing capacity potential is estimated to be approximately 23 hectares per large animal for the study area. The grazing capacity is considered low for commercial livestock agriculture.
Desktop based Land use	The entire study area is characterised by vacant or unspecified landuses.
Alkalinity and Sodicity of the soils	The soils within the Soyuz 4 Solar PV Park are neither alkaline nor sodic, this indicates soils are not affected by high concentration of salts.
Probability of soil loss	The predicted soil loss for the entire study area is considered Moderate. This can be attributed to the sandy nature of the soils, which are susceptible to wind and water erosion.
Soil Water Retaining Characteristics	Water retaining characteristics are scarce or absent within the entire study area. Water storage during the fallow period may not be possible in the absence of irrigated agriculture.
Clay Content	The clay content for most soils within the study area are characterised by clay contents between 15% - 35%.
Soil Depth	The soil depth within the entire Soyuz 4 Solar PV Park is less than 450 mm. This indicates a limited choice of crops for cultivation for majority of the area due to shallower depths.
Department of Environmental Affairs (DFFE) screening tool	The entire Soyuz 4 Solar PV Park is characterised by medium sensitivity to agriculture

18.3 CURRENT LAND USE

According to observations made during the site assessment the study area largely comprises of the Karoo and Fynbos shrubland vegetation associated with wilderness land use as well as livestock grazing, with limited anthropogenic impact. At the time of assessment, no cultivation of crops was observed within the boundaries of the study areas as well as in the immediate vicinity, however livestock is the dominating agricultural activity.

18.4 DOMINANT SOIL FORMS

The identified soil forms within the study area include the soils of Coega, Mispah and Askham/Clovelly formation.

The Askham/Clovelly soil form is characterised by an orthic A horizon underlain by a yellow brown apedal horizon and by either a hard carbonate or/and lithic horizon. These soils are associated with low-activity clays (kaolinite mineral) synonymous with weak and apedal soils related to sandy textured soils. These soils account for approximately 348.0 ha (56.5%) of the entire development footprint and are are considered ideal for cultivation due to:

- Good drainage characteristics;
- Sufficient depth for root growth;
- Sufficient moisture holding capacity; and
- Nutrient retention capacity to support the optimum growth and production.

The Coega soil forms are typically shallow in nature and are characterised by the presence of an orthic A horizon underlain by the hard carbonate horizon. Hard carbonate horizons can be massive, vesicular or platy in nature and typically contain calcium and/or magnesium carbonates with a hard to extremely hard consistence. These soils are typically not suitable for cultivation due to a shallow effective rooting depth, high pH, high alkalinity, low nutrient availability, stoniness and low moisture retention due to the sandy nature of the soils. However, these soils can be cultivated under intensive management strategies by breaking of the hard carbonate and dorbank horizons to improve drainage and rooting depth with the presence of an irrigation scheme. Despite these limitations, the choice of crop is still limited to certain pome fruit varieties. Thus, these soils are generally restricted to intensive grazing and wildlife.

The Mispah soil types is associated with poor physical properties for plant root system penetration and water infiltration, due to the shallow nature of the soil and/or limiting impeding layer of the underlying parent material. Based on the degree of weathering some lithic material of varying sizes can be mixed closely with soil material. These types of soils are usually avoided for intensive use and thus left for grazing, forestry, and wildlife land uses.

18.5 LAND CAPABILITY CLASSIFICATION

For this assessment, land capability was inferred in consideration of observed limitations to land use due to physical soil properties and prevailing climatic conditions. Climate Capability (measured on a scale of 1 to 8) was therefore considered in the agricultural potential classification. The study area falls into Climate Capability Class 7 due a severely restricted choice of crops due to heat, cold and/or moisture stress. The identified soils were classified into land capability and land potential classes using the Camp et. al, and Guy and Smith Classification system (Camp et al., 1987; Guy and Smith, 1998), and this is shown in **Table 40**.

Table 40: Land Capability and Potential Classifications

SOIL FORM	LAND CAPABILITY	LAND POTENTIAL	AREA (HA)	PERCENTAGE (%)
Askham/Clovelly	Arable (Class III)	Restricted Potential (L5)	348.0	56.5
Coega/Mispah	Grazing (Class V)	Restricted Potential (L5)	148.2	24.1
Mispah	Grazing (Class V)	Restricted Potential (L5)	119.8	19.4
Total Enclosed			**616**	**100**

The identified soil forms with respect to agricultural use are depicted in **Figure 61**.

Figure 61: Land Capability of the Identified Soil Forms – Soyuz 4 Solar PV Park

The identified land capability limitations for the identified soils are discussed in comprehensive "dashboard style" summary tables presented from **Table 41**and **Table 42**.

Table 41: Summary discussion of the Arable (Class III) land capability class.

Land Capability: Arable (Class III) and Moderate potential land			
  			
Terrain Morphological Unit (TMU)	Gently sloping land of >1% slope	**Photograph notes**	View of the identified orthic A, yellow brown and hard carbonate horizons associated with the Askham/Clovelly soil horizons.
Soil Form(s)	Askham/Clovelly	**Area Extent**	348.0 ha (56.5%)
Physical Limitations	High pH, low organic matter and low nutrient status is the primary land capability limitation of the Askham/Clovelly soil form.	**Land Capability and Land Potential:** The identified soil forms are of moderate (Class III) land capability, and suitable for arable agricultural land use with restrictions. Therefore, these soils are considered to potentially make a moderate contribution to agricultural productivity on a regional and national scale.	
Land Potential	**Restricted Potential (L5)**: Regular and/or moderate to severe limitations due to soil, temperature, and/or moisture stress.	**Consideration of Integrated Environmental Management and Sustainable Development principles:** The identified soils are considered prime agricultural soils suitable for arable crops. These soils can yield profit returns under prudent crop selection and conservation soil management practices. However, the prevailing local climatic conditions severely restricts the choice of crop cultivation under rainfed agriculture. Lack of irrigation options further disqualify this area for commercial cultivated agriculture although ideal soils occur. Thus, the soils are restricted to grazing land use.	

Table 42: Summary discussion of the Grazing (Class VI) land capability class for the Glenrosa soil form.

Land Capability: Grazing (Class VI)			
 			
Terrain Morphological Unit (TMU)	Typically associated with the crest (TMU 1) and scarp (TMU 2), very steep terrain.	**Photograph notes**	View of the topsoil horizons, hard rock and hard carbonate horizons associated with the Mispah and Coega soil forms.
Soil Form(s)	Coega and Mispah	**Areal Extent**	268 ha (43,5 %)
Physical Limitations	Shallow effective rooting depth is the primary limitation of the land capability of the Coega and Mispah soil forms, which is due to the occurrence of a rocky or hard carbonate layer at relatively shallow depth, which hinders penetration of plant roots.	**Land Capability and Land Potential:** The identified Glenrosa soil forms are of poor (Class VI) land capability and are not suitable for arable agricultural land use. Theses soils are, at best, suitable for natural pastures for light grazing. Therefore, these soils are not considered to make a substantial contribution to extensive subsistence farming on a local scale.	
Land Potential	**Very Restricted potential (L6):** Regular and/or moderate to severe limitations due to soil, temperature, and/or moisture stress.	**Consideration of Integrated Environmental Management and Sustainable Development principles:** The identified soil forms are, at best, suited for grazing and/or wilderness practices. These soils are generally not considered to be of significant agricultural productivity as a result of their shallow nature. These soils, at best are suited for grazing. The proposed development is viable on these soils due to their low agricultural potential. However, mitigation measures should this put in place to minimise further disruption of other adjacent soils which can potentially be used for grazing.	

18.6 POTENTIAL SOIL AND LAND CAPABILITY IMPACTS

The activities and potential impacts identified are summarised in **Table 43** and discussed thereafter.

Table 43: Activities and Potential Impacts associated with proposed development during different phases

ACTIVITIES AND ASPECTS REGISTER
Pre-Construction Phase • Planning and design of the footprint areas. • Preparation for the construction activities **Impacts:** ▪ Excessive vegetation clearance within infrastructure leading to soil erosion ▪ Soil Compaction leading to disruption of soil physical characteristics (i.e. Structure, porosity) ▪ Soil Contamination leading to alteration of the soil chemical characteristics and subsequent impact on fertility
Construction Phase • Land and footprint clearing and light soil stripping. **Impacts:** ▪ Increased soil erosion and subsequent soil loss. Loss of organic matter. ▪ Soil Compaction leading to disruption of soil physical characteristics (i.e., Structure, porosity) ▪ Soil Contamination leading to alteration of the soil chemical characteristics and subsequent impact on fertility • Establishment of surface infrastructure **Impacts:** ▪ Spillage of hydrocarbons leading to soil contamination. ▪ Increased run-off (and erosion) in compacted areas and modification of natural infiltration.
Operational and Maintenance Phases • Operation of the surface infrastructure. **Impacts:** ▪ Increased soil erosion, compaction and spillage of hydrocarbons

18.6.1 Stripping and Removal of Productive Topsoil and Subsequent Loss of Agricultural Land Capability

The Soyuz 4 Solar Park and associated access road are dominated by well-drained soils of the Askham/Clovelly which collectively account for approximately 348.0 (56.5%) of the total study area. These soils suitable for cultivation (Class III) but have a Restricted Potential (L6) due to climate consideration and other factors. The loss of land capability is therefore anticipated to be Medium without mitigation measures and Low with mitigation in place under the condition that the integrated mitigation measures are implemented accordingly.

18.6.2 Impact: Soil Erosion

Soil erosion is largely dependent on land use and soil management and is generally accelerated by anthropogenic activities. In the absence of detailed South African guidelines on erosion classification, the erosion potential and interpretation are based on field observations as well as observed soil profile characteristics. In general, soils with high clay content have a high-water retention capacity, thus less prone to erosion in comparison to sandy textured soils, which in contrast are more susceptible to erosion.

The proposed development footprint is located on a flat to moderately sloping terrain, which slightly increases the erosion risk. While the identified soils display a moderate to low susceptibility to erosion under current conditions, their susceptibility to erosion is likely to increase once the land is cleared for construction activities, and the soils will inevitably be exposed to wind and stormwater. The severity of this impact is anticipated to be Medium for most of the soils and with the appropriate mitigation measures the significance of this impact may be Low. Soil erosion is likely to have some negative impacts on soil and this will most likely lead to:

- Removal of organic matter and important soil nutrients essential for vegetation growth and thus reduced yield potential;
- Possible pollution and sedimentation of nearby water sources consequently affecting the water quality for livestock; and
- Limited water availability essential for vegetation growth.

18.6.3 Soil Compaction

Heavy equipment traffic during construction and activities is anticipated to cause soil compaction. The severity of this impact is anticipated to be moderately high for most soils under cultivation and moderately low for soils characterised by the presence of rocky outcrops and hard carbonates. However, the significance of the impact is Medium if unmanaged and Low if managed, given that the effect will be localized and restricted to access roads, vehicle hardstand areas and equipment and machinery laydown areas. Soil compaction will potentially lead to:

- Increased bulk density and soil strength reduced aeration and lower infiltration rate;
- Consequently, it lowers crop performance via stunted aboveground growth coupled with reduced root growth
- Destroyed soil structure, causing it to become more massive with fewer natural voids with a high possibility of soil crusting. This situation can lead to stunted, drought- stressed plants because of restricted water and nutrient uptake, which results in reduced crop yields; and

18.6.4 Soil Contamination

Contamination sources are mostly unpredictable and often occur as incidental spills or leaks during both the construction and operational phase. Thus, all the identified soils are considered equally predisposed to potential contamination. The significance of soil contamination is medium for all identified soils without mitigation, largely depending on the nature, volume and/or concentration of the contaminant of concern as well as the rate at which contaminants are transported by water in the soil. Therefore, strict waste management protocols, vehicular maintenance, as well as product stockpile management and activity specific Environmental Management Programme (EMP) and monitoring guidelines should be adhered to during the construction and operational activities. If the management protocols are not well managed this will more likely lead to:

- Contaminants leaching into the soil and thus potentially rendering the soil sterile reducing the yield potential of soils.

18.7 IMPACT STATEMENT ON ACCESS ROAD

The proposed access road is short, thus no significant ground clearing, and soil stripping is anticipated for this development except edge effects which might occur should the current roads be widened. The overall impact significance from a soil, land use and land capability as well as agricultural potential perspective is low without mitigation and can be further reduced to a very low significance once mitigation measures have been implemented.

18.8 CONCLUSION OF LAND CAPABILITY SPECIALIST

From a soil, land use and land capability point of view, this proposed development of the Soyuz 4 Solar PV Park on the preferred site is regarded as being of low impact significance due to the inherent soil constraints of the area such as the lack of a soil medium (shallow soils) and the prevailing harsh climatic conditions. Based on the above mentioned the proposed project can be considered. However, mitigation measures and recommendations outlined in this document need to be strongly considered and implemented accordingly in efforts to conserve soil resources and allow use of valuable topsoil in other areas.

19 TOWN PLANNING ASSESSMENT

TMG, on behalf of the Applicant appointed Warren Petterson Planning (C/O MS Soné vd Merwe) (hereinafter referred to as the "Town Planning Specialist") to undertake a town planning report for the proposed Soyuz 4 Solar PV Park.

The subject farm, proposed as the development site, is zoned Agricultural Zone 1 in terms of the Emthanjeni Local Municipality Land Use Scheme, 2022. According to the scheme regulations, no provision is made for renewable energy facilities on land zoned Agricultural Zone 1.

A rezoning application (land use application) to the local authority will be required in terms of Section 3(2)(i) of Emthanjeni Municipality Spatial Planning and Land Use Management By-Law, 2015 to allow for the development of the Soyuz 4 Solar PV Park.

It must be noted that the rezoning application can only be finalized and submitted for consideration once the Environmental Authorization is granted. It is advised that the rezoning application be submitted after the Environmental Authorization is granted as the layout and site development plan will be impacted during this process after input from all the relevant specialists and government departments is received.

20 TRANSPORT IMPACT ASSESSMENT

TMG, on behalf of the Applicant appointed ITS Engineers (Mr Pieter Arrangie)) (hereinafter referred to as the "Traffic Impact Specialist") to undertake a Transport Impact Assessments for the proposed Soyuz 4 Solar PV Park.

20.1 TRAFFIC ANALYSIS SCOPE

This assessment evaluates the expected traffic impact of the proposed development during the construction and operational phases. Possible access routes to the proposed development site are assessed and comments are made on the condition of the existing roads in the vicinity. Improvements to the surrounding road network are recommended where appropriate. The report is based on existing available information on the road network, road condition information obtained during site visits and an assessment of the expected traffic volumes generated by the construction and operational phases of the proposed Soyuz 4 Solar PV Park.

20.2 EXISTING CONDICTIONS

20.2.1 Existing Cross-sections and Surface Conditions

The National Roads (N10 & N12) are the only major roads in the site vicinity. The N10 and N12 have posted speed limits of 120 km/h. The sections of these roads in the vicinity of the site have a typical rural formation of National Roads, paved with one lane per direction of travel with shoulders along both sides of the road. The lanes are 3.7m wide with 2m shoulders. Windpoort Road is 8m wide gravel road. The road surface of sections of Windpoort Road in the site vicinity are in poor condition.

20.2.2 Existing Traffic Volumes

Existing traffic conditions are based on the traffic volumes extracted from the SANRAL Comprehensive Traffic Observation (CTO) Stations and Provincial count stations in the area. **Table 44** presents the current average daily traffic volumes (ADT) and the average daily truck traffic volumes (ADTT) and the peak hour volumes on the road network in the wind farm site vicinity.

Table 44: Existing Traffic Conditions

ROADWAY	AVERAGE DAILY TRAFFIC (ADT) VOLUMES	AVERAGE DAILY TRUCK TRAFFIC VOLUMES	PEAK HOUR VOLUME	% HEAVY VEHICLES
N10	790	284	106	36%
N12	885	355	85	40%
Windpoort Road	<50	<5	Not Applicable	10%

The existing traffic volumes on the surrounding road network are low and will not be any reason for concern in terms of the expected transport impact associated with the proposed development.

20.2.3 Existing Access

Access to the proposed development site will be via existing access roads created off Windpoort Road. The required shoulder sight distance (SSD) for heavy vehicles along roads with a posted speed limit of 60km/h is 220 metres based on the geometric design guidelines of the UTG. The available SSD along Windpoort Road is more than 300 metres in both directions from where the existing site access departs, which is acceptable and safe for the existing posted speed limits along Windpoort Road.

20.3 TRAFFIC IMPACT ANALYSIS METHODOLOGY

The expected effects of traffic that would be generated by the proposed development during peak hours were determined as follows:

- The Existing (2023) traffic volumes were assessed for the road network in the vicinity of the proposed development site.
- The Background (2028) traffic volumes were determined for the study network in the vicinity of the proposed development site. The baseline traffic volumes are the traffic volumes that would be associated with the road network in the absence of the

proposed development in five years' time (No-Go Alternative).

- Construction Phase Traffic was assessed for the study network
- Site-generated trips were estimated for the proposed development;
- The construction phase traffic and the assigned site-generated traffic from the proposed development were added to the background traffic volumes to determine the total traffic conditions during the construction phase and with the development completed.

20.4 YEAR 2028 BACKGROUND TRAFFIC CONDITIONS

For the purposes of this study, year 2028 baseline traffic volumes were developed by applying a 3.0 *percent annual traffic growth rate* to the existing traffic volumes on the major links. This estimated growth rate was assumed to allow for the additional traffic volumes that will be generated by other in-process and future developments in the vicinity of the proposed development prior to the establishment of the Soyuz 4 Solar PV Park.

Due to the low traffic volumes on the surrounding road network, it is expected that the road network will continue to operate at acceptable levels-of-service during baseline conditions. Sections of Windpoort Road in the site vicinity are in a poor condition, but no major road upgrades other than regular road maintenance will be required in the near future.

20.5 CONSTRUCTION PHASE TRAFFIC

A large amount of traffic will be generated during the construction phase. The following activities will probably occur during the construction phase:

- Construction of the internal access roads,
- Stripping and stockpiling of topsoil,
- Excavation and construction of the foundations for the solar panel racks,
- Construction of the operations building,
- Assembly and disassembly of solar panel arrays,
- Trenching for cabling; and
- Reinstatement of the site

The internal access roads will be constructed mainly of local materials sourced on site if the material is suitable, otherwise material will be imported from licensed commercial quarries. These internal roads will be retained and used for inspection and maintenance of the solar panels.

20.5.1 Trip Generation

It is predicted that approximately 1 000 trucks will be required delivering equipment and building material during the construction period, depending on the type and configuration of the solar panel arrays. The number of delivery vehicles could vary substantially, but for the purposes of this study it was assumed that 1 000 delivery truck represents a worst-case scenario. The construction period could probably vary between six and eight months. It is assumed that delivery of the equipment will occur randomly over a six- month period. With a possible 150 working days in a six-month period, it means that on average approximately 7 trucks will visit the site per day which equates to approximately 14 truck trips spread over an eight-hour day.

Based on the information supplied it is assumed that approximately 500 construction workers could be employed during the peak construction period. Based on information provided the bulk of these workers will be transported to/from the construction site via bus. If 90 percent of the construction staff travels by bus with an average occupancy of 50 passengers per vehicle it equates to approximately 9 buses visiting the site in the morning and afternoon peak hours. If the remaining 10 percent travel with private vehicles, it equates to approximately 150 motor vehicle and truck trips during the average weekday.

20.5.2 Trip Distribution and Assignment

It is expected that the trips to/from the proposed Solar Project will come from Britstown. The trucks delivering the building material and equipment could come from Gauteng, Cape Town/Saldanha harbour and from Durban.

20.6 OPERATIONAL PHASE

It is expected that approximately 20 permanent staff members will be employed at the proposed Soyuz 4 Solar PV Park during the operational phase. If all the staff travel to work with private vehicles it means 20 trips in during the a.m. peak hour and 20 trips out during the p.m. peak hour.

The operational phase of this project is not expected to generate significant traffic volumes. The typical day-to-day activities will probably only be service vehicles undertaking general maintenance at the site.

20.7 TRAFFIC IMPACT STATEMENT

Based on the expected number of construction trips generated by the proposed development the existing road network has sufficient capacity to accommodate the additional trips from an operational perspective. During construction it is expected that road surfaces of the gravel roads will require maintenance to prevent damage to the road structure.

It is recommended that once construction is completed the public roads should be inspected and repaired where necessary.

20.8 POTENTIAL TRAFFIC IMPACTS

The following impacts relating to the increased traffic during the construction phase have been identified:

- Increase in traffic volumes on the surrounding road network as a result of construction traffic
- Gravel loss and possible damage to the road layer works. as a result of additional truck traffic during the construction phase.

The following impacts relating to the increased traffic during the operational phase have been identified:

- Increase in traffic volumes on the surrounding road network during the operational phase.

20.9 CONCLUSIONS AND RECOMMENDATIONS OF THE TRAFFIC SPECIALIST

Based on the evaluation as discussed in this report the existing road network has sufficient spare capacity to accommodate trip generation associated with the proposed development, without any road upgrades required to the existing road infrastructure. It is recommended that the proposed Soyuz 4 Solar PV Park be approved from a transport impact perspective.

The Traffic Management Plan must be included in the EMPr.

21 VISUAL IMPACT ASSESSMENT

TMG, on behalf of the Applicant appointed SAS (C/O S. Erwee) (hereinafter referred to as the "Visual Specialist") to undertake the Visual Impact Assessment (VIA) for the proposed Soyuz 4 Solar PV Park.

21.1 Scope of VIA

The purpose of the VIA 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 4 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 to avoid or minimise any potential visual impacts.

21.2 METHODOLOGY

The method of assessment included the following:

- **Desktop Assessment:** The method of assessment for this report is based on a spatial analysis of the Soyuz 4 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 4 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 4 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.

- **Field Assessment:** A field assessment was undertaken during the summer season on the 16th to 18th of January 2023. As the Soyuz 4 Solar PV Park is located in an 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 4 Solar PV Park and drive around in the visual assessment zone (5 km radius), 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.

21.3 DEVELOPMENT CATEGORY AND LEVEL OF IMPACT ASSESSMENT

It was determined that the proposed project can be defined as a Category 5 development, which includes renewable energy structures.

Based on the outcome of the desktop and field assessments it is evident that the proposed Soyuz 4 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. It is important to note that visual impacts are only experienced when there are receptors present to experience the impact. As such, there are only six farmsteads located within a 5 km radius. In addition to the farmsteads there are several gravel roads which are used infrequently and mostly only by the farmers.

The gravel road forming the western boundary of the Soyuz 4 Solar PV Park and the Windpoort Country Guest House and Cottage located approximately 150 m to the south, will experience the highest visual impact, however temporarily, as the farmers traveling on the gravel road are focusing on the road and the have dense vegetation associated with the houses, thus obscuring the view towards the Soyuz 4 Solar PV Park. The proposed Soyuz 4 Solar PV Park is therefore likely to have an overall moderate visual impact on the receiving environment, therefore a Level 2 Assessment was undertaken versus a level 4 Assessment.

21.4 RECEIVING ENVIRONMENT

Table 45 briefly describes the receiving environment associated with the Soyuz 4 Solar PV Park within its current context. **Figure 62** shows the sensitive receptors in the study area while **Figure 63** depicts the topography of the study area.

Table 45: Summary of the visual assessment of the Soyuz 4 Solar PV Park and surrounds

Climate	As a result of climate variations throughout the year, the appearance and perception of the landscape within and surrounding the Soyuz 4 Solar PV Park changes with the seasons. The vegetation associated with the Soyuz 4 Solar PV Park is dominated by short shrubs and grasses, thus seasonal variation in terms of vegetation, is unlikely to have an effect on the area from where project components would potentially be visible. Since the Soyuz 4 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 4 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 4 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 (not visible from the Soyuz 4 Solar PV Park), 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	The Soyuz 4 Solar PV Park is situated in open dwarf karoo shrub veld that is utilised for grazing, with bare patches on gently sloping terrain with a mountainous backdrop. The arid nature of the climate restricts 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. There are only six farmsteads located within the visual assessment zone, of which only two will experience a visual impact from the Soyuz 4 Solar PV Park. As such, the farmsteads are considered highly sensitive receptors, and thus according to the SEAs Identification of No-Go Areas (negative mapping) (2019) a 300m buffer is recommended. According to SAPAD (2022) and SACAD (2022) the Soyuz 4 Solar PV Park is not located within a 10 km radius of any protected or conservation areas.	**Visual Absorption Capacity (VAC)**	The VAC of the area is considered moderately low, indicating that the proposed PV structures will stand out, to a degree. With the vegetation of the area being short and no roadside tree lines the vegetation will not obscure the view. The mountain ranges in the background will however assist in absorbing the silhouettes, if any, of the PV panels and associated infrastructure. Furthermore, the relatively low height of the PV panels and angle thereof, and the mountainous backdrop ensures that the structures will not form part of the skyline. Should the buffer zones recommended for the gravel road and Windpoort Country Guest House and Cottage be adhered to the overall proposed visual intrusion on the landscape may be reduced, with the exception of the portion of the gravel road and Windpoort Country Guest House and Cottage directly adjacent to the Soyuz 4 Solar PV Park which will experience a higher visual intrusion.

	Since the Soyuz 4 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 gravel road forming the western boundary of the Soyuz 4 Solar PV Park may however be considered an important passage as it connects Britstown and Deelfontein, and if the proposed PV panels are situated directly adjacent to the road, the possible glint and glare from the PV panels may distract the motorists, possibly resulting in an accident. Therefore, a 250m buffer was recommended for the gravel road, where no PV panels should be placed. The R398 roadway is located approximately 13,7 km south west of the Soyuz 4 Solar PV Park, while the N12 national road is located approximately 6,4 km west of the Soyuz 4 Solar PV Park and the N10 national road is located approximately 4,4 km to the north. With the national routes located quite a distance from the Soyuz 4 Solar PV Park, and the undulating topography of the area rendering no visibility of the Soyuz 4 Solar PV Park, these routes will not be affected by the proposed Soyuz 4 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 4 Solar PV Park is related to the landscape character type, defined as rural, relatively flat to gently sloping with little anthropogenic movement. The Soyuz 4 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 4 Solar PV Park as it extends to the larger region. During the construction phase of the Soyuz 4 Solar PV Park, the sense of place will however be significantly 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 4 Solar PV Park is relatively flat to gently sloping with a mountainous backdrop. With the local topography of the Soyuz 4 Solar PV Park being relatively flat, it is unlikely to assist in absorbing and/ or screening the Soyuz 4 Solar PV Park. The mountainous backdrop will however somewhat assist in absorbing the Soyuz 4 Solar PV Park. The field assessment did however indicate from a distance, further than 1 km from the Soyuz 4 Solar PV Park, the gently sloping topography does influence the visibility. Please refer to Figures 7 and 8 for the elevation and slope models of the area.	**Night-Time Lighting**	The Soyuz 4 Solar PV Park is located in a rural area where the only sources of lighting are the town of Britstown (located approximately 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 4 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 4 Solar PV Park is not a development that requires a significant amount of lighting. This corresponds with Bortle's Scale – indicating that Soyuz 4 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 4 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 4 Solar PV Park.
Vegetation Cover	The Soyuz 4 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 4 Solar PV Park (Appendix D). The field assessment indicated that the Soyuz 4 Solar PV Park is representative of the Northern Upper Karoo, with areas being subject to grazing, thus displaying degraded habitat and four episodic drainage lines (STS, 2023). With the area dominated by dwarf karoo shrubs and grasses, the vegetative component of the Soyuz 4 Solar PV Park and immediate surrounds will not be able to assist in screening the Soyuz 4 Solar PV Park. The farmsteads including the Winpoort Country Guest House and Cottage have existing dense tree lines which may obscure the view towards Soyuz 4 Solar PV Park.		

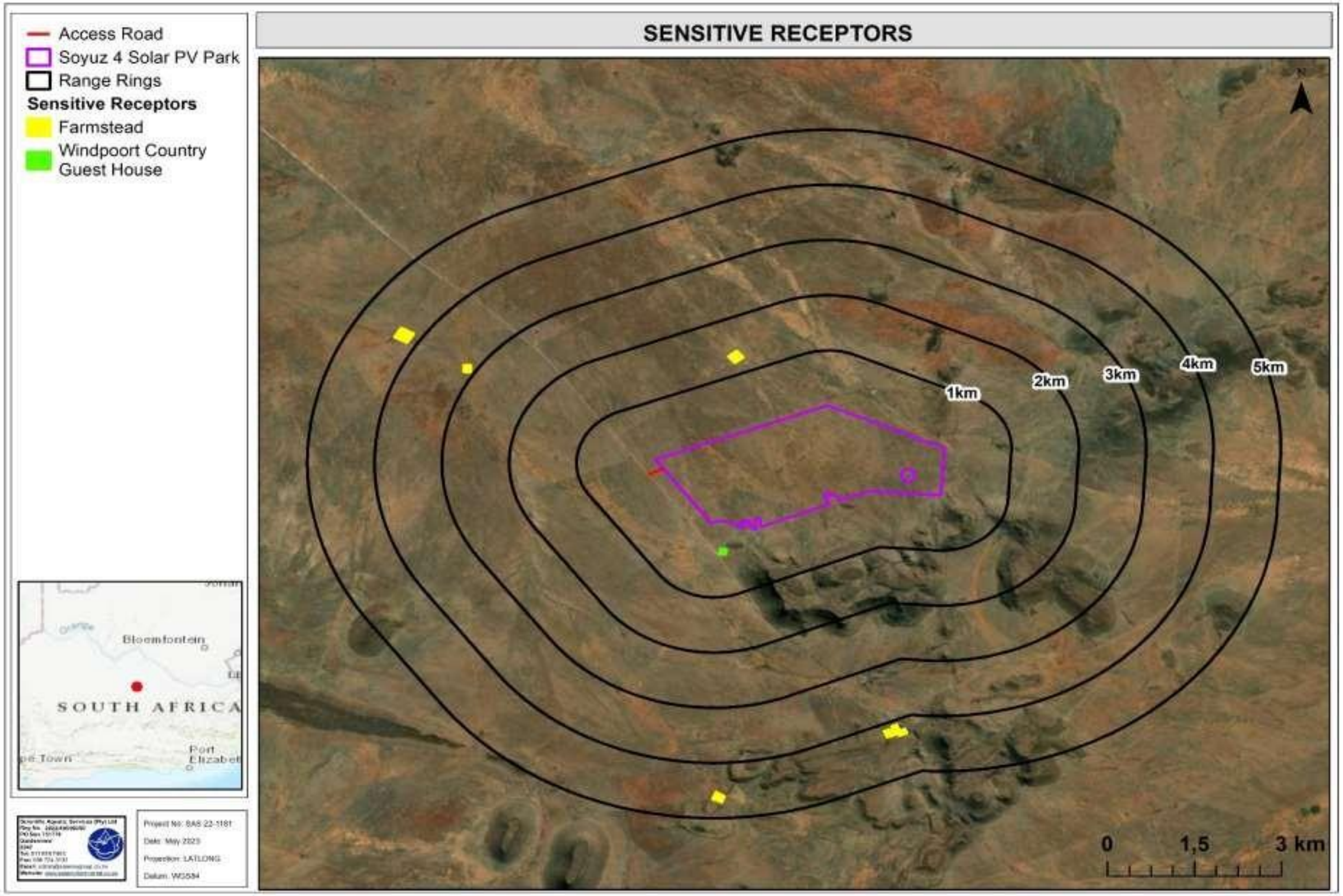


Figure 62: Map indicating the location of potential sensitive receptors within 5km of the Soyuz 4 Solar PV Park

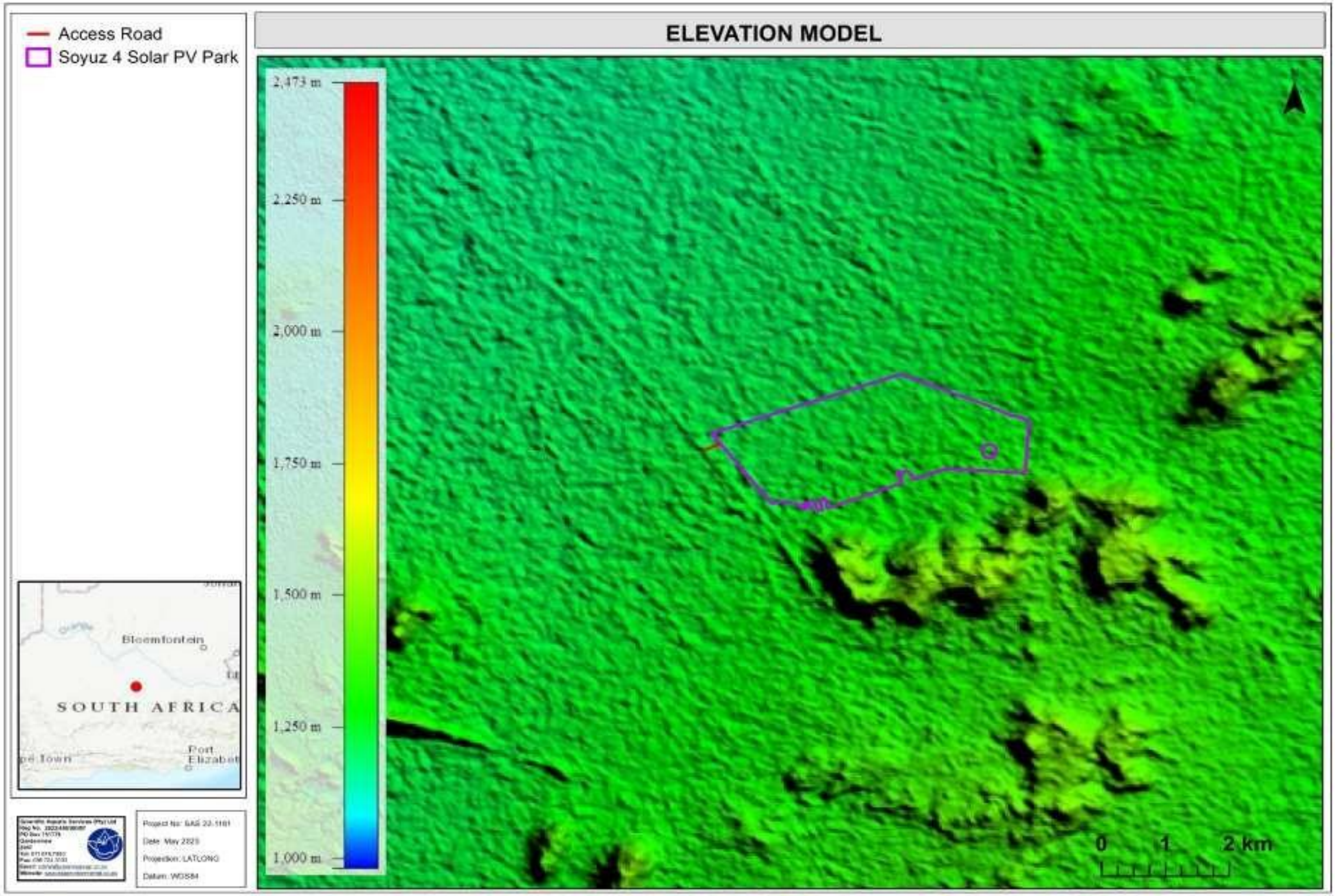


Figure 63: False colour elevation rendering depicting the topographical character of the Soyuz 4 Solar PV Park

21.5 POTENTIAL VISUAL IMPACTS

Potential impacts on the visual environment in the region because of the proposed Soyuz 4 Solar PV Park facilities and based on available information, are discussed.

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.

It should however be noted that dense vegetation is associated with the Guest House, thus largely obscuring the view towards the Soyuz 4 Solar PV Park. Furthermore, the farmsteads located to the south of the Soyuz 4 Solar PV Park have no direct line of sight towards Soyuz 4 Solar PV Park, due to a mountain range blocking the line of sight, as such the visual impact is negligible. Glint and glare possibly experienced by the farmers and visitors (at the farmsteads and Guest House and along the gravel road) will vary throughout the day since the solar panels are tracking the sun, therefore the angle the solar panels are tilted at various degrees throughout the day.

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 near 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 4 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 18 km south south west of the Soyuz 4 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 SOLAR PV PARK 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. With the Soyuz 4 Solar PV Park located north northwest of the airstrip, at an angle of 56˚ and approximately 18 km away, the risk of glint and glare is reduced considerably. Should there be risk of glint and glare, it will be most significant in the mornings and 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. 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 300 MW installation.

Table 46 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.

Table 46: Potential activities resulting in negative Visual Impacts

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 Windpoort Guest House	Site clearing, including the removal of topsoil and vegetation within the footprint.	Presence of the SOLAR PV PARK within a 20 km radius where no renewable energy structures have been introduced. It should however be noted that Soyuz 4 Solar PV Park is part of the Britstown Cluster (six), and Twenty one other 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 SOLAR PV PARK 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

Pre-Construction	Construction	Operational	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 4 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	

21.6 CONCLUSION OF VISUAL SPECIALIST

From a visual resource aspect, there are no fatal flaws associated with the Soyuz 4 Solar PV Park. Hence, it is the professional opinion of the visual specialist that the development of the Soyuz 4 Solar PV Park can be considered for authorisation.

22 PUBLIC PARTICIPATION PROCESS

*In accordance with **Appendix 1 Regulation 2(h)(ii, iii) of GN No. R. 326 of the NEMA EIA Regulations (2014, as amended**), the following information is presented in Section 12:*

> ***2(h) ii** – Details of the Public Participation Process undertaken in terms of Regulation 41 of the Regulations, including copies of the supporting documents and inputs*
> ***2(h) iii** – A summary of the issues raised by interested and affected parties and an indication of the manner in which the issues were incorporated or the reasons for not including them.*

22.1 OBJECTIVES OF THE PUBLIC PARTICIPATION PROCESS

The public consultation process is requirements of the NEMA EIA Regulations (2014 as amended) GNR 982 Regulation 41. The Regulation aims at ensuring that all information pertaining to this Environmental Permitting Process is adequately circulated to all Interested and Affected Parties (I&APs) and further provides the I&APs with timeframes within which to provide feedback throughout the EIA process. This PPP thus aims at providing organisations and individuals with an opportunity to raise concerns and make comments and suggestions regarding the proposed Project.

The principles for the Scoping and EIA that determine communication with all I&APs at large are included in the principles of the National Environmental Management Act (NEMA) (Act 107 of 1998, as amended) and are further highlighted in the DEA&DP EIA Guideline and Information Document

Series (March 2013) which states that: "Public participation process means a process by which potential interested and affected parties are given an opportunity to comment on, or raise issues relevant to an application."

Public participation is an essential and regulatory requirement for an environmental authorisation process and must be undertaken in terms of the Environmental Impact Assessment (EIA) Regulations GN R.982 (December 2014). Public participation is a process that is intended to lead to a joint effort by stakeholders, technical specialists, the authorities and the proponent/developer who work together to produce better decisions than if they had acted independently.

Internationally, the public consultation process complies with the Equator Principles (in particular Principles 5 and 6) and the IFC Performance Standards (PS) (specifically PSs 1, 2, 4, 5, 7 and 8). A Stakeholder Engagement Plan (SEP), provides a more comprehensive summary of the local regulatory requirements and international standards that were considered in the design of the public consultation process.

The public participation process is designed to provide sufficient and accessible information to Interested and Affected Parties (I&APs) in an objective manner.

During the Scoping Phase to enable them to:

- Understand the context of the EIA;
- Become informed and educated about the proposed project and its potential impacts;
- Raise issues of concern and suggestions for enhanced benefits;
- Verify that their comments, issues of concern and suggestions have been recorded;
- Assist in identifying reasonable alternatives; and
- Contribute relevant local information and traditional knowledge to the environmental assessment.

During the impact assessment phase to assist them to:

- Contribute relevant information and local and traditional knowledge to the environmental assessment;
- Verify that their issues and suggestions have been evaluated and considered in the environmental investigations and feedback has been provided;
- Comment on the findings of the EIA; and
- Identify further issues of concern from the findings of the EIA.

During the decision-making phase:

- To advise I&APs of the outcome, i.e. the authority decision, and how the decision can be appealed.

22.2 STEPS TAKEN TO NOTIFY POTENTIALLY INTERESTED AND AFFECTED PARTIES

Identification of Stakeholders

After obtaining the relevant site information, the Landowners, Adjacent Landowners, Relevant Conservation Groups, and Competent and Commenting Authorities will be contacted to obtain owner/occupant details for directly adjacent erven as well as key stakeholders for this Project. In terms of the NEMA EIA Regulations (2014 as amended), notification of directly adjacent landowners and occupiers is required. The EAP is satisfied that the Public Participation Process will be consistent with the requirements of Regulations.

Communication with Stakeholders

In terms of the NEMA EIA Regulations (2014 as amended), potential Interested and Affected Parties (I&AP's) must be given 30 calendar days within which to register as an I&AP (initial notification) and provide comments. Further, registered I&AP's must be given an opportunity to comment on reports that will be submitted to the relevant authority

As such, and in accordance with the Public Participation Guidelines produced by the relevant authority, all I&APs have 30-days within which to register and provide comment on this Scoping Report. An I&APs database will be prepared and maintained as part of the PPP.

The EIA consultation period commences on **14 August 2023** and concludes on **12 September 2023**. Thereafter all issues and concerns raised by the I&APs will be addressed in the Comments and Responses Report. This document and the Final EIA Report, will then be submitted to the Competent Authority in **September 2023.**

One PPP is being conducted for all six of the SOLAR PV PARK's that comprise the Soyuz Solar PV Park Cluster 1-6 development. One regional newspaper advert was published in the NoordKaap Bulletin on **16 March 2023** Six site notices were placed at highly visible locations across the Soyuz Solar PV Park Cluster 1-6 development footprint. Proof this is in Appendix C.

22.3 AUTHORITY CONSULTATION

The following Authorities have been consulted with on the Project as part of the Scoping Report Public Participation process:

- The Department of Forestry, Fisheries and the Environment
- Department of Mineral Resources and Energy
- Department of Water and Sanitation
- Northern Cape Department of Agriculture, Environmental Affairs, Rural Development and Land Reform
- Northern Cape Department of Economic Development and Tourism
- Northern Cape Department of Roads and Public Works
- Ngwao Boswa Kapa Bokone – Provincial Heritage Authority
- Cape Nature
- Emthanjeni Local Municipality
- Air Traffic Navigation Services
- Co-Operative Governance & Traditional Affairs
- National Energy Regulator of South Africa
- South African Civil Aviation Authority
- South African Heritage Resources Agency
- South African Radio Astronomy Observatory
- South African Weather Services
- Agri NoordKaap

- Endangered Wildlife Trust
- Birdlife South Africa
- Wildlife and Environment Society of South Africa

22.4 PROOF OF NOTIFICATION

A copy of the contents of the site notices, adverts and notification letters is contained in Appendix C.

22.5 LIST OF REGISTERED INTERESTED AND AFFECTED PARTIES

The Comments and Responses Report will contain the details of all registered I&AP's and will be submitted with the Final Scoping Report to the Competent Authority.

22.6 SUMMARY OF ISSUES RAISED BY INTERESTED AND AFFECTED PARTIES

All issues raised by I&APs will be placed within the Comments and Responses Report and this will be submitted to the Competent Authority for a Decision once this statutory 30-day PPP has concluded.

22.7 SUMMARY OF APPLICATION AND PUBLIC PARTICIPATION PROCESS

ITEM	DATE	COMMENT
Submission of Application Form and supporting documents to DFFE.	17 March 2023	
Initial Specialist Studies (i.e. opinions) to inform Scoping Report	November 2022 to January 2023.	
Collation of the Scoping Report (SR)	February to March 2023	
Identification of interested and affected parties	January to March 2023	Erf ownership details obtained from landlord and local authority and Windeeds
Newspaper advert published in the *Noordkaap*	16 March 2023	Regional newspaper
Review of Scoping Report and Plan of Study for EIR by registered stakeholders	20 March to 21 April 2023	
Collation of the Scoping Report for Decision	April 2023	
Submission of Scoping Report and Plan of Study (POS) for EIR to DFFE	April 2023	Submitted on 27 April 2023.
Approval of Scoping Report and POS for EIR	June 2023	Approved 12 June 2023
Collation of the Environmental Impact Report (EIR) and EMPr	June – July 2023	
Review of EIR Report by registered stakeholders	14 August to 12 September 2023	
Collation of the EIR Report for Decision	September 2023	
Submission of final EIA Report to DFFE	September 2023	
Notification of registered stakeholders of the environmental authorisation decision	TBA	

23 IMPACT ASSESSMENT METHODOLOGY

In accordance with ***Appendix 2 Regulation 2(1)(g) (vi) of GN No. R. 326 of the NEMA EIA Regulations (2014 as amended)****, the following information is presented in this Section:*

> ***2(1)(g) vi*** *– The methodology used in identifying and ranking the nature, significance, consequences, extent, duration and probability of potential environmental impacts and risks associated with the alternatives;*

The EIA Phase assessment of the potential impacts has been based on extensive experience related to Solar PV Park facilities and the environmental impact assessment process; and augmented by specialist assessment and input. The EIA Phase impact assessment will also be coupled with input and comment from stakeholders.

The types of potential impact (direct, indirect, and cumulative) have been considered along with the nature and magnitude (severe, moderate, and low), extent and location of the potential impacts.

Predictions have been made of the timing (construction, operation or decommissioning phase) and duration (short, long term, intermittent or continuous) of the potential impact. A prediction will also be made of the likelihood or probability of impacts occurring and an estimation of the significance of the potential impact (local, regional or global scale).

Mitigation measures have been identified that could be implemented to avoid or lessen the potential negative impacts and an evaluation of the predicted significance of residual impacts after mitigation, has been made. The assessment of the potential impacts will be carried out implementing a methodology that has been adapted from best practice guidelines disseminated from the Competent Authority (DFFE).

These impacts have been identified based on the following:

- Inspection of the site and surroundings (current environmental conditions);
- Discussions with members of the project team;
- Discussions with relevant authorities (DFFE);
- Previous investigations in the area;
- Independent specialist studies;
- Issues and concerns raised during the public participation process; and
- Determining future changes to the environment because of the proposed activity.

The descriptors used to assess the impacts are described in **Table 47**.

Table 47: Definitions of the Impact Assessment Methodology

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

ITEM	DEFINITION
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.	

To comparatively rank the impacts, each impact has been assigned a score using the scoring system outlined in **Table 48**. This scoring system allows for a comparative, accountable assessment of the indicative cumulative positive or negative impacts of each aspect assessed.

Table 48: Scoring System for Impact Assessment Ratings

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+E)*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

The above significance bands have been determined through calculating a maximum potential score of 156 (e.g. positive or negative) using the above methodology. This was then subdivided into broad bands as indicated above to provide a comparative assessment of all impacts in relation to the maximum possible significance score. The overall status of the impact (after mitigation) for the preferred alternative is stated in each table below.

The potential impacts have been assessed in terms of the requirement to assess "positive and negative impacts that the proposed activity and alternatives will have on the environment and on the community that may be affected focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects".

Only the 'Preferred Site and Preferred Layout Alternative' have been comparatively assessed against the 'No-Go Alternative.

24 POTENTIAL IMPACTS ASSOCIATED WITH THE ACTIVITY AND PREFERRED FOOTPRINT

*In accordance with **Appendix 1 Regulation 3(h)(vii and viii) and Regulation 3 (i) and (j)of GN No. R. 326 of the NEMA EIA Regulations (2014, as amended)**:*

> ***3(h) vii** – Positive and negative impacts that the proposed activity and alternatives will have on the environment and on the community that may be affected focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects*
>
> ***3(h) viii** – The possible mitigation measures that could be applied and level of residual risk,*

***Regulation 3(i)** - A full description of the process undertaken to identify, assess and rank the impacts the activity will impose on the preferred location through the life of the activity, including-*

> ***3(i) (i)** – A description of all environmental issues and risks that were identified during the environmental impact assessment process; and*
>
> ***3(i) (ii)** – An assessment of the significance of each issue and risk and an indication of the extent to which the issue and risk could be avoided or addressed by the adoption of mitigation measures*

***Regulation 3 (j)** – An assessment of each identified potentially significant impact and risk, including*

> ***3(j) (i)** – Cumulative impacts;*
>
> ***3(j) (ii)** – The nature, significance, and consequences of the impact and risk*
>
> ***3(j) (iii)** – The extent and duration of the impact and risk*
>
> ***3(j) (iv)** – The probability of the impact and risk occurring*
>
> ***3(j) (v)** – The degree to which the impact and risk can be reversed*
>
> ***3(j) (vi)** – The degree to which the impact and risk may cause irreplaceable loss of resources; and*
>
> ***3(j) (vii)** - -The degree to which the impact and risk can be mitigated*

The intention of this section is to raise awareness about **potential** impacts that are evident through the establishment and operation of the Project and associated infrastructure.

*The **potential** impacts listed below have been assessed based on available information and through specialist recommendations, which have provided mitigation measures to ensure that the impacts associated with the activity are mitigation to acceptable levels.*

Potential environmental impacts and issues that may be associated with the construction, operational and decommissioning phases of the proposed project (**Figure 64**) and a summary of these have been identified and are listed below. The applicability and degree and extent of these impacts are anticipated to vary depending on the lifecycle stage of the development.

As part of this Environmental Permitting Process, an EMPr has been compiled for the various project life cycle stages to ensure that these impacts are minimised and/or eliminated where practicable.

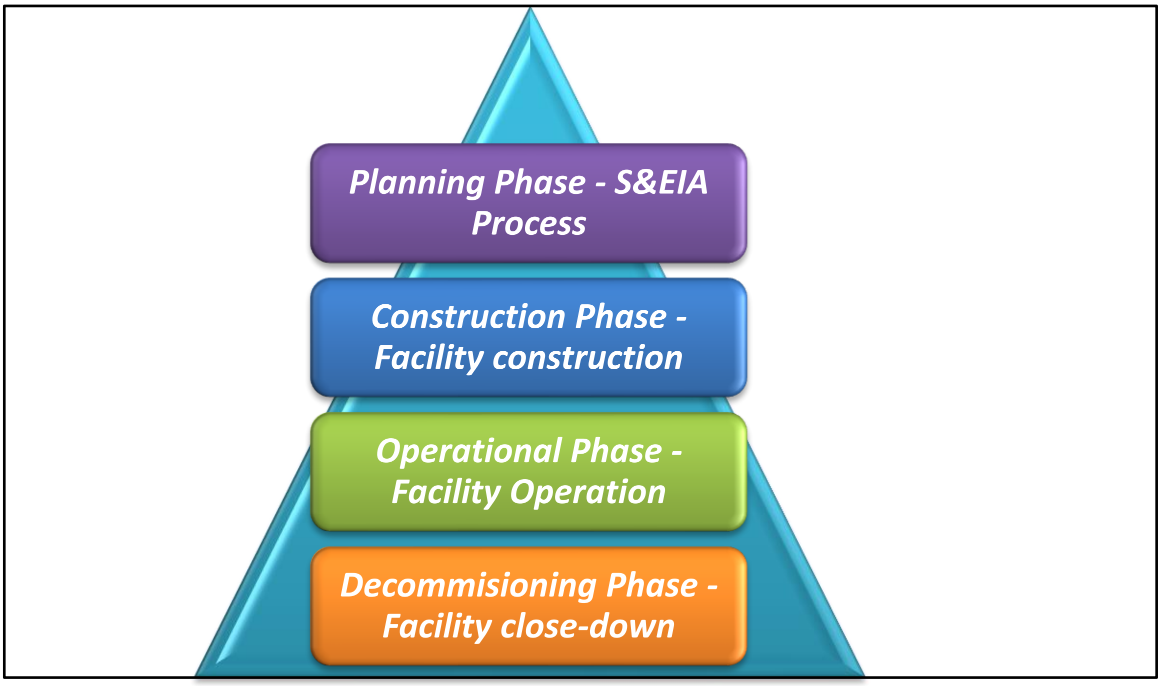


Figure 64: Project Life Cycle

*The **potential** impacts listed have been anticipated based on available information and input from specialists. Please note that the descriptions below do not represent an impact assessment but the anticipated **scope** of impacts and will be further evaluated and assessed in the EIA Phase..*

24.1 PLANNING AND DESIGN PHASE

The physical activities of the planning and design phase do not present any potential environmental impacts themselves. **However**, there are potential impacts that may occur during the construction and operating phase of the Soyuz 4 Solar PV Park that can be **avoided or mitigated in the planning and design phase** by ensuring that certain layout or technology measures are included in the designs and technology choices. These potential impacts and the proposed mitigation measures (which must be considered for implementation in the planning and design phase) are presented as follows:

24.1.1 Potential Avifaunal Impacts

Habitat Loss

Clearing of natural vegetation for the construction and establishment of the SOLAR PV PARK and associated infrastructure will result in the loss, degradation, and fragmentation of foraging habitat for avifauna. Loss of breeding and/or mating display habitat (lekking sites) for SCC (specifically Ludwig's Bustard) or the loss of habitat for important bird congregations may also occur. Based on the impact assessment post-mitigation, this impact has been assessed as **low negative**.

IMPACT NATURE	Direct loss of avifaunal habitat		STATUS	LOW NEGATIVE
Impact Description	Clearing of natural vegetation for the construction and establishment of the solar PV and associated infrastructure will result in the loss, degradation and fragmentation foraging habitat for avifauna. Optimal foraging habitat in and around drainage areas have been excluded from the development area. Loss of breeding and/or mating display habitat for SCC or the loss of habitat for important bird congregations may also occur. While it is possible that a lekking site of Ludwig's Bustard may have been overlooked, it is highly unlikely due to the flat nature of the terrain, as they seek elevated areas from which to be visible from great distances and these have been excluded from the development area. Furthermore, the Soyuz Solar PV Cluster does not support any globally, nationally or regionally important congregations of waterfowl and / or migratory species.			
Impact Source(s)	Location and extent of development footprint.			
Receptor(s)	Ludwig's Bustard, Denham's Bustard, Kori Bustard, Karoo Korhaan and Secretary bird.			
PARAMETER	**WITHOUT MITIGATION**	**SCORE**	**WITH MITIGATION**	**SCORE**
EXTENT (A)	Preferred Alternative:	1	Preferred Alternative:	1
	No-Go Alternative:	1	No-Go Alternative:	1
DURATION (B)	Preferred Alternative:	4	Preferred Alternative:	3
	No-Go Alternative:	4	No-Go Alternative:	4
PROBABILITY (C)	Preferred Alternative:	4	Preferred Alternative:	2
	No-Go Alternative:	4	No-Go Alternative:	4
INTENSITY OR MAGNITUDE (D)	Preferred Alternative:	-2	Preferred Alternative:	-1
	No-Go Alternative:	+1	No-Go Alternative:	+1
SIGNIFICANCE RATING (F) = (A*B*D)*C	Preferred Alternative:	-32	Preferred Alternative:	-6
	No-Go Alternative:	16	No-Go Alternative:	16
CUMULATIVE IMPACTS	If the adjacent Soyuz WEF takes the necessary precautions to buffer the sensitive habitats for the receptor species and to prevent collisions of the receptor species with turbines and/or overhead powerlines (such as high rotor sweep heights, bird flight diverters on powerlines etc.), the receptor species should persist within the WEF cluster project boundary at ecologically viable population densities, limiting the potential for cumulative impacts to occur. The large area of the proposed Soyuz Solar PV Cluster cluster and the relatively small area within this where solar panels will be constructed is expected to provide ample remaining habitat for the receptor species to persist. Therefore, the cumulative impacts to the receptor species are unlikely to be significant.			
CONFIDENCE	High			
MITIGATION MEASURES	▪ Use the SEI spatial layers to appropriately position all surface infrastructure to avoid areas considered important for avifauna to minimise loss of Medium-High sensitivity avifaunal habitat. ▪ Ensure that the BESS and non-solar panel infrastructure occur in Low SEI portions of the project area. ▪ Prioritise existing roads for access routes where practicable.			

Collision and Electrocution

Mortality from collision and electrocution is a potential impact to avifauna from solar PV farms. This risk is likely to be highest in situations where PV panels and overhead powerlines electrical transmission infrastructure are placed closer to areas of higher habitat complexity and resource availability where bird abundances are higher (e.g. wetlands/rivers and rocky ridges). Based on the impact assessment post-mitigation, this impact has been assessed as **low negative**.

IMPACT NATURE	Direct mortality through collision and electrocution		STATUS	LOW NEGATIVE
Impact Description	Mortality from collision and electrocution is a potential impact to avifauna from solar PV farms. This risk is likely to be highest in situations where PV panels and electrical transmission infrastructure are placed closer to areas of higher habitat complexity and resource availability where bird abundances are higher (e.g. wetlands/rivers and rocky ridges). In addition, vehicle induced collisions (direct collisions with vehicles or vehicle induced flushes into fence infrastructure) can pose significant direct mortality risk, especially to large ground dwelling species. Several SCC are likely/known to occur in the region of the proposed development which have a wingspan large enough (>1.5 m) to bridge gaps between live and earthed components or between phases of powerlines. In addition, electrocution of birds within the substations/switching areas is also possible. This impact can be reduced through appropriate planning of the infrastructure layout based on the SEI evaluation.			
Impact Source(s)	Solar PV and electrical transmission infrastructure			
Receptor(s)	All birds but particularly water birds, raptors and other large-bodied species with low power to weight ratios and in-flight manoeuvrability. Major receptors include the bustard species known to be present within the region.			
PARAMETER	WITHOUT MITIGATION	SCORE	WITH MITIGATION	SCORE
EXTENT (A)	Preferred Alternative:	1	Preferred Alternative:	1
	No-Go Alternative:	1	No-Go Alternative:	1
DURATION (B)	Preferred Alternative:	3	Preferred Alternative:	3
	No-Go Alternative:	3	No-Go Alternative:	3
PROBABILITY (C)	Preferred Alternative:	3	Preferred Alternative:	1
	No-Go Alternative:	4	No-Go Alternative:	4
INTENSITY OR MAGNITUDE (D)	Preferred Alternative:	-3	Preferred Alternative:	-3
	No-Go Alternative:	+1	No-Go Alternative:	+1
SIGNIFICANCE RATING (F) = (A*B*D)*C	Preferred Alternative:	-27	Preferred Alternative:	-9
	No-Go Alternative:	12	No-Go Alternative:	12
CUMULATIVE IMPACTS	Without appropriate mitigation, the cumulative impacts on the receptors most at risk (bustards) from collisions with powerlines will be marked. Even with typical mitigation such as bird flight diverters, collisions are not unavoidable and there is likely to be an appreciable cumulative impact on bustard species in the region.			
CONFIDENCE	High for PV Facility but Low for OHPL (without layout depicting grid connection routes and infrastructure)			
MITIGATION MEASURES	▪ The grid connection route alternatives have not yet been provided. It is recommended that wherever possible existing electrical transmission infrastructure is utilised or underground cabling is implemented. Where the creation of new transmission lines is necessary attempts should be made to minimise the route length to the closest existing substation and that the route be aligned with existing powerlines as far as possible. Additionally, the route should avoid or minimise wetland/riverine crossings. ▪ Install Eskom-approved bird flight diverters (flappers or coils) on new transmission lines (particularly the earth wire). This can help to increase the visibility of transmission lines especially the thinner earth line with which most collisions tend to be associated. If the transmission lines are long or if budget is constraining then prioritise portions of the transmission lines that pass near to or cross wetlands/riverine habitats or through High and Very High SEI habitat. ▪ Design of overhead electrical lines must consider potential for electrocution by large species and pre-emptively avoid the likelihood of this by increasing distances between spans to avoid faecal "streamers" or large open wings creating a short. ▪ All power cables within the project area should be fully insulated and preferably buried in demarcated corridors. ▪ White strips or simply the exposed (lustrous) aluminium frames along the edges of the solar panels appear to help to increase visibility and deter birds and are recommended as far as practically feasible.			

IMPACT NATURE	Direct mortality through collision and electrocution	STATUS	LOW NEGATIVE
	▪ Installation of bird deterrent devices on and around solar panels and on transmission line poles, pylons and / or monopoles as well as security/boundary fences, will be required to limit collision risk. ▪ The BESS must be covered in non-reflective surfaces and protected against thermal discharge and the (low) risk of veld fires as a result. ▪ In all areas where service roads intersect with semi natural or natural habitat (which is everywhere), all fences must be set back at least (strictly) 75 metres from the edge of every service road to allow for vulnerable species such as bustards, storks, cranes and korhaans to obtain adequate height after being flushed by vehicle traffic. Alternatively, the fences must be placed completely adjacent to the roads with a maximum of 3 metres buffer and marked with fence flappers to reduce flush related collisions.		

Attraction to the Facility

Certain bird species (mainly commensal) are attracted to the infrastructure associated with SOLAR PV PARK as it can provide perches and nesting habitat as well as increased food source.

IMPACT NATURE	Direct mortality through collision and electrocution		STATUS	LOW NEGATIVE
Impact Description	Certain (mainly commensal species) are often attracted by the establishment of the solar PV park and associated infrastructure as it presents additional resources in the form of perches, nesting habitat, shade and often food availability (increased rodents and weedy annual plants). This artificial increase in the abundance of some species has the effect of augmentation of the natural abundance and species composition of birds but more importantly places these opportunistic species and their predators at risk of collision and electrocution.			
Impact Source(s)	Solar PV Park and associated infrastructure			
Receptor(s)	Commensal and opportunistic species but also their predators.			
PARAMETER	**WITHOUT MITIGATION**	**SCORE**	**WITH MITIGATION**	**SCORE**
EXTENT (A)	Preferred Alternative:	1	Preferred Alternative:	1
	No-Go Alternative:	1	No-Go Alternative:	1
DURATION (B)	Preferred Alternative:	3	Preferred Alternative:	3
	No-Go Alternative:	4	No-Go Alternative:	4
PROBABILITY (C)	Preferred Alternative:	2	Preferred Alternative:	1
	No-Go Alternative:	4	No-Go Alternative:	4
INTENSITY OR MAGNITUDE (D)	Preferred Alternative:	-2	Preferred Alternative:	-1
	No-Go Alternative:	+1	No-Go Alternative:	+1
SIGNIFICANCE RATING (F) = (A*B*D)*C	Preferred Alternative:	**-12**	Preferred Alternative:	**-3**
	No-Go Alternative:	**16**	No-Go Alternative:	**16**
CUMULATIVE IMPACTS	Expected to be low.			
CONFIDENCE	Medium			
MITIGATION MEASURES	▪ Install bird deterrent devices around panels and on overhead infrastructure to limit perching and discourage nesting.			

24.1.2 Potential Faunal Biodiversity Impacts

Loss of Faunal habitat and potential Species Diversity

Vegetation clearing for the establishment of the SOLAR PV PARK can cause habitat destruction and disturbance within the direct footprint area and the direct loss of faunal communities and possibly loss of species of conservation concern (SCC).

IMPACT NATURE	Impact – Loss of faunal habitat and potential species diversity	STATUS	LOW NEGATIVE
Impact Description	Potential poor planning of vegetation clearing for the proposed Soyuz 4 Solar PV Park, which will lead to faunal habitat loss, species displacement and a decrease in faunal diversity. Potential increased mortality rates of fauna, due to not having mitigations in place to lower the risk of human-wildlife conflict caused by potential moving vehicle collisions and potential snaring / poaching within the proposed Soyuz 4 Solar PV Park and access road. It is of the utmost importance that an AIP control and management plan be developed before construction of the proposed Soyuz 4 Solar PV Park commence, as the possible spread of AIPs and habitat fragmentation may lead to lower habitat integrity as secondary impacts. Potential inappropriate planning may lead to Loss of habitat connectivity and potential for increased faunal mortality rates as species become stuck in fences.		
Impact Source(s)	• Potential failure to put in place suitable management measures to ensure that the Freshwater Ecosystem Habitat is not disturbed during construction activities; • Potential failure to implement the required mitigation measures before and at the commencement of construction activities: ○ Potential failure to have a Rehabilitation Plan developed, and implemented, before the commencement of the project activities; ○ Potential failure to implement an Alien and Invasive Plant (AIP) Management/Control Plan before construction activities commence; and • Failure to make allowances for the movement of small mammals and reptiles through the perimeter fence line of the Soyuz 4 Solar PV Park to maintain a semblance of habitat connectivity.		
Receptor(s)	Faunal habitat and species		

Habitat Unit	Driver / Activity	PARAMETER	WITHOUT MITIGATION	SCORE	WITH MITIGATION	SCORE
Low Open Shrubland, Open Karoo	**PV facility and associated infrastructure**	**EXTENT (A)**	Preferred Alternative:	2	Preferred Alternative:	1
		DURATION (B)	Preferred Alternative:	4	Preferred Alternative:	2
		PROBABILITY (C)	Preferred Alternative:	4	Preferred Alternative:	3
		INTENSITY OR MAGNITUDE (D)	Preferred Alternative:	-2	Preferred Alternative:	-2
		SIGNIFICANCE RATING (F) = (A*B*D)*C	Preferred Alternative:	**(-) Medium**	Preferred Alternative:	**(-) Low**
Open Karo	**Access road**	**EXTENT (A)**	Preferred Alternative:	2	Preferred Alternative:	1
		DURATION (B)	Preferred Alternative:	3	Preferred Alternative:	2
		PROBABILITY (C)	Preferred	4	Preferred Alternative:	3

			Alternative:			
		INTENSITY OR MAGNITUDE (D)	Preferred Alternative:	-2	Preferred Alternative:	-2
		SIGNIFICANCE RATING (F) = (A*B*D)*C	Preferred Alternative:	**(-) Medium**	Preferred Alternative:	**(-) Low**
Freshwater Ecosystem Habitat	**PV facility and associated infrastructure**	**EXTENT (A)**	Preferred Alternative:	3	Preferred Alternative:	1
		DURATION (B)	Preferred Alternative:	4	Preferred Alternative:	2
		PROBABILITY (C)	Preferred Alternative:	4	Preferred Alternative:	2
		INTENSITY OR MAGNITUDE (D)	Preferred Alternative:	-2	Preferred Alternative:	-2
		SIGNIFICANCE RATING (F) = (A*B*D)*C	Preferred Alternative:	(-) High	Preferred Alternative:	(-) Low

CUMULATIVE IMPACTS	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 4 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. Vegetation clearing due to Soyuz 4 Solar PV Park will be at a local extent and vegetation regrowth will still provide habitat for common faunal species and no significant faunal habitat loss will present on a regional level. The current farming activities will still be present within the immediate area surrounding the Soyuz 4 Solar PV Park.
CONFIDENCE	High
MITIGATION MEASURES	• Where possible, and feasible, all planning of access roads should be kept to existing roads so to reduce fragmentation of existing natural habitat; • Minimise loss of indigenous vegetation where possible through planning and adherence to suitable layouts; • It is considered imperative that the development area be optimised and that all sensitive areas be avoided as far as possible (Freshwater Ecosystem Habitat). This is in line with the DFFE (2013) mitigation hierarchy that stipulates high risk activities must be avoided first and foremost; • Perimeter fences must be designed in such a way so as to allow for small faunal species movement in and out of the Soyuz 4 Solar PV Park. In this regard, the use of electric perimeter fencing is discouraged to ensure electrocution of species does not occur. Small culverts should be placed every 200m in the fence to allow for the movement of small species through the fence safely; • Design of infrastructure should be environmentally sound and all construction equipment to be utilised must be a good working condition, and all possible precautions taken to prevent potential faunal collisions and mechanical spills and/or leaks; • Prior to the commencement of construction activities, an authorised AIP Management/Control Plan should be compiled for implementation; • Prior to the commencement of construction activities on site, a rehabilitation plan should be developed and • At all times, ensure that sound environmental management is in place during the planning phase.

Loss of Faunal SCC

IMPACT NATURE		Impact – Loss of faunal SCC			STATUS	LOW NEGATIVE
Impact Description		Potential poor planning of vegetation clearing for the proposed Soyuz 4 Solar PV Park, which will lead to faunal SCC habitat loss. Potential increased mortality rates of faunal SCC, due to not having mitigations in place to lower the risk of human-wildlife conflict caused by potential moving vehicle collisions and snaring / poaching within the proposed Soyuz 4 Solar PV Park and access road. It is of the utmost importance that a AIP control and management plan be developed before construction of the proposed Soyuz 4 Solar PV Park commence, as the possible spread of AIPs may lead to lower habitat integrity as secondary impacts. Poor planning may lead to Loss of habitat connectivity and potential for increased faunal SCC mortality rates as species become stuck in fences.				
Impact Source(s)		Potential failure to implement the required mitigation measures before and at the commencement of construction activities: ○ Potential failure to have a Rehabilitation Plan developed, and implemented, before the commencement of the project activities; and ○ Potential failure to implement an Alien and Invasive Plant (AIP) Management/Control Plan before construction activities commence.				
Receptor(s)		Faunal SCC habitat				
Habitat Unit	**Driver / Activity**	**PARAMETER**	**WITHOUT MITIGATION**	**SCORE**	**WITH MITIGATION**	**SCORE**
Low Open Shrubland, Open Karoo	**PV facility and associated infrastructure**	**EXTENT (A)**	Preferred Alternative:	2	Preferred Alternative:	1
		DURATION (B)	Preferred Alternative:	4	Preferred Alternative:	2
		PROBABILITY (C)	Preferred Alternative:	4	Preferred Alternative:	2
		INTENSITY OR MAGNITUDE (D)	Preferred Alternative:	-2	Preferred Alternative:	-2
		SIGNIFICANCE RATING (F) = (A*B*D)*C	Preferred Alternative:	**(-) Medium**	Preferred Alternative:	**(-) Low**
Open Karoo	**Access road**	**EXTENT (A)**	Preferred Alternative:	2	Preferred Alternative:	1
		DURATION (B)	Preferred Alternative:	3	Preferred Alternative:	2
		PROBABILITY (C)	Preferred Alternative:	4	Preferred Alternative:	2
		INTENSITY OR MAGNITUDE (D)	Preferred Alternative:	-2	Preferred Alternative:	-2
		SIGNIFICANCE RATING (F) = (A*B*D)*C	Preferred Alternative:	**(-) Medium**	Preferred Alternative:	**(-) Low**
Freshwater		**EXTENT (A)**	Preferred Alternative:	3	Preferred Alternative:	1
		DURATION (B)	Preferred Alternative:	4	Preferred Alternative:	2
		PROBABILITY (C)	Preferred Alternative:	4	Preferred Alternative:	2

Ecosystem Habitat	**PV facility and associated infrastructure**	**INTENSITY OR MAGNITUDE (D)**	Preferred Alternative:	-2	Preferred Alternative:	-2
		SIGNIFICANCE RATING (F) = (A*B*D)*C	**Preferred Alternative:**	**(-) High**	Preferred Alternative:	(-) Low

CUMULATIVE IMPACTS	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 4 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. Vegetation clearing due to Soyuz 4 Solar PV Park will be at a local extent and vegetation regrowth will still provide habitat for common faunal species and no significant faunal habitat loss will present on a regional level. The current farming activities will still be present within the immediate area surrounding the Soyuz 4 Solar PV Park..
CONFIDENCE	High
MITIGATION MEASURES	• Where possible, and feasible, all access roads should be kept to existing roads so to reduce fragmentation of existing natural habitat; • Footprint areas should be kept as small as possible. Site boundaries should be clearly demarcated so as to ensure that vegetation beyond the authorised footprint is not cleared; • Perimeter fences must be designed in such a way so as to allow for small faunal species movement in and out of the Soyuz 4 Solar PV Park. In this regard, the use of electric perimeter fencing is discouraged to ensure electrocution of species does not occur. Small culverts should be placed every 200m in the fence to allow for the movement of small species through the fence safely; • A documented rescue and relocation plan of action must be in place prior to commencement of construction and operational activities so all personnel are aware of the requirements should a faunal SCC be encountered; • Prior to vegetation clearing activities, the site should be inspected for the presence of SCC, including burrowing scorpion burrows, and reptiles. If located, these species should be carefully rescued and relocated as per an approved rescue and relocation plan that must be developed; o Permits are to be obtained from DFFE and NCDENC prior to the relocation of any faunal SCC; • Prior to the commencement of construction activities, an authorised AIP Management/Control Plan should be compiled for implementation; and • Prior to the commencement of construction activities on site, a rehabilitation plan should be developed.

24.1.3 Potential Floral Biodiversity Impacts

Summary of the Floral Habitat and Diversity Impact Assessment of the Pre-Construction & Planning Phase of the proposed Soyuz 4 Solar PV Park

IMPACT NATURE		Impact – Loss of floral habitat and potential species diversity			STATUS	LOW NEGATIVE
Impact Description		Potential failure to implement an Alien and Invasive Plant (AIP) Management/Control Plan causing the spread of AIP's in uncontrolled environmental s resulting in the displacements of floral habitat and diversity. Poor planning of project footprint areas leading to a loss of favourable floral habitat beyond the authorised footprint, leading to a decline in floral diversity.				
Impact Source(s)		• Potential failure to implement the AIP Management/Control Plan; and • Potential inadequate design and management planning of stormwater and erosion.				
Receptor(s)		Floral habitat and species				
Habitat Unit	**Driver / Activity**	**PARAMETER**	**WITHOUT MITIGATION**	**SCORE**	**WITH MITIGATION**	**SCORE**
Open Karoo Veld Habitat, Low Open Shrubland	**PV facility and associated infrastructure**	**EXTENT (A)**	Preferred Alternative:	2	Preferred Alternative:	2
		DURATION (B)	Preferred Alternative:	4	Preferred Alternative:	2
		PROBABILITY (C)	Preferred Alternative:	4	Preferred Alternative:	3
		INTENSITY OR MAGNITUDE (D)	Preferred Alternative:	-2	Preferred Alternative:	-2
		SIGNIFICANCE RATING (F) = (A*B*D)*C	Preferred Alternative:	**(-) Medium**	Preferred Alternative:	**(-) Low**
Open Karoo Veld	**Access road**	**EXTENT (A)**	Preferred Alternative:	2	Preferred Alternative:	1
		DURATION (B)	Preferred Alternative:	2	Preferred Alternative:	2
		PROBABILITY (C)	Preferred Alternative:	4	Preferred Alternative:	3
		INTENSITY OR MAGNITUDE (D)	Preferred Alternative:	-2	Preferred Alternative:	-2
		SIGNIFICANCE RATING (F) = (A*B*D)*C	Preferred Alternative:	**(-) Low**	Preferred Alternative:	**(-) Low**
CUMULATIVE IMPACTS		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 4 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 several renewable energy facilities, which may alter the landscape character. Vegetation clearing due to Soyuz 4 Solar PV Park will be at a local extent and vegetation regrowth could possibly occur. The current farming activities will still be present within the immediate area surrounding the Soyuz 4 Solar PV Park. the Soyuz 4 Solar PV Park.				

CONFIDENCE	High
MITIGATION MEASURES	• Minimise loss of indigenous vegetation and natural habitat where possible through adequate planning and, where necessary, by incorporating the sensitivity of the biodiversity report as well as other specialist studies; • Where possible, and feasible, all planning of access roads should be kept to existing roads so to reduce fragmentation of existing natural habitat; • Design of infrastructure should be environmentally sound and all construction equipment to be utilised must be a good working condition, and all possible precautions taken to prevent potential mechanical spills and/or leaks; • Prior to the commencement of construction activities, an authorised AIP Management/Control Plan should be compiled for implementation; • Prior to the commencement of construction activities on site, a rehabilitation plan should be developed and • At all times, ensure that sound environmental management is in place during the planning phase.

Summary of the Floral SCC Impact Assessment of the Pre-Construction & Planning Phase of the proposed Soyuz 4 Solar PV Park.

IMPACT NATURE		**Impact – Loss of floral SCC**			**STATUS**	**LOW NEGATIVE**
Impact Description		Unnecessary or unlawful destruction/removal of floral SCC and protected species leading to a decline in the numbers of SCC and Protected floral species within the Soyuz 4 Solar PV Park. Poor planning of project footprint areas leading to a loss of favourable floral habitat beyond the authorised footprint, leading to a decline in floral diversity.				
Impact Source(s)		• Failure to undertake a walkdown of the finalised footprints, during which floral protected floral species are searched for and marked; • Potential failure to comply with national and regional legislation regarding permit applications for the potential removal, destruction, and/or relocation of floral SCC within footprint areas (depending on the outcome of the walkdown); and • Potential inadequate design of stormwater management and erosion control, resulting in increased risk of erosion and loss of topsoil within and outside of planned footprints.				
Receptor(s)		Floral SCC habitat				
Habitat Unit	**Driver / Activity**	**PARAMETER**	**WITHOUT MITIGATION**	**SCORE**	**WITH MITIGATION**	**SCORE**
Open Karoo Veld Habitat, Low Open Shrubland	**PV facility and associated infrastructure**	**EXTENT (A)**	Preferred Alternative:	2	Preferred Alternative:	1
		DURATION (B)	Preferred Alternative:	4	Preferred Alternative:	2
		PROBABILITY (C)	Preferred Alternative:	4	Preferred Alternative:	2
		INTENSITY OR MAGNITUDE (D)	Preferred Alternative:	-2	Preferred Alternative:	-2
		SIGNIFICANCE RATING (F) = (A*B*D)*C	Preferred Alternative:	**(-) Medium**	Preferred Alternative:	**(-) Low**

Open Karoo Veld	Access road	EXTENT (A)	Preferred Alternative:	2	Preferred Alternative:	1
		DURATION (B)	Preferred Alternative:	3	Preferred Alternative:	2
		PROBABILITY (C)	Preferred Alternative:	4	Preferred Alternative:	2
		INTENSITY OR MAGNITUDE (D)	Preferred Alternative:	-2	Preferred Alternative:	-2
		SIGNIFICANCE RATING (F) = (A*B*D)*C	Preferred Alternative:	(-) Medium	Preferred Alternative:	(-) Low

CUMULATIVE IMPACTS	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 4 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 a number of renewable energy facilities, which may alter the landscape character. Vegetation clearing due to Soyuz 4 Solar PV Park will be at a local extent and vegetation regrowth could possibly occur but a potential floral SCC habitat loss will be present on a regional level. The current farming activities will still be present within the immediate area surrounding the Soyuz 4 Solar PV Park.
CONFIDENCE	High
MITIGATION MEASURES	• Floral SCC (i.e., protected flora) are associated with the habitat in which the proposed activities will take place). A walkdown of the footprint area must take place before construction activities commence, where all anticipated floral SCC are searched for and marked to determine the number of individuals that will be impacted. Based on the outcome of the walkdown, the appropriateness of rescue and relocation initiatives must be determined, and a rescue and relocation plan may be required. The following permit application will be necessary: - Where provincially protected species will be impacted, permits from Northern Cape DAEARDLR and from the DFFE should be obtained to remove, cut, or destroy the above-mentioned protected species before any vegetation clearing may take place. • Geophytes and succulents are good candidates for rescue and relocation, and these should be targeted for such initiatives (if appropriate).

24.1.4 Soil and Land Capability

IMPACT NATURE	Impact –Soil, land capability and agricultural potential.			STATUS	LOW NEGATIVE	
Impact Description	Loss of Land Capability					
Impact Source(s)	• Vegetation clearing and partial topsoil stripping as part of surface preparation; • Placement of infrastructure on soil suitable for cultivation and grazing; and • Movement of Construction vehicles of good potential agricultural soils.					
Receptor(s)	Agricultural Resources					
Soil Impact	Driver / Activity	PARAMETER	WITHOUT MITIGATION	SCORE	WITH MITIGATION	SCORE
		EXTENT (A)	Preferred Alternative:	2	Preferred Alternative:	1

Loss of Land Capability	Potential poor planning leading to placement of stripped and stockpiled soils outside the demarcated areas.	**DURATION (B)**	Preferred Alternative:	4	Preferred Alternative:	2
		PROBABILITY (C)	Preferred Alternative:	4	Preferred Alternative:	3
		INTENSITY OR MAGNITUDE (D)	Preferred Alternative:	-2	Preferred Alternative:	-2
		SIGNIFICANCE RATING (F) = (A*B*D)*C	Preferred Alternative:	**-64**	Preferred Alternative:	**-12**
Soil Erosion	Potential poor planning leading to placement of the solar PV and associated infrastructure on moderate potential agricultural soils utilised for grazing.	**EXTENT (A)**	Preferred Alternative:	2	Preferred Alternative:	1
		DURATION (B)	Preferred Alternative:	3	Preferred Alternative:	2
		PROBABILITY (C)	Preferred Alternative:	4	Preferred Alternative:	3
		INTENSITY OR MAGNITUDE (D)	Preferred Alternative:	-2	Preferred Alternative:	-2
		SIGNIFICANCE RATING (F) = (A*B*D)*C	Preferred Alternative:	**-48**	Preferred Alternative:	**-12**
Soil Contamination	Potential poor planning leading to spillage of petroleum hydrocarbons on moderate potential agricultural soils utilised for grazing.	**EXTENT (A)**	Preferred Alternative:	1	Preferred Alternative:	1
		DURATION (B)	Preferred Alternative:	3	Preferred Alternative:	2
		PROBABILITY (C)	Preferred Alternative:	4	Preferred Alternative:	2
		INTENSITY OR MAGNITUDE (D)	Preferred Alternative:	-2	Preferred Alternative:	-2
		SIGNIFICANCE RATING (F) = (A*B*D)*C	Preferred Alternative:	**-24**	Preferred Alternative:	**-8**
Soil Compaction	Potential poor planning leading to placement of the solar pv and associated infrastructure on soils susceptible to compaction.	**EXTENT (A)**	Preferred Alternative:	1	Preferred Alternative:	1
		DURATION (B)	Preferred Alternative:	4	Preferred Alternative:	2
		PROBABILITY (C)	Preferred Alternative:	4	Preferred Alternative:	2
		INTENSITY OR MAGNITUDE (D)	Preferred Alternative:	-2	Preferred Alternative:	-2
		SIGNIFICANCE RATING (F) = (A*B*D)*C	Preferred Alternative:	**-32**	Preferred Alternative:	**-8**
CUMULATIVE IMPACTS		The Soyuz 4 Solar PV Park and associated access road are dominated by well-drained soils of Askham/Clovelly which collectively account for approximately 56.5% of total investigated. These soils are suitable for cultivation (Class III) but have a Restricted agricultural Potential (Class L5). If the above-mentioned land capability and potential conditions are considered as well as occurring climatic conditions with limited rainfall (200 – 400 mm per annum) the development footprint is deemed not suitable for any large-scale agricultural cultivation in the absence of supplementary irrigation and other intensive management practices. The cumulative impact on the local and regional scale is considered medium to low without mitigation and low to very low with mitigatory measures in place as the dominant soils are not sensitive from a soil and land capability point of view.				
CONFIDENCE		High				

MITIGATION MEASURES	• Infrastructure footprint area should be clearly demarcated to avoid unnecessary disturbance of adjacent soils; • Access road should be aligned to the existing road as far as practically possible to avoid further agricultural impact and unnecessary soil disturbance; • Construction vehicle movement should be limited to within the project perimeter fence to avoid unnecessary compaction of adjacent soils; • Revegetate adjacent areas with an indigenous grass mix, to re-establish a protective cover, in order to minimise soil erosion and dust emissions; and • Always strip a suitable time before the placement or construction of the solar PV facilities, to avoid soil loss and contamination.

24.1.5 Potential Freshwater Impacts

Altered freshwater ecosystem habitat and ecological structure

Direct impacts could occur should the footprint of the Soyuz 4 Solar PV Park encroach on the delineated extent of the freshwater ecosystems that are located within the study area, thereby resulting in direct transformation or degradation of freshwater habitat.

IMPACT NATURE	Direct transformation of freshwater habitat		STATUS	NEGATIVE
Impact Description	Direct impacts could occur should the footprint of the Soyuz 4 Solar PV Park encroach on the delineated extent of the freshwater ecosystems. This would materialise if the footprint of the solar arrays encroach on the three drainage lines that occur within the study area boundaries, and in the instance of the proposed access road crossing the drainage line in the eastern part of its alignment. Indirect and cumulative impacts to the receiving freshwater environments could also occur.			
Impact Source(s)	Construction and operational phase of the facility			
Receptor(s)	The on- and off-site aquatic environment.			
PARAMETER	**WITHOUT MITIGATION**	**SCORE**	**WITH MITIGATION**	**SCORE**
EXTENT (A)	Preferred Alternative:	1	Preferred Alternative:	1
	No-Go Alternative:	1	No-Go Alternative:	1
DURATION (B)	Preferred Alternative:	4	Preferred Alternative:	4
	No-Go Alternative:	4	No-Go Alternative:	4
PROBABILITY (C)	Preferred Alternative:	2	Preferred Alternative:	1
	No-Go Alternative:	1	No-Go Alternative:	1
INTENSITY OR MAGNITUDE (D)	Preferred Alternative:	-2	Preferred Alternative:	-1
	No-Go Alternative:	1	No-Go Alternative:	1
SIGNIFICANCE RATING (F) = (A*B*D)*C	Preferred Alternative:		Preferred Alternative:	
	No-Go Alternative:		No-Go Alternative:	
CUMULATIVE IMPACTS	There could be potential cumulative impacts due to the possible existence of other operations/activities in the region impacting on the same surface water resources.			
CONFIDENCE	Medium			
MITIGATION MEASURES	The construction footprint must be contained within the delineated development footprint as described by this EIA as the preferred site layout.			

Altered surface water velocities

It is considered likely that the development of operational stormwater infrastructure will occur as part of the proposed development and may lead to loss of catchment yield from stormwater containment, thereby leading to altered aquatic vegetation community structure and diversity due to moisture stress and reduction in volume of water entering the freshwater environment, leading to reduced recharge.

IMPACT NATURE	Deterioration in surface water quality.	STATUS	LOW NEGATIVE
Impact Description	It is considered likely that the development of operational stormwater infrastructure will occur as part of the proposed development and may lead to loss of catchment yield from stormwater containment, thereby leading to altered aquatic vegetation community structure and diversity due to moisture stress and reduction in volume of water entering the freshwater environment, leading to reduced recharge.		

IMPACT NATURE	Deterioration in surface water quality.		STATUS	LOW NEGATIVE
Impact Source(s)	Stormwater management during the construction and decommissioning of the facility			
Receptor(s)	The on- and off-site aquatic environment.			
PARAMETER	WITHOUT MITIGATION	SCORE	WITH MITIGATION	SCORE
EXTENT (A)	Preferred Alternative:	1	Preferred Alternative:	1
	No-Go Alternative:	No impact	No-Go Alternative:	No impact
DURATION (B)	Preferred Alternative:	3	Preferred Alternative:	3
	No-Go Alternative:	No impact	No-Go Alternative:	No impact
PROBABILITY (C)	Preferred Alternative:	2	Preferred Alternative:	1
	No-Go Alternative:	No impact	No-Go Alternative:	No impact
INTENSITY OR MAGNITUDE (D)	Preferred Alternative:	-1	Preferred Alternative:	-1
	No-Go Alternative:	No impact	No-Go Alternative:	No impact
SIGNIFICANCE RATING (F) = (A*B*D)*C	Preferred Alternative:	-6	Preferred Alternative:	-3
	No-Go Alternative:	0	No-Go Alternative:	0
CUMULATIVE IMPACTS	There could be potential cumulative impacts due to the possible existence of other operations/activities in the region impacting on the same surface water resources.			
CONFIDENCE	Medium			
MITIGATION MEASURES	The intensity of the impact will be reduced if stormwater generated from the operational components of the development, if not used for stormwater recycling purposes, be discharged into the receiving freshwater environments in a manner that does not result in scouring and erosion of freshwater ecosystems and alterations to freshwater ecosystem hydrology. It is recommended that vegetation be retained in the parts of the site where clearing for bi facial panels is not required in order to improve infiltration of runoff and to trap surface runoff during precipitation events; Stormwater infrastructure on the development site must be designed in line with the principles of SUDS in order to polish stormwater by trapping sediments and by removing pollutants that could pollute downgradient freshwater ecosystems, and in order to allow the gradual discharge of stormwater into the drainage lines following rainfall events. •As such the use of 'soft' engineering features such as bioswales that are vegetated with suitable vegetation that is tolerant of both wet and dry conditions is strongly recommended. •The use of stone pitching to reduce velocity of stormwater is strongly recommended; •The proposed stormwater infrastructure must also be incorporated into a suitable and site-specific Stormwater Management Plan (SWMP). Stormwater generated from the road surfaces in the catchments of the EDLs must be directed at intervals into the catchment areas rather than being channelled towards the crossing points; •Design measures such as flow breakers to slow the velocity of stormwater must be included in the design of the roads at the 2 EDL crossing points.			

24.1.6 Potential Noise Impact

There are several potential sources of noise generation associated with the construction phase of the Soyuz 4 Solar PV Park. The operational phase noise impacts have been assessed by the noise specialist.

IMPACT NATURE	Noise from the BESS activities		STATUS	LOW NEGATIVE
Impact Description	Change in the prevailing ambient noise levels associated with the fully operational facility.			
Impact Source(s)	Extract and impelling ventilation fans			
Receptor(s)	Nearby farm house and employees			
PARAMETER	WITHOUT MITIGATION	SCORE	WITH MITIGATION	SCORE

IMPACT NATURE	**Noise from the BESS activities**		**STATUS**	**LOW NEGATIVE**
EXTENT (A)	Preferred Alternative:	1	Preferred Alternative:	1
	No-Go Alternative:	1	No-Go Alternative:	1
DURATION (B)	Preferred Alternative:	4	Preferred Alternative:	4
	No-Go Alternative:	4	No-Go Alternative:	4
PROBABILITY (C)	Preferred Alternative:	2	Preferred Alternative:	1
	No-Go Alternative:	3	No-Go Alternative:	2
INTENSITY OR MAGNITUDE (D)	Preferred Alternative:	-2	Preferred Alternative:	-2
	No-Go Alternative:	1	No-Go Alternative:	1
SIGNIFICANCE RATING (F) = (A*B*D)*C	Preferred Alternative:	**-24**	Preferred Alternative:	**-16**
	No-Go Alternative:	**8**	No-Go Alternative:	**8**
CUMULATIVE IMPACTS	The noise level change during the power generation activities has been modelled and is expected to be well below the nuisance threshold value of 7.0dBA.			
CONFIDENCE	High			
MITIGATION MEASURES	Ensure that there is a buffer zone between the BESS, central inverter and substation and the abutting farmhouses.			

24.1.7 Potential Visual Impacts

The development of the PV Solar Facility has the potential to alter the visual landscape and the sense of place in this area through the installation of infrastructure that will rise above ground level (industrial look) and is different to any existing infrastructure in the area (agricultural look)

IMPACT NATURE	**Potential impact on the overall landscape, visual intrusion and exposure of the landscape**		**STATUS**	**LOW 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)	Operational phase infrastructure			
Receptor(s)	Windpoort Country Guest House and farmsteads and gravel road			
PARAMETER	**WITHOUT MITIGATION**	**SCORE**	**WITH MITIGATION**	**SCORE**
EXTENT (A)	Preferred Alternative:	1	Preferred Alternative:	1
	No-Go Alternative:	1	No-Go Alternative:	1
DURATION (B)	Preferred Alternative:	3	Preferred Alternative:	3
	No-Go Alternative:	3	No-Go Alternative:	3
PROBABILITY (C)	Preferred Alternative:	2	Preferred Alternative:	1
	No-Go Alternative:	2	No-Go Alternative:	2
INTENSITY OR MAGNITUDE (D)	Preferred Alternative:	-2	Preferred Alternative:	-1
	No-Go Alternative:	1	No-Go Alternative:	1
SIGNIFICANCE RATING (F) = (A*B*D)*C	Preferred Alternative:	**-12**	Preferred Alternative:	**-3**
	No-Go Alternative:	**6**	No-Go Alternative:	**6**
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 Solar PV Parks are within the observer's arc view			

IMPACT NATURE	Potential impact on the overall landscape, visual intrusion and exposure of the landscape	STATUS	LOW NEGATIVE
	concurrently; ➢ Successive - where the observer has to turn his / her head to see the various Solar PV Park 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 Solar PV Parks on the landscape and visual amenity is a product of: The distance between individual Solar PV Parks; ➢ 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 SOLAR PV PARKs themselves; and ➢ The way in which the landscape is experienced. Cumulative visual impacts resulting from landscape modifications because of the proposed project in conjunction Soyuz 1 – 6 Solar PV Parks and the eleven 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 near 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.		
CONFIDENCE	Medium		
MITIGATION MEASURES	• 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 SOLAR PV PARK, 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; • Another design feature to limit glint and glare is to roughen the protective glass surface, reducing specular reflection; • 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;		

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

IMPACT NATURE	Potential visual intrusion and exposure of the landscape	STATUS	LOW 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 Solar PV Parks on airfields can vary depending on several factors: **1. Scale and size:** Large Solar PV Parks 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 4 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 4 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. This should be helpful to reduce the potential glint and glare experienced especially where the gravel road is slightly elevated above the Solar PV Park; ➢ Another design feature to limit glint and glare is to roughen the protective glass surface, reducing specular reflection

Visual Impacts of Night-time Lighting

IMPACT NATURE	Potential impact of night-time lighting on the visual environment		STATUS	LOW 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)	Farmhouses within 5 km of Soyuz Solar Park 1 and the Rietpoort Guest House			
PARAMETER	WITHOUT MITIGATION	SCORE	WITH MITIGATION	SCORE
EXTENT (A)	Preferred Alternative:	1	Preferred Alternative:	1
	No-Go Alternative:	1	No-Go Alternative:	1
DURATION (B)	Preferred Alternative:	1	Preferred Alternative:	1
	No-Go Alternative:	3	No-Go Alternative:	3
PROBABILITY (C)	Preferred Alternative:	2	Preferred Alternative:	1
	No-Go Alternative:	2	No-Go Alternative:	2
INTENSITY OR MAGNITUDE (D)	Preferred Alternative:	-2	Preferred Alternative:	-1
	No-Go Alternative:	1	No-Go Alternative:	1
SIGNIFICANCE RATING (F) = (A*B*D)*C	Preferred Alternative:	-4	Preferred Alternative:	-1
	No-Go Alternative:	6	No-Go Alternative:	6
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 eleven 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	➢ 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; • Where security lighting is used during the construction phase and operational phase, the following management measures should be implemented:			

IMPACT NATURE	Potential impact of night-time lighting on the visual environment	STATUS	LOW NEGATIVE
	○ 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).		

24.1.8 Potential Water Management Impacts

Potential water impacts as a result from improper waste management practices on site during the operations of the PV facility related to cleaning of the PV panels. Washing is anticipated to be undertaken on a quarterly basis. It is envisaged to collect and store runoff from the solar panels onsite for washing the panels. Based on the available information it is reasonable to suggest that the impact will potentially have a **low negative** impact.

IMPACT NATURE	Water management impacts		STATUS	LOW NEGATIVE
Impact Description	Potential water impacts because of improper water use practices on site relating primarily to the cleaning of the PV panels. Washing of the PV panels is anticipated to occur quarterly. It is envisaged to collect and store run-off from the solar panels on site for washing.			
Impact Source(s)	Operation of the Solar PV Park			
Receptor(s)	Immediate site and receiving environment			
PARAMETER	**WITHOUT MITIGATION**	**SCORE**	**WITH MITIGATION**	**SCORE**
EXTENT (A)	Preferred Alternative:	1	Preferred Alternative:	1
	No-Go Alternative:	1	No-Go Alternative:	1
DURATION (B)	Preferred Alternative:	3	Preferred Alternative:	3
	No-Go Alternative:	2	No-Go Alternative:	2
PROBABILITY (C)	Preferred Alternative:	3	Preferred Alternative:	2
	No-Go Alternative:	2	No-Go Alternative:	2
INTENSITY OR MAGNITUDE (D)	Preferred Alternative:	-2	Preferred Alternative:	-2
	No-Go Alternative:	1	No-Go Alternative:	1
SIGNIFICANCE RATING (F) = (A*B*D)*C	Preferred Alternative:	**-18**	Preferred Alternative:	**-12**
	No-Go Alternative:	**4**	No-Go Alternative:	**4**
CUMULATIVE IMPACTS	This impact could be cumulative.			
CONFIDENCE	High			
MITIGATION MEASURES	Water from boreholes will be used to wash the panels and this water will be recovered and reused to wash the panels again.			

24.2 POTENTIAL CONSTRUCTION IMPACTS

The potential social and environmental impacts associated with the construction and decommissioning phases for the 'Preferred Alternative' and 'No Go' alternative have been assessed as follows:

24.2.1 Potential Avifaunal Impacts

Each of the potential impacts is carefully described along with proposed mitigation measures to limit these impacts.

Based on the available information and the Avifaunal Scoping Assessment, the following impacts have been scoped and assessed in the Scoping Phase of this Environmental Permitting Process and will be further detailed and assessed in the EIA Phase:

Habitat Loss

The potential clearing of additional area to accommodate the construction phase camp and laydown areas could result in the additional loss, degradation and fragmentation foraging habitat for avifauna beyond the planned development footprint. Based on the impact assessment post-mitigation, this impact has been assessed as **low negative**.

IMPACT NATURE	Direct loss of avifaunal habitat		STATUS	LOW NEGATIVE
Impact Description	Clearing of natural vegetation for the construction and establishment of the solar PV and associated infrastructure will result in the loss, degradation and fragmentation foraging habitat for avifauna. Optimal foraging habitat in and around drainage areas have been excluded from the development area. Loss of breeding and/or mating display habitat for SCC or the loss of habitat for important bird congregations may also occur. While it is possible that a lekking site of Ludwig's Bustard may have been overlooked, it is highly unlikely due to the flat nature of the terrain, as they seek elevated areas from which to be visible from great distances and these have been excluded from the development area. Furthermore, the Soyuz Solar PV Park Cluster does not support any globally, nationally or regionally important congregations of waterfowl and / or migratory species.			
Impact Source(s)	Site clearing and preparation.			
Receptor(s)	Ludwig's Bustard, Denham's Bustard, Kori Bustard, Karoo Korhaan and Secretary bird.			
PARAMETER	**WITHOUT MITIGATION**	**SCORE**	**WITH MITIGATION**	**SCORE**
EXTENT (A)	Preferred Alternative:	1	Preferred Alternative:	1
	No-Go Alternative:	1	No-Go Alternative:	1
DURATION (B)	Preferred Alternative:	4	Preferred Alternative:	3
	No-Go Alternative:	4	No-Go Alternative:	4
PROBABILITY (C)	Preferred Alternative:	4	Preferred Alternative:	2
	No-Go Alternative:	4	No-Go Alternative:	4
INTENSITY OR MAGNITUDE (D)	Preferred Alternative:	-2	Preferred Alternative:	-1
	No-Go Alternative:	+1	No-Go Alternative:	+1
SIGNIFICANCE RATING (F) = (A*B*D)*C	Preferred Alternative:	**-32**	Preferred Alternative:	**-6**
	No-Go Alternative:	**16**	No-Go Alternative:	**16**

IMPACT NATURE	Direct loss of avifaunal habitat	STATUS	LOW NEGATIVE
CUMULATIVE IMPACTS	If the adjacent Soyuz WEF takes the necessary precautions to buffer the sensitive habitats for the receptor species and to prevent collisions of the receptor species with turbines and/or overhead powerlines (such as high rotor sweep heights, bird flight diverters on powerlines etc.), the receptor species should persist within the WEF cluster project boundary at ecologically viable population densities, limiting the potential for cumulative impacts to occur. The large area of the proposed Soyuz SOLAR PV PARK cluster and the relatively small area within this where solar panels will be constructed is expected to provide ample remaining habitat for the receptor species to persist. Therefore, the cumulative impacts to the receptor species are unlikely to be significant.		
CONFIDENCE	High		
MITIGATION MEASURES	▪ Limit the areas cleared for construction purposes (e.g. laydown areas). ▪ Do not implement a bare earth policy for construction of solar panels, rather mow the vegetation. ▪ Use the SEI spatial layers to appropriately position all surface infrastructure so as to minimise loss of High sensitivity avifaunal habitat. ▪ Demarcate such areas on the ground during construction and sign post them as “Environmentally sensitive areas - keep out!”. ▪ Ensure that the BESS and non-solar panel infrastructure occur in Low SEI portions of the project area. ▪ Rehabilitate all areas disturbed immediately after construction. ▪ Prioritise existing roads for access routes. ▪ Develop and implement an Alien and Invasive Plant Control Plan.		

Disturbance and Displacement

Potential impact of the disturbance of birds and displacement effects on birds (and specifically SCC), during the construction of the proposed SOLAR PV PARK due to sensory effects such as dust, noise and anthropogenic activity. These effects may cause birds to relocate to alternative territories. The Avifaunal Specialist has advised that the sensory disturbance of avifauna during the construction phase is likely to occur. Based on the available information it is reasonable to suggest that this impact has a **low negative** impact.

IMPACT NATURE	Sensory disturbance		STATUS	LOW NEGATIVE
Impact Description	Sensory disturbances to avifauna are inevitable but are unlikely to negatively impact upon nesting SCC and is mainly likely to be restricted to the construction phase. Although dust, noise and human activity during construction is unavoidable, much can be done to reduce the effect of these sensory disturbance impacts on avifauna. During operation, the residual impacts associated with sensory disturbance should be negligible.			
Impact Source(s)	Machinery, influx of people, noise, dust, light.			
Receptor(s)	All avifauna, particularly large terrestrial birds and raptors			
PARAMETER	WITHOUT MITIGATION	SCORE	WITH MITIGATION	SCORE
EXTENT (A)	Preferred Alternative:	1	Preferred Alternative:	1
	No-Go Alternative:	1	No-Go Alternative:	1
DURATION (B)	Preferred Alternative:	1	Preferred Alternative:	1
	No-Go Alternative:	4	No-Go Alternative:	4
PROBABILITY (C)	Preferred Alternative:	3	Preferred Alternative:	2
	No-Go Alternative:	4	No-Go Alternative:	4

<table>
<tr><th>IMPACT NATURE</th><th colspan="2">Sensory disturbance</th><th>STATUS</th><th>LOW NEGATIVE</th></tr>
<tr><td rowspan="2">INTENSITY OR MAGNITUDE (D)</td><td>Preferred Alternative:</td><td>-2</td><td>Preferred Alternative:</td><td>-1</td></tr>
<tr><td>No-Go Alternative:</td><td>+2</td><td>No-Go Alternative:</td><td>+2</td></tr>
<tr><td rowspan="2">SIGNIFICANCE RATING (F) = (A*B*D)*C</td><td>Preferred Alternative:</td><td>-6</td><td>Preferred Alternative:</td><td>-2</td></tr>
<tr><td>No-Go Alternative:</td><td>32</td><td>No-Go Alternative:</td><td>32</td></tr>
<tr><td>CUMULATIVE IMPACTS</td><td colspan="4">Disturbances to birds from the construction of renewable energy facilities in the region is likely to be short lived and very occasional and therefore unlikely to represent a significant cumulative impact.</td></tr>
<tr><td>CONFIDENCE</td><td colspan="4">High</td></tr>
<tr><td>MITIGATION MEASURES</td><td colspan="4">▪ Adopt temporal avoidance strategies. Attempt, as far as possible to conduct most of the high intensity earthmoving and building activities during winter (June to September) to minimize disturbance of avifauna during sensitive life stages such as lekking, courting, nesting and fledging.
▪ Minimise light pollution and fit external lighting with downward facing hoods.
▪ Demarcate natural areas beyond the surface infrastructure footprint and restrict access of personnel into these areas through education and signposting.
▪ Train staff and contractors on the importance of birds and other biodiversity and the sensitive areas for these species which should be avoided.
▪ Introduce and enforce a speed limit (40 km/h)</td></tr>
</table>

24.2.2 Potential Faunal Biodiversity Impacts

Based on the available information and input from the Biodiversity Scoping Assessment, the following impacts have been scoped and assessed:

Faunal Habitat Destruction and Species Diversity

Vegetation clearing and construction activities can cause habitat destruction and disturbance within the direct footprint area and the direct loss of floral and faunal communities and possibly loss of species of conservation concern (SCC).

<table>
<tr><th colspan="2">IMPACT NATURE</th><th colspan="3">Impact – Loss of faunal habitat and potential species diversity</th><th>STATUS</th><th>LOW NEGATIVE</th></tr>
<tr><td colspan="2">Impact Description</td><td colspan="5">The most significant impact will occur with the vegetation clearing for the proposed Soyuz 4 Solar PV Park, which will lead to faunal habitat loss, species displacement and a decrease in faunal diversity. Increased loss of habitat connectivity and ecological functioning due to unplanned and uncontrolled site clearing and removal of faunal habitat. Potential increased mortality rates of fauna, due to collision with moving vehicles, human-wildlife conflict (notably snakes) and potential snaring / poaching within the proposed Soyuz 4 Solar PV Park and along the access road. Possible spread of AIPs and habitat fragmentation may lead to lower habitat integrity as secondary impacts.</td></tr>
<tr><td colspan="2">Impact Source(s)</td><td colspan="5">• Potential non-adherence to final approved layout plans;
• Increased human presence associated with the proposed development, contributing to:
o Potential hunting/trapping/removal/collection of faunal species; and
o Increased human activity will lead to the displacement and/or loss of faunal species;
• Potential uncontrolled and unplanned site clearing and the removal of faunal habitat;
• Potential dumping of excavated and construction material outside of designated areas;
• Potential that edge effects of the proposed activities are poorly managed;
• Possible increased fire frequency during construction activities;
• Increased risk of faunal collisions with construction vehicles; and
• Proliferation of AIP species that colonise disturbed areas.</td></tr>
<tr><td colspan="2">Receptor(s)</td><td colspan="5">Faunal habitat and species</td></tr>
<tr><th>Habitat Unit</th><th>Driver / Activity</th><th>PARAMETER</th><th>WITHOUT MITIGATION</th><th>SCORE</th><th>WITH MITIGATION</th><th>SCORE</th></tr>
<tr><td rowspan="5">Low Open Shrubland, Open Karoo</td><td rowspan="5">PV facility and associated infrastructure</td><td>EXTENT (A)</td><td>Preferred Alternative:</td><td>2</td><td>Preferred Alternative:</td><td>1</td></tr>
<tr><td>DURATION (B)</td><td>Preferred Alternative:</td><td>4</td><td>Preferred Alternative:</td><td>3</td></tr>
<tr><td>PROBABILITY (C)</td><td>Preferred Alternative:</td><td>4</td><td>Preferred Alternative:</td><td>3</td></tr>
<tr><td>INTENSITY OR MAGNITUDE (D)</td><td>Preferred Alternative:</td><td>-3</td><td>Preferred Alternative:</td><td>-2</td></tr>
<tr><td>SIGNIFICANCE RATING (F) = (A*B*D)*C</td><td>Preferred Alternative:</td><td>(-) High</td><td>Preferred Alternative:</td><td>(-) Low</td></tr>
<tr><td></td><td></td><td>EXTENT (A)</td><td>Preferred</td><td>2</td><td>Preferred Alternative:</td><td>1</td></tr>
</table>

Open Karoo	**Access road**		Alternative:			
		DURATION (B)	Preferred Alternative:	4	Preferred Alternative:	3
		PROBABILITY (C)	Preferred Alternative:	4	Preferred Alternative:	3
		INTENSITY OR MAGNITUDE (D)	Preferred Alternative:	-2	Preferred Alternative:	-2
		SIGNIFICANCE RATING (F) = (A*B*D)*C	Preferred Alternative:	**(-) Medium**	Preferred Alternative:	**(-) Low**
Freshwater Ecosystem Habitat	**PV facility and associated infrastructure**	**EXTENT (A)**	Preferred Alternative:	3	Preferred Alternative:	1
		DURATION (B)	Preferred Alternative:	4	Preferred Alternative:	2
		PROBABILITY (C)	Preferred Alternative:	4	Preferred Alternative:	2
		INTENSITY OR MAGNITUDE (D)	Preferred Alternative:	-2	Preferred Alternative:	-2
		SIGNIFICANCE RATING (F) = (A*B*D)*C	Preferred Alternative:	(-) High	Preferred Alternative:	(-) Low
CUMULATIVE IMPACTS	According to the South African Renewable Energy EIA Application Database (REEA, 2021) there are eighteen applications for renewable 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 4 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. Vegetation clearing due to Soyuz 4 Solar PV Park will be at a local extent and vegetation regrowth will still provide habitat for common faunal species and no significant faunal habitat loss will present on a regional level. The current farming activities will still be present within the immediate area surrounding the Soyuz 4 Solar PV Park.					
CONFIDENCE	High					

MITIGATION MEASURES	• Footprint areas should be kept as small as possible. Site boundaries should be clearly demarcated so as to ensure that vegetation beyond the authorised footprint is not cleared; • No development should occur within the Freshwater Ecosystem Habitat or within the relevant zones of regulation around these features present within the proposed PV plant area. A corridor for the movement of fauna should be maintained within the proposed project footprint; • Construction equipment should be restricted to travelling only on designated roadways or within the intended development footprint to limit the ecological footprint of the development activities. Additional road construction should be limited to what is absolutely necessary, and the footprint thereof kept to a minimum; • Access road for construction should be gravel. Post construction and before operation of PV plant permeable paving is recommended (e.g. grassblock) in areas where areas should be paved; • Perimeter fences must be designed in such a way so as to allow for small faunal species movement in and out of the solar farm. In this regard, the use of electric perimeter fencing is discouraged to ensure electrocution of species does not occur. Small culverts should be placed every 200m in the fence to allow for the movement of small species through the fence safely; • Care should be taken during the construction and before operation of the proposed development to limit edge effects to surrounding natural habitat. This can be achieved by: o Demarcating all footprint areas during construction activities; o No construction rubble or cleared alien invasive species are to be disposed of outside of demarcated areas, and should be taken to a registered waste disposal facility; o All soil compacted because of construction activities (outside of the development footprint) should be ripped, profiled and reseeded; and o Manage the spread of AIP species, which may affect remaining natural habitat within surrounding areas. • Should any lights be installed they should face downwards to reduce the abundance of insects attracted to the night lights, this prey source may attract insects to the project areas and may increase bat collisions or electrocutions. Furthermore increased lighting will impose upon the nights darkness altering invertebrate movement. Lights should not be LED or white light; • If any spills occur, they should be immediately cleaned up to avoid soil contamination that can hinder floral rehabilitation later down the line and faunal recolonization. In the event of a breakdown, maintenance of vehicles must take place with care, and the collection of spillages should be practised preventing the ingress of hydrocarbons into the topsoil; • No hunting/trapping or collecting of faunal species is allowed; • No illicit fires must be allowed during the construction phase of the proposed development; • A rehabilitation plan should be compiled by a suitable specialist. This rehabilitation plan should consider all development phases of the project indicating rehabilitation actions to be undertaken during, and once construction has been completed as well as ongoing rehabilitation during the operational phase of the project to ensure habitat for fauna is restored; • Any natural areas beyond the development footprint, that have been affected by the construction activities, must be rehabilitated using indigenous plant species; • Revegetation of disturbed areas should be carried out in order to restore habitat availability and minimise soil erosion and surface water runoff; • When rehabilitating a footprint site, it is imperative that as far as possible the habitat that was present prior to disturbances is recreated, so that faunal species that were displaced by vegetation clearing activities are able to recolonize the rehabilitated area; • Smaller species of invertebrates and reptiles are likely to be less mobile during colder periods, as such should any be observed in the

	footprint areas during clearing and operational activities, they are to be carefully and safely moved to an area of similar habitat outside of the disturbance footprint. Construction and Operational personnel are to be educated about these species and the need for their conservation. Harmless reptiles should be carefully relocated by a suitably nominated construction person. For larger venomous snakes, a suitable construction official should be contacted to affect the relocation of the species, should it not move off on its own; • All faunal species rescued must be relocated to a suitable area, with similar habitat adjacent to the footprint area or within the property; • Maintain habitat connectivity and corridors for species movement; • Edge effect control needs to be implemented to ensure no further degradation and potential loss of faunal SCC outside of the proposed project footprint area. An on-site Environmental Control Officer (ECO) should monitor and mitigate any edge effects throughout the life of the operation; • No additional habitat is to be disturbed outside of the approved footprints areas. Weekly (recommended) to monthly (minimum requirement) monitoring and recording of the footprint areas must be done during the construction phase by the ECO and photographic records kept – special attention should also be paid to the potential increase and spread of AIPs; • No dumping of waste on site should take place. As such it is advised that waste disposal containers and bins be provided during the construction phase for all dilapidates, rubble and general waste; • At all times, ensure that sound environmental management is in place; • It is recommended that after vegetation clearing during the construction phase, vegetation regrowth must be promoted while appropriately maintained so as not to create a safety or production risk, as this will create habitat for faunal species and will aid in preventing soil erosion.

Loss of Faunal Species of Concern

IMPACT NATURE	Impact – Loss of faunal SCC	STATUS	NEGATIVE
Impact Description	The most significant impact will occur with the vegetation clearing for the proposed Soyuz 4 Solar PV Park, which will lead to faunal SCC habitat loss and displacement. Increased loss of habitat connectivity and ecological functioning due to unplanned and uncontrolled site clearing and removal of faunal SCC habitat. Potential increased mortality rates of faunal SCC, due to collision with moving vehicles, human-wildlife conflict (notably scorpions) and potential snaring / poaching within the proposed Soyuz 4 Solar PV Park and access road. Possible spread of AIPs and habitat fragmentation may lead to lower habitat integrity as secondary impacts.		

Impact Source(s)	• Non-adherence to final layout plans;
	• Increased human presence associated with the proposed development, contributing to:
	  ○ Potential hunting/trapping/removal/collection of faunal SCC; and
	  ○ Increased human activity will lead to the displacement and/or loss of faunal SCC;
	• Uncontrolled and unplanned site clearing and the removal of faunal habitat;
	• Potential dumping of excavated and construction material outside of designated areas;
	• Potential that edge effects of the proposed activities are poorly managed;
	• Possible increased fire frequency during construction activities;
	• Increased risk of faunal collisions with construction vehicles; and
	• Proliferation of AIP species that colonise disturbed areas.		

Receptor(s)	Faunal SCC habitat		

Habitat Unit	Driver / Activity	PARAMETER	WITHOUT MITIGATION	SCORE	WITH MITIGATION	SCORE
Upper Karoo Habitat	PV facility and associated infrastructure	EXTENT (A)	Preferred Alternative:	3	Preferred Alternative:	2
		DURATION (B)	Preferred Alternative:	3	Preferred Alternative:	3
		PROBABILITY (C)	Preferred Alternative:	4	Preferred Alternative:	3
		INTENSITY OR MAGNITUDE (D)	Preferred Alternative:	-3	Preferred Alternative:	-2
		SIGNIFICANCE RATING (F) = (A*B*D)*C	Preferred Alternative:	(-) High	Preferred Alternative:	(-) Low
Upper Karoo Habitat & Modified Karoo Footslope	Access road	EXTENT (A)	Preferred Alternative:	3	Preferred Alternative:	2
		DURATION (B)	Preferred Alternative:	3	Preferred Alternative:	3
		PROBABILITY (C)	Preferred Alternative:	4	Preferred Alternative:	3
		INTENSITY OR MAGNITUDE (D)	Preferred Alternative:	-2	Preferred Alternative:	- 2
		SIGNIFICANCE RATING (F) = (A*B*D)*C	Preferred Alternative:	(-) Medium	Preferred Alternative:	(-) Low
	Access road	EXTENT (A)	Preferred Alternative:	3	Preferred Alternative:	1
Freshwater Ecosystem Habitat		DURATION (B)	Preferred Alternative:	3	Preferred Alternative:	3
		PROBABILITY (C)	Preferred Alternative:	4	Preferred Alternative:	3
		INTENSITY OR MAGNITUDE (D)	Preferred Alternative:	-3	Preferred Alternative:	-2
		SIGNIFICANCE RATING (F) = (A*B*D)*C	Preferred Alternative:	(-) High	Preferred Alternative:	(-) Low
CUMULATIVE IMPACTS		According to the South African Renewable Energy EIA Application Database (REEA, 2021) there are eighteen applications for renewable energy facilities (wind and solar) within a 50 km radius of the Soyuz 4 Solar PV Park, of which thirteen have been approved, three has lapsed or have been withdrawn and six is still in the process. This indicates that the larger region has been earmarked for several renewable energy facilities, which may alter the landscape character. Vegetation clearing due to Soyuz 4 Solar PV Park will be at a local extent and vegetation regrowth will still provide habitat for faunal SCC and no significant faunal SCC habitat loss will be present on a regional level. The current farming activities will still be present within the immediate area surrounding the Soyuz 4 Solar PV Park.				
CONFIDENCE		High				

MITIGATION MEASURES	• Edge effect control needs to be implemented to prevent further degradation and potential loss of faunal SCC habitat outside of the proposed development footprint; • Perimeter fences must be designed in such a way so as to allow for small faunal species movement in and out of the solar farm. In this regard, the use of electric perimeter fencing is discouraged to ensure electrocution of species does not occur. Small culverts should be placed every 200m in the fence to allow for the movement of small species through the fence safely; • Should any other faunal species protected under the National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004) or the Northern Cape Nature Conservation Act (schedule 1) be encountered, construction should be halted and authorisation to relocate such species must be obtained from the DFFE or NCDENC; • Prior to vegetation clearing activities, it is recommended that the site should be inspected for the presence of burrowing SCC scorpions. If located, these species should be carefully excavated ensuring no harm to the specimens and relocated to similar surrounding habitat outside of the footprint area. A night-time survey utilising UV lights is recommended to aid in the collection of potential scorpion SCC. The survey should be undertaken in summer where these arachnids are more active. Where this is not feasible, as species are observed when vegetation clearance takes place, they are to be appropriately rescued and relocated; • Smaller species such as scorpions and reptiles are likely to be less mobile during the colder period, as such should any be observed in the study site during construction activities, they are to be carefully and safely moved to an area of similar habitat outside of the disturbance footprint. Construction personnel are to be educated about these species and the need for their conservation. Harmless scorpion or reptiles should be carefully relocated by a nominated construction person or staff member. For venomous snakes or scorpions, a suitably trained official or specialist should be contacted to affect the relocation of the species, should it not move off on its own; • A suitable rescue and relocation plan should be developed and overseen by a suitably qualified specialist should SCC be identified within the project areas in order to ensure that species loss during construction activities is kept to a minimum; • No collection or hunting of any fauna species is to be allowed by personnel during the construction phase, especially with regards to faunal SCC (if encountered and not part of a rescue/relocation plan); • No unauthorised fires are to be allowed on the site; • Minimise loss of indigenous vegetation where possible through the planning of suitable faunal corridors. As far as possible layouts must avoid placement within habitat of increased sensitivity; • The development footprint is to be located outside the Freshwater Ecosystem Habitat or within the relevant zones of regulation around these features. Edge effect control needs to be implemented to ensure no further degradation and potential loss of faunal habitat and SCC outside of the footprint area. An on-site ECO should monitor and mitigate any edge effects throughout the operation; • It is recommended that after vegetation clearing during the construction phase, vegetation regrowth must be promoted while appropriately maintained so as not to create a safety or production risk, as this will create habitat for faunal SCC and will aid in preventing soil erosion.

24.2.3 Potential Floral Biodiversity Impacts

Loss of Floral Habitat and Potential Species Diversity

IMPACT NATURE	Impact – Loss of floral habitat and potential species diversity				STATUS	LOW NEGATIVE
Impact Description	he most significant impact will occur with the vegetation clearing for the proposed Soyuz 4 Solar PV Park, which will lead to floral habitat loss, AIP proliferation (also part of poorly managed edge effects) and habitat fragmentation. Dust generated during construction activities accumulating on the surrounding floral individuals, altering the photosynthetic ability of plants and potentially further decreasing optimal growing /re-establishing conditions.					
Impact Source(s)	• Vegetation clearing and construction activities will lead to habitat destruction and disturbance within the direct footprint area; • Potential uncontrolled and unplanned site clearing and the removal of floral habitat beyond of the direct footprint areas; • Potential dumping of excavated and construction material outside of designated areas; • Potential that edge effects of the proposed activities are poorly managed; • Changes in surface characteristics may lead to increased runoff and erosion; • Declines in plant functioning leading to loss of floral species and habitat for optimal growth; and • Proliferation of AIP species that colonise disturbed areas.					
Receptor(s)	Floral habitat and species					
Habitat Unit	**Driver / Activity**	**PARAMETER**	**WITHOUT MITIGATION**	**SCORE**	**WITH MITIGATION**	**SCORE**
Open Karoo Veld Habitat, Low Open Shrubland	**PV facility and associated infrastructure**	**EXTENT (A)**	Preferred Alternative:	2	Preferred Alternative:	2
		DURATION (B)	Preferred Alternative:	4	Preferred Alternative:	3
		PROBABILITY (C)	Preferred Alternative:	4	Preferred Alternative:	4
		INTENSITY OR MAGNITUDE (D)	Preferred Alternative:	-2	Preferred Alternative:	-2
		SIGNIFICANCE RATING (F) = (A*B*D)*C	Preferred Alternative:	**(-) Medium**	Preferred Alternative:	**(-) Low**
Open KarooVeld	**Access road**	**EXTENT (A)**	Preferred Alternative:	2	Preferred Alternative:	1
		DURATION (B)	Preferred Alternative:	3	Preferred Alternative:	3
		PROBABILITY (C)	Preferred Alternative:	4	Preferred Alternative:	2
		INTENSITY OR MAGNITUDE (D)	Preferred Alternative:	-2	Preferred Alternative:	-2

		SIGNIFICANCE RATING (F) = (A*B*D)*C	Preferred Alternative:	**(-) Medium**	Preferred Alternative:	**(-) Low**
CUMULATIVE IMPACTS		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 4 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 several renewable energy facilities, which may alter the landscape character. Vegetation clearing due to Soyuz 4 Solar PV Park will be at a local extent and vegetation regrowth could possibly occur. The current farming activities will still be present within the immediate area surrounding the Soyuz 4 Solar PV Park.				
CONFIDENCE		High				

MITIGATION MEASURES	• Footprint areas should be kept as small as possible. Site boundaries should be clearly demarcated so as to ensure that vegetation beyond the authorised footprint is not cleared; • No development should occur within the Freshwater Ecosystem Habitat or within the relevant zones of regulation around these features present within the proposed PV plant area; • Construction equipment should be restricted to travelling only on designated roadways or within the intended development footprint to limit the ecological footprint of the development activities. Additional road construction should be limited to what is absolutely necessary, and the footprint thereof kept to a minimum; • Access road for construction should be gravel. Post construction and before operation of PV plant permeable paving is recommended (e.g. grassblock) in areas where areas should be paved; • Care should be taken during the construction and before operation of the proposed development to limit edge effects to surrounding natural habitat. This can be achieved by: - Demarcating all footprint areas during construction activities; - No construction rubble or cleared alien invasive species are to be disposed of outside of demarcated areas, and should be taken to a registered waste disposal facility; - Suppress dust to mitigate the impact of dust on flora within a close proximity of construction activities; - All soil compacted because of construction activities (outside of the development footprint) should be ripped, profiled and reseeded; and - Manage the spread of AIP species, which may affect remaining natural habitat within surrounding areas. • If any spills occur, they should be immediately cleaned up to avoid soil contamination that can hinder floral rehabilitation later down the line. In the event of a breakdown, maintenance of vehicles must take place with care, and the collection of spillages should be practised preventing the ingress of hydrocarbons into the topsoil; • Any natural areas beyond the development footprint, that have been affected by the construction activities, must be rehabilitated using indigenous plant species; • Revegetation of disturbed areas should be carried out in order to restore habitat availability and minimise soil erosion and surface water runoff; • Edge effect control needs to be implemented to ensure no further degradation and potential loss of floral species outside of the proposed project footprint area. An on-site Environmental Control Officer (ECO) should monitor and mitigate any edge effects throughout the life of the operation; • No additional habitat is to be disturbed outside of the approved footprints areas. Weekly (recommended) to monthly (minimum requirement) monitoring and recording of the footprint areas must be done during the construction phase by the ECO and photographic records kept – special attention should also be paid to the potential increase and spread of AIPs; • No dumping of waste on site should take place. As such it is advised that waste disposal containers and bins be provided during the construction phase for all dilapidates, rubble and general waste; • At all times, ensure that sound environmental management is in place; and • It is recommended that after vegetation clearing during the construction phase, vegetation regrowth must be promoted while appropriately maintained so as not to create a safety or production risk, as this will create habitat for species and will aid in preventing soil erosion.

Loss of Floral Species of Conservation Concern

<table>
<tr><th colspan="2">IMPACT NATURE</th><th colspan="3">Impact – Loss of floral SCC</th><th>STATUS</th><th>LOW NEGATIVE</th></tr>
<tr><td colspan="2">Impact Description</td><td colspan="5">The most significant impact will occur with the vegetation clearing for the proposed Soyuz 4 Solar PV Park, which will lead to floral SCC habitat loss. Without the successful relocation of eligible floral SCC and monitoring of these species, the activities will result in a loss of SCC individuals. Long-term changes in floral structure, altered genetic fitness and potential loss of SCC and their habitat is also possible with severe habitat fragmentation. Without management of edge effects and AIPs, floral SCC are likely to be displaced by other and non-indigenous specie.</td></tr>
<tr><td colspan="2">Impact Source(s)</td><td colspan="5">• Non-adherence to final layout plans;
• Potential failure to have successfully relocated eligible floral SCC within the proposed footprint prior to the construction phase Proliferation of AIP species that colonise disturbed areas;
• Potential failure to monitor rescue and relocation initiatives (if applicable) during the construction phase of the project (pending outcome of the floral walkdown of the authorised footprints);
• Overexploitation through the removal and/or collection of floral SCC and protected flora beyond the direct footprint area due to increased presence of construction workers on site; and
• Dumping of excavated and construction material outside of designated areas, promoting the establishment of AIPs.</td></tr>
<tr><td colspan="2">Receptor(s)</td><td colspan="5">Flora SCC habitat</td></tr>
<tr><th>Habitat Unit</th><th>Driver / Activity</th><th>PARAMETER</th><th>WITHOUT MITIGATION</th><th>SCORE</th><th>WITH MITIGATION</th><th>SCORE</th></tr>
<tr><td rowspan="5">Open Karoo Veld Habitat, Low Open Shrubland</td><td rowspan="5">PV facility and associated infrastructure</td><td>EXTENT (A)</td><td>Preferred Alternative:</td><td>2</td><td>Preferred Alternative:</td><td>2</td></tr>
<tr><td>DURATION (B)</td><td>Preferred Alternative:</td><td>4</td><td>Preferred Alternative:</td><td>3</td></tr>
<tr><td>PROBABILITY (C)</td><td>Preferred Alternative:</td><td>4</td><td>Preferred Alternative:</td><td>3</td></tr>
<tr><td>INTENSITY OR MAGNITUDE (D)</td><td>Preferred Alternative:</td><td>-3</td><td>Preferred Alternative:</td><td>-2</td></tr>
<tr><td>SIGNIFICANCE RATING (F) = (A*B*D)*C</td><td>Preferred Alternative:</td><td>(-) Medium</td><td>Preferred Alternative:</td><td>(-) Low</td></tr>
<tr><td rowspan="5">Open Karoo Veld</td><td rowspan="5">Access road</td><td>EXTENT (A)</td><td>Preferred Alternative:</td><td>2</td><td>Preferred Alternative:</td><td>2</td></tr>
<tr><td>DURATION (B)</td><td>Preferred Alternative:</td><td>3</td><td>Preferred Alternative:</td><td>2</td></tr>
<tr><td>PROBABILITY (C)</td><td>Preferred Alternative:</td><td>4</td><td>Preferred Alternative:</td><td>3</td></tr>
<tr><td>INTENSITY OR MAGNITUDE (D)</td><td>Preferred Alternative:</td><td>-2</td><td>Preferred Alternative:</td><td>-2</td></tr>
<tr><td>SIGNIFICANCE RATING (F) = (A*B*D)*C</td><td>Preferred Alternative:</td><td>(-) Medium</td><td>Preferred Alternative:</td><td>(-) Low</td></tr>
</table>

CUMULATIVE IMPACTS	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 4 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 several renewable energy facilities, which may alter the landscape character. Vegetation clearing due to Soyuz 4 Solar PV Park will be at a local extent and vegetation regrowth could possibly occur but a potential floral SCC habitat loss will be present on a regional level. The current farming activities will still be present within the immediate area surrounding the Soyuz 4 Solar PV Park.
CONFIDENCE	High
MITIGATION MEASURES	• The relocation success of floral SCC or protected floral species (where applicable) must be monitored during the construction phase to ensure immediate actions can be taken if it becomes evident that relocation is not successful; • No collection of floral SCC must be allowed by construction personnel; • Edge effect control needs to be implemented to prevent further degradation and potential loss of floral SCC or protected floral species outside of the proposed development footprint area; and • It is recommended that after vegetation clearing during the construction phase, vegetation regrowth must be promoted while appropriately maintained so as not to create a safety or production risk, as this will create habitat for floral SCC and will aid in preventing soil erosion.

24.2.4 Potential Soil and Land Capability Impacts

IMPACT NATURE	Impact –Soil, land capability and agricultural potential.			STATUS		NEGATIVE
Impact Description	Loss of Land Capability					
Impact Source(s)	• Movement of Construction vehicles of good potential agricultural soils; • Placement of infrastructure on soil suitable for cultivation and grazing; and • Vegetation clearing and partial topsoil stripping as part of surface preparation.					
Receptor(s)	Agricultural Resources					
Soil Impact	**Driver / Activity**	**PARAMETER**	**WITHOUT MITIGATION**	**SCORE**	**WITH MITIGATION**	**SCORE**
Loss of Land Capability	Soil stripping/excavation and removal of soil as a growth medium and loss of grazing land (game and livestock).	**EXTENT (A)**	Preferred Alternative:	2	Preferred Alternative:	2
		DURATION (B)	Preferred Alternative:	4	Preferred Alternative:	3
		PROBABILITY (C)	Preferred Alternative:	4	Preferred Alternative:	2
		INTENSITY OR MAGNITUDE (D)	Preferred Alternative:	-3	Preferred Alternative:	-2
		SIGNIFICANCE RATING (F) = (A*B*D)*C	Preferred Alternative:	**-96**	Preferred Alternative:	**-24**
	Site clearing, removal of vegetation, and	**EXTENT (A)**	Preferred Alternative:	2	Preferred Alternative:	1

Soil Erosion	associated disturbances to soils, leading to increased runoff, erosion, and consequent loss of land capability in cleared areas and subsequent loss of soils utilised for grazing. *Potential frequent movement of earth moving machinery within lose and exposed soils, leading to excessive erosion.	**DURATION (B)**	Preferred Alternative:	4	Preferred Alternative:	3
		PROBABILITY (C)	Preferred Alternative:	2	Preferred Alternative:	2
		INTENSITY OR MAGNITUDE (D)	Preferred Alternative:	-3	Preferred Alternative:	-2
		SIGNIFICANCE RATING (F) = (A*B*D)*C	Preferred Alternative:	**-48**	Preferred Alternative:	**-12**
Soil Contamination	Spillage of petroleum hydrocarbons during construction of the proposed solar facilities and the associated access road. *Potential disposal of hazardous and non-hazardous waste, including waste material spills and refuse deposits into the soil.	**EXTENT (A)**	Preferred Alternative:	2	Preferred Alternative:	1
		DURATION (B)	Preferred Alternative:	4	Preferred Alternative:	2
		PROBABILITY (C)	Preferred Alternative:	3	Preferred Alternative:	2
		INTENSITY OR MAGNITUDE (D)	Preferred Alternative:	-3	Preferred Alternative:	-3
		SIGNIFICANCE RATING (F) = (A*B*D)*C	Preferred Alternative:	**-72**	Preferred Alternative:	**-12**
Soil Compaction	Site clearing, removal of vegetation, and associated disturbances to soils, leading to, increased runoff, soil compaction and	**EXTENT (A)**	Preferred Alternative:	1	Preferred Alternative:	1
		DURATION (B)	Preferred Alternative:	3	Preferred Alternative:	2
		PROBABILITY (C)	Preferred Alternative:	3	Preferred Alternative:	3
		INTENSITY OR MAGNITUDE (D)	**Preferred Alternative:**	**-3**	Preferred Alternative:	-2
		SIGNIFICANCE RATING (F) = (A*B*D)*C	**Preferred Alternative:**	**-27**	Preferred Alternative:	-12

CUMULATIVE IMPACTS	The Soyuz 4 Solar PV Park and associated access road are dominated by well-drained soils of Askham/Clovelly which collectively account for approximately 56.5% of total investigated. These soils are suitable for cultivation (Class III) but have a Restricted agricultural Potential (Class L5). If the above-mentioned land capability and potential conditions are considered as well as occurring climatic conditions with limited rainfall (200 – 400 mm per annum) the development footprint is deemed not suitable for any large-scale agricultural cultivation in the absence of supplementary irrigation and other intensive management practices. The cumulative impact on the local and regional scale is considered medium to low without mitigation and low to very low with mitigatory measures in place as the dominant soils are not sensitive from a soil and land capability point of view.
CONFIDENCE	High

MITIGATION MEASURES	• A spill prevention and emergency spill response plan, as well as dust suppression, and fire prevention plans should also be compiled to guide the construction works; • All disturbed areas adjacent to the proposed development areas should be re-vegetated with an indigenous grass mix, if necessary, to re-establish a protective cover, to minimise soil erosion and dust emission; • An emergency response contingency plan should be put in place to address clean-up measures should a spill and/or a leak occur, as well as preventative measures to prevent contamination; and • Bare soils within the access roads can be regularly dampened with water to suppress dust during the construction phase, especially when strong wind conditions are predicted according to the local weather forecast; • Burying of any waste including domestic waste, empty containers on the site should be strictly prohibited and all construction rubble waste must be removed to an approved disposal site; • Contamination prevention measures should be addressed in the Environmental Management Programme (EMP) for the proposed development, and this should be implemented, always made available and accessible to the contractors and construction crew conducting the works on site for reference; • Revegetate the disturbed soils with an indigenous grass mix, to re-establish a protective cover, in order to minimise soil erosion and dust emissions; • Temporary erosion control measures should be used to protect the disturbed soils during the construction phase until adequate vegetation has established; • The footprint areas should be lightly ripped to alleviate compaction; and • The proposed Solar Photovoltaic (PV) Facilities development within the study area should aim to minimise the impact on soils with used for grazing activities;

24.2.5 Potential Climate Change Impacts

Impact of Greenhouse gases produced during construction phase of the Soyuz 4 Solar PV Park

The release of GHG includes mainly CO_2, CH_4 and N_2O. GHGs are those gaseous constituents of the atmosphere, both natural and anthropogenic, that absorb and emit radiation at specific wavelengths within the spectrum of thermal infrared radiation emitted by the Earth's surface, the atmosphere itself, and by clouds. This property causes the greenhouse effect.

IMPACT NATURE	Release of gaseous emissions to atmosphere		STATUS	LOW NEGATIVE
Impact Description	Gaseous pollutants released from the combustion of fuel is the main source of GHGs from the project.			
Impact Source(s)	Construction vehicles and delivery vehicles			
Receptor(s)	Construction phase employees, equipment and materials. Integrity and operational sustainability of the facility.			
PARAMETER	WITHOUT MITIGATION	SCORE	WITH MITIGATION	SCORE
EXTENT (A)	Preferred Alternative:	2	Preferred Alternative:	2
	No-Go Alternative:	No impact	No-Go Alternative:	No Impact
DURATION (B)	Preferred Alternative:	1	Preferred Alternative:	1
	No-Go Alternative:	No impact	No-Go Alternative:	No impact
PROBABILITY (C)	Preferred Alternative:	3	Preferred Alternative:	3
	No-Go Alternative:	No impact	No-Go Alternative:	No impact
INTENSITY OR MAGNITUDE (D)	Preferred Alternative:	-1	Preferred Alternative:	-1
	No-Go Alternative:	No impact	No-Go Alternative:	No impact
SIGNIFICANCE RATING (F) = (A*B*D)*C	Preferred Alternative:	-6	Preferred Alternative:	-6
	No-Go Alternative:	No impact	No-Go Alternative:	No impact
CUMULATIVE IMPACTS	None anticipated.			
CONFIDENCE	High			
MITIGATION MEASURES	Ensure construction vehicles are regularly serviced and maintained.			

24.2.6 Potential Freshwater Impacts

Construction-phase impacts of the proposed solar PV arrays and associated infrastructure on the freshwater environment.

IMPACT NATURE	Impact of the construction of the solar PV arrays and associated infrastructure on freshwater ecosystem provisioning and resource quality	STATUS	LOW NEGATIVE
Impact Description	• Removal of vegetation in the solar PV development site footprint by construction vehicles that could lead to altered patterns of runoff and drainage in the landscape that could adversely affect freshwater ecosystems; • Mixing and casting of concrete for construction purposes on the PV footprint development site which could pollute the freshwater environment; • Containment loss of hazardous substances related to BESS batteries and substation transformer oils could lead to soil and water pollution impacts.		
Impact Source(s)	Construction equipment and construction workforce; infrastructure components that contain hazardous substances.		

IMPACT NATURE	Impact of the construction of the solar PV arrays and associated infrastructure on freshwater ecosystem provisioning and resource quality		STATUS	LOW NEGATIVE
Receptor(s)	The five (5) EDLs in the area surrounding the development site.			
PARAMETER	WITHOUT MITIGATION	SCORE	WITH MITIGATION	SCORE
EXTENT (A)	Preferred Alternative:	1	Preferred Alternative:	1
	No-Go Alternative:	No impact	No-Go Alternative:	No impact
DURATION (B)	Preferred Alternative:	1	Preferred Alternative:	1
	No-Go Alternative:	No impact	No-Go Alternative:	No impact
PROBABILITY (C)	Preferred Alternative:	2	Preferred Alternative:	1
	No-Go Alternative:	No impact	No-Go Alternative:	No impact
INTENSITY OR MAGNITUDE (D)	Preferred Alternative:	-1	Preferred Alternative:	-1
	No-Go Alternative:	No impact	No-Go Alternative:	No impact
SIGNIFICANCE RATING (F) = (A*B*D)*C	Preferred Alternative:	-2	Preferred Alternative:	-1
	No-Go Alternative:	0	No-Go Alternative:	0
CUMULATIVE IMPACTS	Freshwater ecosystems within the Karoo and the broader Northern Cape region Freshwater ecosystems within the Karoo and the broader Northern Cape region are under continued threat due a variety of factors primarily related to landuse which, in the long term and cumulatively, may prove to be unsustainable. The predominant landuse and economic activity in the wider area is commercial livestock farming. This has resulted in degradation of freshwater features due to over-utilisation by livestock, as well as physical transformation of freshwater ecosystems, primarily in the form of impoundments that have been developed along most of the episodic drainage lines in the area. Such impoundments exert various types of impacts, including freshwater habitat transformation, hydrological impacts, as well as hydromorphological impacts. Other factors such as existing linear infrastructure (roads and railways) as well as climate change also exert impacts on the freshwater ecosystems in the wider area and in a Northern Cape Karoo context. The development of the Soyuz 4 Solar PV Park will not directly impact any freshwater ecosystems in terms of the development of its solar arrays as no freshwater ecosystems are located within the proposed solar array footprint, however indirect impacts could occur. Such indirect impacts could result in the creation of a cumulative impact on the freshwater environment in the wider area if these indirect impacts resulted in a measurable impact on ecosystem provisioning or on the PES of any of the EDLs. The implementation of the recommended mitigation measures would however significantly reduce or negate the potential for cumulative impacts to materialise.			
CONFIDENCE	Medium			
MITIGATION MEASURES	• Prior to the commencement of construction and vegetation clearing to ensure that no vehicle or other construction personnel access occurs off the site and within the 32m ZoR of the EDLs or into the EDLs themselves; • All construction and site clearing must take place during the dry season to limit potential impacts to downgradient drainage lines (i.e. the two EDL's to the north-east of the development footprint) as a result of construction activities; • Areas which are to be cleared of vegetation including contractor laydown areas must remain as small as possible and it must be ensured as far as possible that vegetation clearing is focused to the proposed development footprint; • Areas to be cleared of vegetation must be cleared in a controlled, phased manner. • The following measures are recommended to mitigate against indirect impacts with regards to excavation and earthworks within the boundaries of the development site: • A construction-phase stormwater control system must be implemented as part of the development and implementation of stormwater controls across all development phases. Temporary measures must be used to control construction phase stormwater - e.g. the use of berms, silt traps / silt curtains, along with the retention of natural vegetation where possible;			

IMPACT NATURE	Impact of the construction of the solar PV arrays and associated infrastructure on freshwater ecosystem provisioning and resource quality	STATUS	LOW NEGATIVE
	• During excavation activities, it must be ensured that stockpiles are not higher than 2 m in height and all exposed soil must be protected for the duration of the construction phase with a suitable geotextile (e.g. Geojute or hessian sheeting) to prevent erosion and sedimentation of the downgradient EDLs. Furthermore, measures must be undertaken to limit the time in which soil is exposed; • Dust suppression measures must be implemented (such as spray watering on gravel roads) throughout the proposed development activities to prevent excessive dust which may adversely affect riparian vegetation within the EDLs. • With regards to concrete mixing on site: • Concrete and cement-related mortars can be toxic to aquatic life and other biota. Proper handling and disposal are considered imperative to minimise or eliminate discharge into the drainage lines. High alkalinity associated with cement can dramatically affect and contaminate both soil and ground water. The following recommendations must be adhered to: • Fresh concrete and cement mortar must not be mixed near the site boundaries (i.e. within the 100m Zone of Regulation) of the drainage lines; • Mixing of cement should only be undertaken within the construction camp and may not be mixed on bare soils; • Mixing of concrete is also to be strictly undertaken within a lined, bound or bunded portable mixer. Consideration must be taken to use ready mix concrete; • A batter board or other suitable platform/mixing tray is to be provided onto which any mixed concrete can be deposited whilst it awaits placing; • A washout area must be designated outside of the confines of the 100m Zone of Regulation around the EDLs; • Cement bags must be disposed of in the demarcated hazardous waste receptacles; • Concrete spillage outside of the demarcated area must be promptly removed and taken to a suitably licenced waste disposal site. • It is recommended that vegetation be retained in the parts of the site where clearing for bi facial panels is not required in order to improve infiltration of runoff and to trap surface runoff during precipitation events; • Stormwater infrastructure on the development site must be designed in line with the principles of SUDS in order to polish stormwater by trapping sediments and by removing pollutants that could pollute downgradient freshwater ecosystems, and in order to allow the gradual discharge of stormwater into the drainage lines following rainfall events. • As such the use of 'soft' engineering features such as bioswales that are vegetated with suitable vegetation that is tolerant of both wet and dry conditions is strongly recommended. • The use of stone pitching to reduce velocity of stormwater is strongly recommended; • The proposed stormwater infrastructure must also be incorporated into a suitable and site-specific Stormwater Management Plan (SWMP).		

24.2.7 Potential Geotechnical and Soil Impacts

The primary concern associated with geotechnical works is increased soil erosion on site, due to the stripping of vegetation during the construction phase of the project. Removal of vegetation reduces infiltration, thereby increasing runoff yielding increased erosion. Further, compaction during earthworks reduces rainwater infiltration and increases surface runoff and increasing erosion. The construction of paved and/or hard-surfaced areas increases runoff and often localises discharge of stormwater, which may lead to increased erosion and consequently loss of topsoil. Disturbance of the soil may extend beyond the footprint of the structures should such conditions persist for long periods, e.g., more than 10 years.

IMPACT NATURE	Soil erosion, soil contamination and soil destabilisation		STATUS	LOW NEGATIVE
Impact Description	The primary concern associated with geotechnical works is increased soil erosion on site, due to the stripping of vegetation during the construction phase of the project. Removal of vegetation reduces infiltration, thereby increasing runoff yielding increased erosion. Further, compaction during earthworks reduces rainwater infiltration and increases surface runoff and increasing erosion. The construction of paved and/or hard-surfaced areas increases runoff and often localises discharge of stormwater, which may lead to increased erosion and consequently loss of topsoil. Disturbance of the soil may extend beyond the footprint of the structures should such conditions persist for long periods, e.g., more than 10 years.			
Impact Source(s)	Stripping of vegetation during construction Machinery and earth-moving plant causing spills contaminating soils and soil compaction			
Receptor(s)	Soil, biota, and vegetation			
PARAMETER	**WITHOUT MITIGATION**	**SCORE**	**WITH MITIGATION**	**SCORE**
EXTENT (A)	Preferred Alternative:	1	Preferred Alternative:	1
	No-Go Alternative:	1	No-Go Alternative:	
DURATION (B)	Preferred Alternative:	1	Preferred Alternative:	1
	No-Go Alternative:	4	No-Go Alternative:	4
PROBABILITY (C)	Preferred Alternative:	2	Preferred Alternative:	1
	No-Go Alternative:	1	No-Go Alternative:	1
INTENSITY OR MAGNITUDE (D)	Preferred Alternative:	-1	Preferred Alternative:	1
	No-Go Alternative:	0	No-Go Alternative:	0
SIGNIFICANCE RATING (F) = (A*B*D)*C	Preferred Alternative:	**-2**	Preferred Alternative:	**1**
	No-Go Alternative:	**No impact**	No-Go Alternative:	**No impact**
CUMULATIVE IMPACTS	Low			
CONFIDENCE	Medium			
MITIGATION MEASURES	• Do not prolong the construction period; and rehabilitate any disturbed areas following completion of the construction period, whether complete or on hold. • Only designated laydown areas and access roads, within appropriate locations, should be used. • Where required, during construction, temporary drainage channels should divert surface runoff to appropriate areas. • Appropriately design drainage for infrastructure and roads. • Implement erosion control measures, where appropriate, e.g. erosion control mats. • Vehicles should be well maintained, parked over drip trays/hard-surfaced areas, and parked within designated areas. • Decommissioning phase - Land rehabilitation to near natural state, i.e. removal of foundations and filling of any resultant voids within the soil, as well as removal of hard surfaced areas. Replacement soil should be sourced locally to ensure homogeneity.			

24.2.8 Potential Heritage Impacts

Palaeontology Impacts

Activities associated with the construction and decommissioning of the Soyuz 4 project may disturb or destroy fossil material within the Quaternary sediment that covers the site. However, the potential for fossils in these sediments is very variable and significance of impacts palaeontological resources would thus be **low negative**, but **very low negative** with the implementation of mitigation measures.

IMPACT NATURE	Disturbance and/or destruction of paleontological material during construction		STATUS	LOW NEGATIVE
Impact Description	Direct disturbance and/or destruction of paleontological material because of excavation and clearing activities.			
Impact Source(s)	Activities associated with the construction and decommissioning of the SPV facility			
Receptor(s)	Potential palaeontological material within the development footprint			
PARAMETER	WITHOUT MITIGATION	SCORE	WITH MITIGATION	SCORE
EXTENT (A)	Preferred Alternative:	1	Preferred Alternative:	1
	No-Go Alternative:	0	No-Go Alternative:	0
DURATION (B)	Preferred Alternative:	4	Preferred Alternative:	4
	No-Go Alternative:	0	No-Go Alternative:	0
PROBABILITY (C)	Preferred Alternative:	1	Preferred Alternative:	1
	No-Go Alternative:	0	No-Go Alternative:	0
INTENSITY OR MAGNITUDE (D)	Preferred Alternative:	-2	Preferred Alternative:	2
	No-Go Alternative:	0	No-Go Alternative:	0
SIGNIFICANCE RATING (F) = (A*B*D)*C	Preferred Alternative:	-8	Preferred Alternative:	8
	No-Go Alternative:	-0	No-Go Alternative:	+0
CUMULATIVE IMPACTS	Cumulative impacts to palaeontological resources are difficult to assess due to the variable distribution and preservation of fossil material. However, location of this project and others approved or built within a 30 km radius on areas either largely underlain by dolerite or Quaternary sediments suggests that a cumulative impact on palaeontological resources is not likely.			
CONFIDENCE	High			
MITIGATION MEASURES	• Implement a Fossil Chance Find Protocol. • Environmental Compliance Officer to monitor earthworks for fossils. • Report any chance finds of palaeontological material to a palaeontologist who must collect a representative sample.			

Archaeology

Archaeological sites and/or materials may be affected during activities associated with the construction and decommissioning of the Project. Most of the archaeological material identified within the project footprint is of very low cultural significance,. The significance of impacts on the known archaeological would thus be low negative, but very low negative with the implementation of mitigation measures.

IMPACT NATURE	Disturbance and/or destruction of archaeological sites and/or materials during construction and decommissioning		STATUS	LOW NEGATIVE
Impact Description	Disturbance and/or destruction of archaeological sites and/or materials			
Impact Source(s)	Activities associated with the construction and decommissioning of the SPV facility			
Receptor(s)	Known and potential archaeological sites and/or materials			
PARAMETER	WITHOUT MITIGATION	SCORE	WITH MITIGATION	SCORE
EXTENT (A)	Preferred Alternative:	1	Preferred Alternative:	1
	No-Go Alternative:	0	No-Go Alternative:	0
DURATION (B)	Preferred Alternative:	4	Preferred Alternative:	4
	No-Go Alternative:	0	No-Go Alternative:	0

IMPACT NATURE	Disturbance and/or destruction of archaeological sites and/or materials during construction and decommissioning		STATUS	LOW NEGATIVE
PROBABILITY (C)	Preferred Alternative:	3	Preferred Alternative:	2
	No-Go Alternative:	0	No-Go Alternative:	0
INTENSITY OR MAGNITUDE (D)	Preferred Alternative:	-2	Preferred Alternative:	1
	No-Go Alternative:	0	No-Go Alternative:	0
SIGNIFICANCE RATING (F) = (A*B*D)*C	Preferred Alternative:	-24	Preferred Alternative:	8
	No-Go Alternative:	-0	No-Go Alternative:	+0
CUMULATIVE IMPACTS	Cumulative impacts to archaeological resources are difficult to assess due to the variable distribution and quality of archaeological surveys ion the area. However, our cumulative knowledge of the archaeology of the Karoo suggests that the cumulative impact of the Soyuz SPV Cluster and other projects within a 30km on archaeological resources is likely to be low.			
CONFIDENCE	High			
MITIGATION MEASURES	Report any chance finds of archaeological material to SAHRA and/or an archaeologist.			

Graves or Burials

Human graves or burials could be impacted almost anywhere on the site, but the probability of this happening during activities earthworks associated with the construction and decommissioning of the Project is extremely low and the significance rating is thus **very low negative** both without and with the implementation of mitigation measures.

IMPACT NATURE	Disturbance and/or destruction of graves or burials during construction and decommissioning		STATUS	VERY LOW NEGATIVE
Impact Description	Physical disturbance and/or destruction of graves or burials because of excavations and clearing.			
Impact Source(s)	Activities associated with the construction and decommissioning of the SPV facility			
Receptor(s)	Potential human graves or burials			
PARAMETER	WITHOUT MITIGATION	SCORE	WITH MITIGATION	SCORE
EXTENT (A)	Preferred Alternative:	1	Preferred Alternative:	1
	No-Go Alternative:	0	No-Go Alternative:	0
DURATION (B)	Preferred Alternative:	4	Preferred Alternative:	4
	No-Go Alternative:	0	No-Go Alternative:	0
PROBABILITY (C)	Preferred Alternative:	1	Preferred Alternative:	1
	No-Go Alternative:	0	No-Go Alternative:	0
INTENSITY OR MAGNITUDE (D)	Preferred Alternative:	-2	Preferred Alternative:	1
	No-Go Alternative:	0	No-Go Alternative:	0
SIGNIFICANCE RATING (F) = (A*B*D)*C	Preferred Alternative:	-8	Preferred Alternative:	4
	No-Go Alternative:	-0	No-Go Alternative:	+0
CUMULATIVE IMPACTS	Most historical graveyards are associated with farm complexes, whether still occupied or not, and are thus generally avoided in the planning and construction of project such as the Soyuz 4 SPV park. Although unmarked burials can occur anywhere within the landscape, the pre-colonial inhabitants of the area often buried their dead along river courses which are invariably excluded from developments due to their other environmental sensitivity. Overall, therefore, it is likely that the cumulative impacts of this project and others in the vicinity on graves and burials will be very low.			

IMPACT NATURE	Disturbance and/or destruction of graves or burials during construction and decommissioning	STATUS	VERY LOW NEGATIVE
CONFIDENCE	High		
MITIGATION MEASURES	Cease work immediately in the immediate area if human remains are encountered. Leave remains in situ and make site safe. Report the finds to SAHRA and/or an archaeologist.		

Cultural Landscape

The cultural landscape is likely to be the heritage resource most affected by the construction of the SPV facility, but given that it is of low cultural significance, the potential impact is assessed to be **low negative**.

IMPACT NATURE	Alteration of the cultural landscape due to the presence of the SPV project		STATUS	LOW NEGATIVE
Impact Description	Alteration of the cultural landscape			
Impact Source(s)	Construction of the SPV facility			
Receptor(s)	Landscape in and around the SPV facility			
PARAMETER	WITHOUT MITIGATION	SCORE	WITH MITIGATION	SCORE
EXTENT (A)	Preferred Alternative:	1	Preferred Alternative:	1
	No-Go Alternative:	0	No-Go Alternative:	0
DURATION (B)	Preferred Alternative:	3	Preferred Alternative:	3
	No-Go Alternative:	0	No-Go Alternative:	0
PROBABILITY (C)	Preferred Alternative:	3	Preferred Alternative:	3
	No-Go Alternative:	0	No-Go Alternative:	0
INTENSITY OR MAGNITUDE (D)	Preferred Alternative:	-2	Preferred Alternative:	1
	No-Go Alternative:	0	No-Go Alternative:	0
SIGNIFICANCE RATING (F) = (A*B*D)*C	Preferred Alternative:	-18	Preferred Alternative:	9
	No-Go Alternative:	-0	No-Go Alternative:	0
CUMULATIVE IMPACTS	Impacts on the cultural landscape could occur extensively if numerous projects are constructed close to one another and especially if these projects contain tall structural elements like turbines or powerlines. These impacts cannot be fully mitigated but the application of the recommendations of visual consultants would likely reduce the impacts from medium to low negative.			
CONFIDENCE	High			
MITIGATION MEASURES	Minimise disturbance footprint during construction and rehabilitate all disturbed areas that will not be needed during operation. At decommissioning, rehabilitate all areas following approved rehabilitation plan.			

24.2.9 Potential Noise Impact

Based on the available information, and the specialist noise it is reasonable to suggest that noise impacts are likely to be present during the construction phase of this Project.

Noise may be generated by the construction activities and the use of construction equipment such as Graders, TLB's, front end loaders, drilling equipment, generators and cranes. The use of this equipment will create an increase in noise levels in the immediate vicinity of the construction activities and in some cases at some distance from the activities.

IMPACT NATURE	Noise generated by construction equipment operation		STATUS	LOW NEGATIVE
Impact Description	Change in the prevailing ambient noise levels in the vicinity of the construction activities.			
Impact Source(s)	Operation of construction vehicles and equipment.			
Receptor(s)	Farm-houses in the vicinity of the SOLAR PV PARK			
PARAMETER	**WITHOUT MITIGATION**	**SCORE**	**WITH MITIGATION**	**SCORE**
EXTENT (A)	Preferred Alternative:	1	Preferred Alternative:	1
	No-Go Alternative:	1	No-Go Alternative:	1
DURATION (B)	Preferred Alternative:	2	Preferred Alternative:	2
	No-Go Alternative:	2	No-Go Alternative:	2
PROBABILITY (C)	Preferred Alternative:	2	Preferred Alternative:	1
	No-Go Alternative:	3	No-Go Alternative:	2
INTENSITY OR MAGNITUDE (D)	Preferred Alternative:	-1	Preferred Alternative:	-1
	No-Go Alternative:	-2	No-Go Alternative:	-2
SIGNIFICANCE RATING (F) = (A*B*D)*C	Preferred Alternative:	**-4**	Preferred Alternative:	**-4**
	No-Go Alternative:	**-12**	No-Go Alternative:	**-8**
CUMULATIVE IMPACTS	The noise level increase during the daytime will be below the nuisance threshold value of 7.0dBA.			
CONFIDENCE	High			
MITIGATION MEASURES	Construction activities to take place during daytime only. Noise Management Plan to be included in EMPr and implemented.			

24.2.10 Potential Social Impacts

Based on the available information, it is reasonable to suggest that the following social impacts are likely to be prevalent during the construction phase of this Project.

Creation of Local Employment, Training and Business Opportunities

The construction phase of each PV SEFs will extend over a period of approximately 18 months and create in the region of 200 - 250 employment opportunities. Members from the local communities in the area, specifically Britstown and De Aar, would be able to qualify for most of the low skilled and semi-skilled employment opportunities. Most of these employment opportunities will accrue to Historically Disadvantaged (HD) members of the community. Based on information from similar projects the total wage bill will be in the region of R 25 million (2023 Rand values). A percentage of the wage bill will be spent in the local economy which will also create opportunities for local businesses in the local towns in the area.

IMPACT NATURE	Employment and business opportunities		STATUS	MEDIUM POSITIVE
Impact Description	Creation of employment and business opportunities during the construction phase			
Impact Source(s)	Construction and decommissioning activities			
Receptor(s)	Local and regional community			
PARAMETER	**WITHOUT MITIGATION**	**SCORE**	**WITH MITIGATION**	**SCORE**
EXTENT (A)	Preferred Alternative:	3	Preferred Alternative:	4
	No-Go Alternative:	0	No-Go Alternative:	0
DURATION (B)	Preferred Alternative:	2	Preferred Alternative:	2
	No-Go Alternative:	0	No-Go Alternative:	0
PROBABILITY (C)	Preferred Alternative:	4	Preferred Alternative:	4

IMPACT NATURE	Employment and business opportunities		STATUS	MEDIUM POSITIVE
	No-Go Alternative:	0	No-Go Alternative:	0
INTENSITY OR MAGNITUDE (D)	Preferred Alternative:	6	Preferred Alternative:	8
	No-Go Alternative:	0	No-Go Alternative:	0
SIGNIFICANCE RATING (F) = (A*B*D)*C	Preferred Alternative:	44	Preferred Alternative:	54
	No-Go Alternative:	0	No-Go Alternative:	0
CUMULATIVE IMPACTS	This impact is direct and considered temporary.			
RESIDUAL IMPACTS	Improved pool of skills and experience in the local area.			
CONFIDENCE	High			
CAN IMPACT BE ENHANCED	Yes			
ENHANCEMENT MEASURES	**Employment** ▪ Preparation and implementation of a Stakeholder Engagement Plan (SEP) prior to and during the construction phase. ▪ Where reasonable and practical, the proponent should appoint local contractors and implement a 'locals first' policy, especially for semi and low-skilled job categories. However, due to the low skills levels in the area, most skilled posts are likely to be filled by people from outside the area. ▪ Where feasible, efforts should be made to employ local contactors that are compliant with Broad Based Black Economic Empowerment (BBBEE) criteria. ▪ Before the construction phase commences the proponent should meet with representatives from the ELM to establish the existence of a skills database for the area. If such as database exists, it should be made available to the contractors appointed for the construction phase. ▪ The local authorities, community representatives, and organisations on the interested and affected party database should be informed of the final decision regarding the project and the potential job opportunities for locals and the employment procedures that the proponent intends following for the construction phase of the project. ▪ Where feasible, training and skills development programmes for locals should be initiated prior to the initiation of the construction phase. ▪ The recruitment selection process should seek to promote gender equality and the employment of women wherever possible. **Business** ▪ The proponent should liaise with the ELM with regards the establishment of a database of local companies, specifically BBBEE companies, which qualify as potential service providers (e.g. construction companies, catering companies, waste collection companies, security companies etc.) prior to the commencement of the tender process for construction contractors. These companies should be notified of the tender process and invited to bid for project-related work. ▪ Where possible, the proponent should assist local BBBEE companies to complete and submit the required tender forms and associated information. ▪ The ELM, in conjunction with the local business sector and representatives from the local hospitality industry, should identify strategies aimed at maximising the potential benefits associated with the project.			

Impact of Construction Workers on Local Communities

The presence of construction workers poses a potential risk to family structures and social networks. While the presence of construction workers does not in itself constitute a social impact, the way construction workers conduct themselves can impact on local communities. The most significant negative impact is associated with the disruption of existing family structures and social networks. This risk is linked to potentially risky behaviour, mainly of male construction workers.

IMPACT NATURE	Social impact of construction workers		STATUS	MEDIUM NEGATIVE
Impact Description	Potential social impacts due to presence of construction workers and potential impacts on family structures and social networks.			
Impact Source(s)	Construction and decommissioning activities			
Receptor(s)	Local and regional community			
PARAMETER	WITHOUT MITIGATION	SCORE	WITH MITIGATION	SCORE
EXTENT (A)	Preferred Alternative:	2	Preferred Alternative:	1
	No-Go Alternative:	0	No-Go Alternative:	0
DURATION (B)	Preferred Alternative:	2	Preferred Alternative:	2
	No-Go Alternative:	0	No-Go Alternative:	0
PROBABILITY (C)	Preferred Alternative:	3	Preferred Alternative:	2
	No-Go Alternative:	0	No-Go Alternative:	0
INTENSITY OR MAGNITUDE (D)	Preferred Alternative:	-6	Preferred Alternative:	-4
	No-Go Alternative:	0	No-Go Alternative:	0
SIGNIFICANCE RATING (F) = (A*B*D)*C	Preferred Alternative:	**-30**	Preferred Alternative:	**-21**
	No-Go Alternative:	**0**	No-Go Alternative:	**0**
Reversibility	No in the case of HIV and AIDs			
CUMULATIVE IMPACTS	This impact is direct and considered temporary			
RESIDUAL IMPACTS	Impacts on family and community relations that may, in some cases, persist for a long period of time. Also, in cases where unplanned / unwanted pregnancies occur or members of the community are infected by an STD, specifically HIV and or AIDS, the impacts may be permanent and have long term to permanent cumulative impacts on the affected individuals and/or their families and the community.			
CONFIDENCE	High			
CAN IMPACT BE MITIGATED	Yes, to some degree. However, the risk cannot be eliminated			
MITIGATION MEASURES	▪ Preparation and implementation of a Stakeholder Engagement Plan (SEP) prior to and during the construction phase. ▪ Preparation and implementation of a Community Health, Safety and Security Plan (CHSSP) prior to and during the construction phase. ▪ The SEP and CHSSP should include a Grievance Mechanism that enables stakeholders to report resolve incidents. ▪ Where possible, the proponent should make it a requirement for contractors to implement a 'locals first' policy for construction jobs, specifically for semi and low-skilled job categories. ▪ The proponent should consider the option of establishing a Monitoring Committee (MC) for the construction phase that representatives from local landowners, farming associations, and the local municipality. This MC should be established prior to commencement of the construction phase and form part of the SEP. ▪ The proponent and contractor should develop an agreement for construction workers. The agreement should identify which types of behaviour and activities are not acceptable. Construction workers in breach of the agreement should be subject to appropriate disciplinary action and/or dismissed. All dismissals must comply with the South African labour legislation. The agreement should be signed by the proponent and the contractors before the contractors move onto site. The agreement should form part of the CHSSP. ▪ The proponent and the contractor should implement an HIV/AIDS, COVID-19 and Tuberculosis (TB) awareness programme for all construction workers at the outset of the construction phase. The programmes should form part of the CHSSP.			

IMPACT NATURE	Social impact of construction workers	STATUS	MEDIUM NEGATIVE
	▪ The contractor should provide transport for workers to and from the site daily. This will enable the contactor to effectively manage and monitor the movement of construction workers on and off the site. ▪ The contractor must ensure that all construction workers from outside the area are transported back to their place of residence within 2 days for their contract coming to an end. ▪ No construction workers, except for security personnel, should be permitted to stay over-night on the site.		

Influx of Job Seekers

Large construction projects tend to attract people to the area in the hope that they will secure a job, even if it is a temporary job. These job seekers can in turn become "economically stranded" in the area or decide to stay on irrespective of finding a job or not. The main areas of concern associated with the influx of job seekers include:

- Impacts on existing social networks and community structures.
- Competition for housing, specifically low-cost housing.
- Competition for scarce jobs.
- Increase in incidences of crime.

IMPACT NATURE	Influx of job seekers		STATUS	LOW NEGATIVE
Impact Description	Potential social impacts because of influx of job seekers (migrant workers) to the area.			
Impact Source(s)	Construction and decommissioning activities			
Receptor(s)	Local and regional community			
PARAMETER	**WITHOUT MITIGATION**	**SCORE**	**WITH MITIGATION**	**SCORE**
EXTENT (A)	Preferred Alternative:	2	Preferred Alternative:	1
	No-Go Alternative:	0	No-Go Alternative:	0
DURATION (B)	Preferred Alternative:	2	Preferred Alternative:	2
	No-Go Alternative:	0	No-Go Alternative:	0
PROBABILITY (C)	Preferred Alternative:	3	Preferred Alternative:	3
	No-Go Alternative:	0	No-Go Alternative:	0
INTENSITY OR MAGNITUDE (D)	Preferred Alternative:	-2	Preferred Alternative:	-2
	No-Go Alternative:	0	No-Go Alternative:	0
SIGNIFICANCE RATING (F) = (A*B*D)*C	Preferred Alternative:	**-18**	Preferred Alternative:	**-15**
	No-Go Alternative:	**0**	No-Go Alternative:	**0**
Reversibility	No in the case of HIV and AIDs			
CUMULATIVE IMPACTS	This impact is direct and considered temporary			
RESIDUAL IMPACTS	Impacts on family and community relations that may, in some cases, persist for a long period of time. Also, in cases where unplanned / unwanted pregnancies occur or members of the community are infected by an STD, specifically HIV and or AIDS, the impacts may be permanent and have long term to permanent cumulative impacts on the affected individuals and/or their families and the community.			
CONFIDENCE	LOW			

IMPACT NATURE	Influx of job seekers	STATUS	LOW NEGATIVE
CAN IMPACT BE MITIGATED	Yes, to some degree. However, the risk cannot be eliminated		
MITIGATION MEASURES	It is impossible to stop people from coming to the area in search of employment. However, as indicated above, the proponent should ensure that the employment criteria favour residents from the area. In addition: • Preparation and implementation of a Stakeholder Engagement Plan (SEP) prior to and during the construction phase. • Preparation and implementation of a Community Health, Safety and Security Plan (CHSSP) prior to and during the construction phase. • The proponent, in consultation with the ELM, should investigate the option of establishing a MC to monitor and identify potential problems that may arise due to the influx of job seekers to the area. • The proponent should implement a "locals first" policy, specifically regarding unskilled and low skilled opportunities. • The proponent should implement a policy that no employment will be available at the gate.		

Risk to safety, livestock, and farm infrastructure

The presence on and movement of construction workers on and off the site poses a potential safety threat to local famers and farm workers in the vicinity of the site. In addition, farm infrastructure, such as fences and gates, may be damaged and stock losses may also result from gates being left open and/or fences being damaged, or stock theft linked either directly or indirectly to the presence of farm workers on the site.

IMPACT NATURE	Farm safety		STATUS	LOW NEGATIVE
Impact Description	Potential risk to safety of farmers and farm workers, livestock and damage to farm infrastructure associated with the presence of construction workers on site			
Impact Source(s)	Construction and decommissioning activities			
Receptor(s)	Local and regional community			
PARAMETER	WITHOUT MITIGATION	SCORE	WITH MITIGATION	SCORE
EXTENT (A)	Preferred Alternative:	3	Preferred Alternative:	1
	No-Go Alternative:	0	No-Go Alternative:	0
DURATION (B)	Preferred Alternative:	2	Preferred Alternative:	2
	No-Go Alternative:	0	No-Go Alternative:	0
PROBABILITY (C)	Preferred Alternative:	3	Preferred Alternative:	3
	No-Go Alternative:	0	No-Go Alternative:	0
INTENSITY OR MAGNITUDE (D)	Preferred Alternative:	-6	Preferred Alternative:	-4
	No-Go Alternative:	0	No-Go Alternative:	0
SIGNIFICANCE RATING (F) = (A*B*D)*C	Preferred Alternative:	33	Preferred Alternative:	24
	No-Go Alternative:	0	No-Go Alternative:	0
Reversibility	Yes, compensation paid for stock losses and damage to farm infrastructure etc.			
CUMULATIVE IMPACTS	This impact is direct and considered temporary			
RESIDUAL IMPACTS	No, provided losses are compensated for.			
CONFIDENCE	LOW			

IMPACT NATURE	Farm safety	STATUS	LOW NEGATIVE
CAN IMPACT BE MITIGATED	Yes		
MITIGATION MEASURES	▪ All farm gates must be closed after passing through. ▪ Contractors appointed by the proponent should provide daily transport for low and semi-skilled workers to and from the site. ▪ The proponent should consider the option of establishing a MF (see above) that includes local farmers and develop an agreement for construction workers. This committee should be established prior to commencement of the construction phase. This agreement should be signed by the proponent and the contractors before the contractors move onto site. ▪ The proponent should hold contractors liable for compensating farmers and communities in full for any stock losses and/or damage to farm infrastructure that can be linked to construction workers. This should be contained in the agreement to be signed between the proponent, the contractors, and neighbouring landowners. The agreement should also cover loses and costs associated with fires caused by construction workers or construction related activities (see below). ▪ The Environmental Management Plan (EMP) must outline procedures for managing and storing waste on site, specifically plastic waste that poses a threat to livestock if ingested. ▪ Contractors appointed by the proponent must ensure that all workers are informed at the outset of the construction phase of the conditions contained in theagreement, specifically consequences of stock theft and trespassing on adjacent farms. ▪ Contractors appointed by the proponent must ensure that construction workers who are found guilty of stealing livestock and/or damaging farm infrastructure are dismissed and charged. This should be contained in the agreement. All dismissals must be in accordance with South African labour legislation. ▪ It is recommended that no construction workers, except for security personnel, should be permitted to stay over-night on the site.		

Increased Risk of Grass Fires

The presence of construction workers and construction-related activities on the site poses an increased risk of grass fires that could, in turn pose, a threat to livestock, crops, wildlife and farm infrastructure. The potential risk of grass fires will be higher during the dry, windy winter months from May to October.

IMPACT NATURE	Fire damage		STATUS	LOW NEGATIVE
Impact Description	Potential loss of livestock, crops and houses, damage to farm infrastructure and threat to human life associated with increased incidence of grass fires			
Impact Source(s)	Construction and decommissioning activities			
Receptor(s)	Local and regional community			
PARAMETER	WITHOUT MITIGATION	SCORE	WITH MITIGATION	SCORE
EXTENT (A)	Preferred Alternative:	4	Preferred Alternative:	2
	No-Go Alternative:	0	No-Go Alternative:	0
DURATION (B)	Preferred Alternative:	2	Preferred Alternative:	2
	No-Go Alternative:	0	No-Go Alternative:	0
PROBABILITY (C)	Preferred Alternative:	3	Preferred Alternative:	3
	No-Go Alternative:	0	No-Go Alternative:	0
INTENSITY OR MAGNITUDE (D)	Preferred Alternative:	-6	Preferred Alternative:	-4
	No-Go Alternative:	0	No-Go Alternative:	0
SIGNIFICANCE RATING (F) = (A*B*D)*C	Preferred Alternative:	36	Preferred Alternative:	24
	No-Go Alternative:	0	No-Go Alternative:	0

IMPACT NATURE	Fire damage	STATUS	LOW NEGATIVE
Reversibility	Yes, compensation paid for stock and crop losses etc.		
CUMULATIVE IMPACTS	This impact is direct and considered temporary		
RESIDUAL IMPACTS	No, provided losses are compensated for.		
CONFIDENCE	Low		
CAN IMPACT BE MITIGATED	Yes		
MITIGATION MEASURES	▪ Contractor should ensure that open fires on the site for cooking or heating are not allowed except in designated areas. ▪ Smoking on site should be confined to designated areas. ▪ Contractor should ensure that construction related activities that pose a potential fire risk, such as welding, are properly managed and are confined to areas where the risk of fires has been reduced. Measures to reduce the risk of fires include avoiding working in high wind conditions when the risk of fires is greater. In this regard special care should be taken during the high-risk dry, windy winter months. ▪ Contractor should provide adequate fire-fighting equipment on-site, including a fire fighting vehicle. ▪ Contractor should provide fire-fighting training to selected construction staff. ▪ No construction staff, except for security staff, to be accommodated on site overnight. ▪ As per the conditions of the agreement, in the advent of a fire being caused by construction workers and or construction activities, the appointed contractors must compensate farmers for any damage caused to their farms. The contractor should also compensate the fire-fighting costs borne by farmers and local authorities.		

Nuisance Impacts

Construction related activities, including the movement of heavy construction vehicles of and on the site, has the potential to create dust, noise and safety impacts and damage roads. The impacts will be largely local and can be effectively mitigated. The number of potentially sensitive social receptors, such as farmsteads, will also be low due to the sparse settlement patterns and small number of farmsteads in the area.

IMPACT NATURE	Nuisance impacts		STATUS	LOW NEGATIVE
Impact Description	Potential noise, dust and safety impacts associated with construction related activities			
Impact Source(s)	Construction and decommissioning activities			
Receptor(s)	Local and regional community			
PARAMETER	WITHOUT MITIGATION	SCORE	WITH MITIGATION	SCORE
EXTENT (A)	Preferred Alternative:	2	Preferred Alternative:	1
	No-Go Alternative:	0	No-Go Alternative:	0
DURATION (B)	Preferred Alternative:	2	Preferred Alternative:	2
	No-Go Alternative:	0	No-Go Alternative:	0
PROBABILITY (C)	Preferred Alternative:	3	Preferred Alternative:	3
	No-Go Alternative:	0	No-Go Alternative:	0
INTENSITY OR MAGNITUDE (D)	Preferred Alternative:	-6	Preferred Alternative:	-2
	No-Go Alternative:	0	No-Go Alternative:	0
	Preferred Alternative:	**-30**	Preferred Alternative:	**-15**

IMPACT NATURE	Nuisance impacts		STATUS	LOW NEGATIVE
SIGNIFICANCE RATING (F) = (A*B*D)*C	No-Go Alternative:	0	No-Go Alternative:	0
Reversibility	Yes, compensation paid for stock and crop losses etc.			
CUMULATIVE IMPACTS	This impact is direct and considered temporary			
RESIDUAL IMPACTS	If damage to local farm roads is not repaired then this will affect the farming activities in the area and result in higher maintenance costs for vehicles of local farmers and other road users. The costs will be borne by road users who were no responsible for the damage.			
CONFIDENCE	HIGH			
CAN IMPACT BE MITIGATED	Yes			
MITIGATION MEASURES	The potential impacts associated with heavy vehicles can be effectively mitigated. The mitigation measures include: • The movement of construction vehicles on the site should be confined to agreed access road/s. • Establishment of a Grievance Mechanism that provides local farmers and other road users with an effective and efficient mechanism to address issues related to construction related impacts, including damage to local gravel farm roads. • The movement of heavy vehicles associated with the construction phase should be timed to avoid times days of the week, such as weekends, when the volume of traffic travelling along the access roads may be higher. • Establishment of a Grievance Mechanism that provides local farmers and other road users with an effective and efficient mechanism to address issues related to construction related impacts, including damage to local gravel farm roads. • Dust suppression measures should be implemented, such as wetting on a regular basis and ensuring that vehicles used to transport sand and building materials are fitted with tarpaulins or covers. • All vehicles must be road worthy, and drivers must be qualified and made aware of the potential road safety issues and need for strict speed limits.			

Impacts Associated with Loss of Farmland

The activities associated with the construction phase and establishment of the proposed project and associated infrastructure will result in the disturbance and loss of land available for grazing. The impact on farmland associated with the construction phase can be mitigated by minimising the footprint of the construction related activities and ensuring that disturbed areas are fully rehabilitated on completion of the construction phase.

IMPACT NATURE	Loss of farmland		STATUS	LOW NEGATIVE
Impact Description	The activities associated with the construction phase, such as establishment of access roads and the construction camp, movement of heavy vehicles and preparation of foundations for the project etc. will damage farmlands and result in a loss of farmlands for grazing.			
Impact Source(s)	Construction and decommissioning activities			
Receptor(s)	Local and regional community			
PARAMETER	WITHOUT MITIGATION	SCORE	WITH MITIGATION	SCORE
EXTENT (A)	Preferred Alternative:	1	Preferred Alternative:	1
	No-Go Alternative:	0	No-Go Alternative:	0
DURATION (B)	Preferred Alternative:	5	Preferred Alternative:	2
	No-Go Alternative:	0	No-Go Alternative:	0

IMPACT NATURE	Loss of farmland		STATUS	LOW NEGATIVE
PROBABILITY (C)	Preferred Alternative:	3	Preferred Alternative:	4
	No-Go Alternative:	0	No-Go Alternative:	0
INTENSITY OR MAGNITUDE (D)	Preferred Alternative:	6	Preferred Alternative:	2
	No-Go Alternative:	0	No-Go Alternative:	0
SIGNIFICANCE RATING (F) = (A*B*D)*C	Preferred Alternative:	-36	Preferred Alternative:	-20
	No-Go Alternative:	0	No-Go Alternative:	0
Reversibility	Yes, disturbed areas can be rehabilitated			
CUMULATIVE IMPACTS	This impact is direct and considered temporary			
RESIDUAL IMPACTS	Overall loss of farmland could affect the livelihoods of the affected farmers, their families, and the workers on the farms and their families. However, disturbed areas can be rehabilitated.			
CONFIDENCE	HIGH			
CAN IMPACT BE MITIGATED	Yes			
MITIGATION MEASURES	The potential impacts associated with damage to, and loss of farmland can be effectively mitigated. The aspects that should be covered include: • An Environmental Control Officer (ECO) should be appointed to monitor the construction phase. • Existing internal roads should be used where possible. If new roads are required, these roads should be rehabilitated on completion of the construction phase. • The footprint associated with the construction related activities (access roads, construction camps, workshop etc.) should be minimised. • All areas disturbed by construction related activities, such as access roads on the site, construction camps etc., should be rehabilitated at the end of the construction phase. • The implementation of a rehabilitation programme should be included in the terms of reference for the contractor/s appointed. The specifications for the rehabilitation programme should be included in the EMPr. • The implementation of the Rehabilitation Programme should be monitored by the ECO.			

24.2.11 Potential Traffic Impacts

Increased traffic volumes

IMPACT NATURE	Increase in traffic volumes on the surrounding road network as a result of construction traffic		STATUS	LOW NEGATIVE
Impact Description	During the construction phase there will be an increase in traffic volumes on the surrounding road network that will impact on the general road users.			
Impact Source(s)	Construction activities			
Receptor(s)	General public/Road users			
PARAMETER	WITHOUT MITIGATION	SCORE	WITH MITIGATION	SCORE
EXTENT (A)	Preferred Alternative:	1	Preferred Alternative:	1
	No-Go Alternative:	1	No-Go Alternative:	1
DURATION (B)	Preferred Alternative:	1	Preferred Alternative:	1
	No-Go Alternative:	1	No-Go Alternative:	1
PROBABILITY (C)	Preferred Alternative:	3	Preferred Alternative:	2
	No-Go Alternative:	3	No-Go Alternative:	2
	Preferred Alternative:	-1	Preferred Alternative:	-1

IMPACT NATURE	Increase in traffic volumes on the surrounding road network as a result of construction traffic		STATUS	LOW NEGATIVE
INTENSITY OR MAGNITUDE (D)	No-Go Alternative:	-1	No-Go Alternative:	-1
SIGNIFICANCE RATING (F) = (A*B*D)*C	Preferred Alternative:	-3	Preferred Alternative:	-2
	No-Go Alternative:	-3	No-Go Alternative:	-2
CUMULATIVE IMPACTS	This impact is direct and considered temporary			
CONFIDENCE	HIGH			
MITIGATION MEASURES	• Construction traffic should not be allowed on the public road network during the typical weekday a.m. and p.m. peak hours in built up areas. • These measures will be included in the Traffic Management Plan			

Impacts of truck traffic

IMPACT NATURE	Gravel loss and possible damage to the road layer works. as a result of additional truck traffic during the construction phase.		STATUS	LOW NEGATIVE
Impact Description	During the construction phase there will be gravel loss and possible damage to the road layer works along Windpoort Road as a result of additional truck traffic and heavy load truck traffic delivering equipment to the site.			
Impact Source(s)	Construction activities			
Receptor(s)	General public/Road users			
PARAMETER	WITHOUT MITIGATION	SCORE	WITH MITIGATION	SCORE
EXTENT (A)	Preferred Alternative:	1	Preferred Alternative:	1
	No-Go Alternative:	1	No-Go Alternative:	1
DURATION (B)	Preferred Alternative:	1	Preferred Alternative:	1
	No-Go Alternative:	1	No-Go Alternative:	1
PROBABILITY (C)	Preferred Alternative:	3	Preferred Alternative:	2
	No-Go Alternative:	3	No-Go Alternative:	2
INTENSITY OR MAGNITUDE (D)	Preferred Alternative:	-2	Preferred Alternative:	-1
	No-Go Alternative:	-2	No-Go Alternative:	-1
SIGNIFICANCE RATING (F) = (A*B*D)*C	Preferred Alternative:	-6	Preferred Alternative:	-2
	No-Go Alternative:	-6	No-Go Alternative:	-2
CUMULATIVE IMPACTS	This impact is direct and considered temporary			
CONFIDENCE	HIGH			
MITIGATION MEASURES	• Resurfacing of sections along Windpoort Road, where required and regular road maintenance i.e. grading of the road once every two weeks during the construction phase. • The road can also be sprayed with water (grey water if available) once a day to limit dust pollution and gravel loss.			

24.2.12 Potential Visual Impacts

Based on the available information and the visual impact scoping report, it is reasonable to suggest that the following visual impacts are likely to be prevalent during the construction phase of this Project.

The visual impact scoping report has identified the following potential visual impacts associated with the construction phase:

- Development activities such as vegetation clearing, vehicular movement, rubble dumping, and associated construction will lead to changes in the landscape character and sense of place, visual exposure and visibility;
- Excavation activities related to the development of foundations for the substations and solar panels, resulting in dust generation, leading to visual exposure and visibility.

IMPACT NATURE	Potential impact on the overall landscape, visual intrusion and exposure of the landscape		STATUS	LOW 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 phase activities			
Receptor(s)	Witpoort Guest house			
PARAMETER	WITHOUT MITIGATION	SCORE	WITH MITIGATION	SCORE
EXTENT (A)	Preferred Alternative:	1	Preferred Alternative:	1
	No-Go Alternative:	1	No-Go Alternative:	1
DURATION (B)	Preferred Alternative:	1	Preferred Alternative:	1
	No-Go Alternative:	3	No-Go Alternative:	3
PROBABILITY (C)	Preferred Alternative:	2	Preferred Alternative:	1
	No-Go Alternative:	23	No-Go Alternative:	2
INTENSITY OR MAGNITUDE (D)	Preferred Alternative:	-2	Preferred Alternative:	-1
	No-Go Alternative:	1	No-Go Alternative:	1
SIGNIFICANCE RATING (F) = (A*B*D)*C	Preferred Alternative:	-4	Preferred Alternative:	-1
	No-Go Alternative:	6	No-Go Alternative:	6
CUMULATIVE IMPACTS	Cumulative visual impacts resulting from landscape modifications because of the proposed project in conjunction Soyuz 1 – 6 Solar PV Parks and the eleven 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 near 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.			
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			

IMPACT NATURE	Potential impact on the overall landscape, visual intrusion and exposure of the landscape	STATUS	LOW NEGATIVE
	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 SOLAR PV PARK, to avoid impeding visibility and ensure that it is visually pleasing to observers; • 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		

Visual Impacts of Night-time Lighting

IMPACT NATURE	Potential impact of night-time lighting on the visual environment		STATUS	LOW 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)	Farmhouses within 5 km of Soyuz Solar Park 1 and the Rietpoort Guest House			
PARAMETER	WITHOUT MITIGATION	SCORE	WITH MITIGATION	SCORE

IMPACT NATURE	Potential impact of night-time lighting on the visual environment		STATUS	LOW NEGATIVE
EXTENT (A)	Preferred Alternative:	1	Preferred Alternative:	1
	No-Go Alternative:	1	No-Go Alternative:	1
DURATION (B)	Preferred Alternative:	1	Preferred Alternative:	1
	No-Go Alternative:	3	No-Go Alternative:	3
PROBABILITY (C)	Preferred Alternative:	2	Preferred Alternative:	1
	No-Go Alternative:	2	No-Go Alternative:	2
INTENSITY OR MAGNITUDE (D)	Preferred Alternative:	-2	Preferred Alternative:	-1
	No-Go Alternative:	1	No-Go Alternative:	1
SIGNIFICANCE RATING (F) = (A*B*D)*C	Preferred Alternative:	-4	Preferred Alternative:	-1
	No-Go Alternative:	6	No-Go Alternative:	6
CUMULATIVE IMPACTS	Cumulative visual impacts resulting from landscape modifications because of the proposed project in conjunction Soyuz 1 – 6 Solar PV Parks and the eleven 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 near 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	➢ 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; • 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).			

Potential Waste Management Impacts

Potential waste impacts as a result from improper waste management practices on site during the construction of the Soyuz 4 Solar PV Park. Based on the available information it is reasonable to suggest that the impact will potentially have a **low negative** impact provided waste management plan is designed and costed for before construction starts.

IMPACT NATURE	Waste management impacts		STATUS	LOW NEGATIVE
Impact Description	Potential waste impacts due to the construction. The construction phase will generate construction wastes at large volumes that cannot be accommodated for by the local or regional. This could result in illegal disposal or treatment of waste which will impact negatively on the local and regional environment.			
Impact Source(s)	Construction phase – packaging waste			
Receptor(s)	Local and regional waste management facilities			
PARAMETER	WITHOUT MITIGATION	SCORE	WITH MITIGATION	SCORE
EXTENT (A)	Preferred Alternative:	3	Preferred Alternative:	3
	No-Go Alternative:	0	No-Go Alternative:	0
DURATION (B)	Preferred Alternative:	4	Preferred Alternative:	4
	No-Go Alternative:	0	No-Go Alternative:	0
PROBABILITY (C)	Preferred Alternative:	4	Preferred Alternative:	1
	No-Go Alternative:	0	No-Go Alternative:	0
INTENSITY OR MAGNITUDE (D)	Preferred Alternative:	-3	Preferred Alternative:	-1
	No-Go Alternative:	0	No-Go Alternative:	0
SIGNIFICANCE RATING (F) = (A*B*D)*C	Preferred Alternative:	**-144**	Preferred Alternative:	**-36**
	No-Go Alternative:	**0**	No-Go Alternative:	**0**
CUMULATIVE IMPACTS	This impact could be cumulative.			
CONFIDENCE	Medium			
MITIGATION MEASURES	Develop a detailed construction phase waste management plan that identifies all potential waste types to be generated and how they will be handled including the reuse, recycle before disposal. Ensure that the cost of handling waste is included into the tender requirements for the construction phase.;			

24.3 POTENTIAL OPERATIONS IMPACTS

24.3.1 Potential Avifaunal Impacts

Many of the potential avifauna impacts are associated with the completed facility structures and their location in association to sensitive landscapes. Addressing these potential impacts is undertaken during the design phase and these impacts are therefore assessed in the construction phase as all design requirements to mitigate against impacts should be finalised prior to construction.

Sensory Disturbance

Security lighting is an essential part of solar PV facilities. Security lighting can affect crepuscular and nocturnal behaviour of birds and may also affect nesting and feeding patterns or potential. Security lighting may cause certain species to relocate to alternative territories. In addition, lighting can blind some species to overhead structures and increase collisions with these structures at night.

IMPACT NATURE	Sensory disturbance		STATUS	NEGATIVE
Impact Description	Sensory disturbance because of night-time security lighting and increase in potential collisions and mortality.			
Impact Source(s)	Night-time lighting			
Receptor(s)	Primarily crepuscular and nocturnal species			
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	This impact could be cumulative.			
CONFIDENCE	High			
MITIGATION MEASURES	Minimise light pollution and fit external lighting with downward facing hoods.			

Chemical Use

The surfactants and/or dust suppressants and other chemicals that may be used to keep the PV panels clean may cause poisoning and or exacerbate habitat loss. However if the storage and use of these chemicals is properly controlled, the potential negative impact will be Low.

IMPACT NATURE	Ecotoxicity		STATUS	LOW NEGATIVE
Impact Description	The surfactants, dust suppressants and other chemicals that may be used to keep the PV panels clean may cause poisoning and or exacerbate habitat loss.			
Impact Source(s)	Chemicals.			
Receptor(s)	All avifauna			
PARAMETER	WITHOUT MITIGATION	SCORE	WITH MITIGATION	SCORE
EXTENT (A)	Preferred Alternative:	2	Preferred Alternative:	1
	No-Go Alternative:	2	No-Go Alternative:	2
DURATION (B)	Preferred Alternative:	3	Preferred Alternative:	3
	No-Go Alternative:	4	No-Go Alternative:	4
PROBABILITY (C)	Preferred Alternative:	2	Preferred Alternative:	1
	No-Go Alternative:	4	No-Go Alternative:	4
INTENSITY OR MAGNITUDE (D)	Preferred Alternative:	-2	Preferred Alternative:	-1
	No-Go Alternative:	+2	No-Go Alternative:	+2
SIGNIFICANCE RATING (F) = (A*B*D)*C	Preferred Alternative:	**-24**	Preferred Alternative:	**-3**
	No-Go Alternative:	**64**	No-Go Alternative:	**64**

IMPACT NATURE	Ecotoxicity	STATUS	LOW NEGATIVE
CUMULATIVE IMPACTS	The regular use of cleaning detergents by a large number of SOLAR PV PARKs in a region has the potential to adversely affect water quality of watercourses. The extent, regularity and intensity of this impact on a regional level in such an arid environment is difficult to assess and impacts of this nature from solar developments on avifauna are poorly studied. However, given the very limited occurrence of wetlands and drainage areas throughout the region as a whole, this is unlikely to be a major concern.		
CONFIDENCE	Medium		
MITIGATION MEASURES	▪ Avoid or minimise the use of chemical surfactants and dust suppressants on site; and ▪ Where necessary ensure that none of the cleaning water enters nearby watercourses through runoff; ▪ Do not clean before an imminent rainstorm.		

24.3.2 Potential Faunal Biodiversity Impacts

Loss of Faunal Habitat and Species Diversity

IMPACT NATURE	Impact – Loss of faunal habitat and potential species diversity	STATUS	LOW NEGATIVE
Impact Description	The most intense impact will occur with keeping the herbaceous material at a low height below the PV panels as part of the ongoing maintenance activities for the proposed Soyuz 4 Solar PV Park, which will lead to faunal habitat loss. Potential ineffective rehabilitation of exposed and impacted areas leading to vegetation succession and a possible reduction of faunal diversity over the long-term. Poorly implemented and monitored AIP Management programme leading to the reintroduction and proliferation of AIP species within the proposed Soyuz 4 Solar PV Park and access road. Potential poor management and failure to monitor rehabilitation efforts, leading to: ○ Landscapes being left fragmented, resulting in reduced migration capabilities of faunal species, isolation of faunal populations and a decrease in faunal diversity; ○ Increased storm water run-off; ○ Compacted soils limiting the re-establishment of natural vegetation; and ○ Increased risk of erosion in areas left disturbed.		
Impact Source(s)	• Increased risk of faunal collisions with vehicles; • Altered species movement patterns and habitat utilisation in the local area; • Uncontrolled cutting of vegetation below the PV panels; • Long term impacts to faunal species assemblages of the footprint area, including lost opportunity to re-establish a semblance of faunal habitat and species activity in unison with the operation of the solar facility; • Possible increased fire frequency during operational and maintenance activities; and • Proliferation of AIP species that colonise disturbed areas.		
Receptor(s)	Faunal habitat and species		

Habitat Unit	Driver / Activity	PARAMETER	WITHOUT MITIGATION	SCORE	WITH MITIGATION	SCORE
Upper Karoo Habitat	**PV facility and associated infrastructure**	**EXTENT (A)**	Preferred Alternative:	2	Preferred Alternative:	1
		DURATION (B)	Preferred Alternative:	3	Preferred Alternative:	3
		PROBABILITY (C)	Preferred Alternative:	4	Preferred Alternative:	3
		INTENSITY OR MAGNITUDE (D)	**Preferred Alternative:**	**-3**	Preferred Alternative:	-2
		SIGNIFICANCE RATING (F) = (A*B*D)*C	**Preferred Alternative:**	**(-) Medium**	Preferred Alternative:	(-) Low
Upper Karoo		**EXTENT (A)**	**Preferred Alternative:**	**2**	Preferred Alternative:	1
		DURATION (B)	**Preferred**	**3**	Preferred Alternative:	3

Habitat & Modified Karoo Footslope	**Access road**		**Alternative:**			
		PROBABILITY (C)	**Preferred Alternative:**	**4**	Preferred Alternative:	3
		INTENSITY OR MAGNITUDE (D)	**Preferred Alternative:**	**-2**	Preferred Alternative:	-2
		SIGNIFICANCE RATING (F) = (A*B*D)*C	**Preferred Alternative:**	**(-) Medium**	Preferred Alternative:	(-) Low
Freshwater Ecosystem Habitat	**Access road**	**EXTENT (A)**	**Preferred Alternative:**	**2**	Preferred Alternative:	1
		DURATION (B)	**Preferred Alternative:**	**3**	Preferred Alternative:	3
		PROBABILITY (C)	**Preferred Alternative:**	**4**	Preferred Alternative:	3
		INTENSITY OR MAGNITUDE (D)	**Preferred Alternative:**	**-2**	Preferred Alternative:	-2
		SIGNIFICANCE RATING (F) = (A*B*D)*C	**Preferred Alternative:**	**(-) Medium**	Preferred Alternative:	(-) Low

CUMULATIVE IMPACTS	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 4 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. Vegetation clearing due to Soyuz 4 Solar PV Park will be at a local extent and vegetation regrowth will still provide habitat for common faunal species and no significant faunal habitat loss will present on a regional level. The current farming activities will still be present within the immediate area surrounding the Soyuz 4 Solar PV Park..
CONFIDENCE	High
MITIGATION MEASURES	▪ All vehicles should be restricted to travelling only on designated roadways to limit the ecological footprint of the development activities; ▪ No hunting/trapping or collecting of faunal species is allowed; ▪ Lights should face downwards to reduce the abundance of insects and any other fauna attracted to light. Invertebrates may attract bats to the project areas and may increase bat collisions or electrocutions. Furthermore, increased lighting will impose upon the nights darkness altering invertebrate movement. Lights should not be LED or white light; ▪ Ongoing alien and invasive plant monitoring and clearing/control should take place throughout the operational phase, and the project perimeters should be regularly checked for AIP establishment to prevent spread into surrounding natural areas which may alter the suitability of the habitat to faunal species; ▪ Alien vegetation that is removed must not be allowed to lay on unprotected ground as seeds might disperse upon it. All cleared

	plant material to be disposed of at a licensed waste facility, which comply with legal standards; ▪ No illicit fires must be allowed; ▪ Where bare soils are left exposed as a result of construction activities, they should be immediately rehabilitated. Rehabilitated efforts should continue to be monitored throughout the operational phase, until natural processes will allow the ecological functioning and biodiversity of the area to be re-instated; ▪ Rehabilitation must proceed in accordance with the approved rehabilitation plan and must aim to achieve more than rehabilitation but must ensure that the veld is restored, at least, to a point where natural processes can re-instate the environment to a state that has the majority of the elements of biodiversity can be re-instated and supported; ▪ Preserve, enhance, restore or replace faunal movement corridors and habitat, important the freshwater ecosystem habitat; ▪ Edge effect control needs to be implemented to ensure no further degradation and potential loss of faunal SCC outside of the proposed project footprint area. An on-site Environmental Control Officer (ECO) should monitor and mitigate any edge effects throughout the life of the operation; ▪ No additional habitat is to be disturbed outside of the approved footprints areas. Bi-annual (minimum requirement) monitoring and recording of the footprint areas must be done during the operational and maintenance phase by the ECO and photographic records kept – special attention should also be paid to potential increase and spread of AIPs; ▪ Rehabilitation should only cease once a suitably qualified team of ecologists sign off that the rehabilitation and restoration is adequate; and ▪ It is recommended that vegetation regrowth during the Operational and Maintenance Phases must be promoted while appropriately maintained so as not to create a safety or production risk, as this will create habitat for faunal species and will aid in preventing soil erosion.

Loss of Faunal Species of Conservation Concern

IMPACT NATURE	Impact – Loss of faunal SCC	STATUS	LOW NEGATIVE
Impact Description	The most significant impact will occur with keeping the herbaceous material at a low height below the PV panels as part of the ongoing maintenance activities for the proposed Soyuz 4 Solar PV Park, which will lead to faunal SCC habitat loss. Potential ineffective rehabilitation of exposed and impacted areas leading to vegetation succession and a possible reduction of faunal SCC habitat over the long-term. Poorly implemented and monitored AIP Management programme leading to the reintroduction and proliferation of AIP species within the proposed Soyuz 4 Solar PV Park and access road. Potential poor management and failure to monitor rehabilitation efforts, leading to: ○ Landscapes being left fragmented, resulting in reduced migration capabilities of faunal SCC species, isolation of faunal SCC populations; ○ Increased storm water run-off; ○ Compacted soils limiting the re-establishment of natural vegetation; and Increased risk of erosion in areas left disturbed.		

Impact Source(s)	• Increased risk of faunal collisions with vehicles; • Altered faunal SCC movement patterns and habitat utilisation in the local area; • Long term impacts to faunal SCC of the footprint area, including lost opportunity to re-establish a semblance of faunal SCC habitat and species activity in unison with the operation of the solar facility; and • Possible increased fire frequency during operational and maintenance activities; and • Proliferation of AIP species that colonise disturbed areas.
Receptor(s)	Faunal SCC habitat

Habitat Unit	Driver / Activity	PARAMETER	WITHOUT MITIGATION	SCORE	WITH MITIGATION	SCORE
Upper Karoo Habitat	**PV facility and associated infrastructure**	**EXTENT (A)**	Preferred Alternative:	2	Preferred Alternative:	1
		DURATION (B)	Preferred Alternative:	3	Preferred Alternative:	3
		PROBABILITY (C)	Preferred Alternative:	4	Preferred Alternative:	3
		INTENSITY OR MAGNITUDE (D)	Preferred Alternative:	-3	Preferred Alternative:	-2
		SIGNIFICANCE RATING (F) = (A*B*D)*C	Preferred Alternative:	**(-) Medium**	Preferred Alternative:	**(-) Low**
Upper Karoo Habitat & Modified Karoo Footslope	**Access road**	**EXTENT (A)**	Preferred Alternative:	2	Preferred Alternative:	1
		DURATION (B)	Preferred Alternative:	3	Preferred Alternative:	3
		PROBABILITY (C)	Preferred Alternative:	4	Preferred Alternative:	3
		INTENSITY OR MAGNITUDE (D)	Preferred Alternative:	-2	Preferred Alternative:	-2
		SIGNIFICANCE RATING (F) = (A*B*D)*C	Preferred Alternative:	**(-) Medium**	Preferred Alternative:	**(-) Low**
Freshwater Ecosystem Habitat	**Access road**	**EXTENT (A)**	Preferred Alternative:	2	Preferred Alternative:	1
		DURATION (B)	Preferred Alternative:	3	Preferred Alternative:	3
		PROBABILITY (C)	Preferred Alternative:	4	Preferred Alternative:	3
		INTENSITY OR MAGNITUDE (D)	Preferred Alternative:	-3	Preferred Alternative:	-2

		SIGNIFICANCE RATING (F) = (A*B*D)*C	Preferred Alternative:	**(-) High**	Preferred Alternative:	**(-) Low**
CUMULATIVE IMPACTS		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 4 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. Vegetation clearing due to Soyuz 4 Solar PV Park will be at a local extent and vegetation regrowth will still provide habitat for common faunal species and no significant faunal habitat loss will present on a regional level. The current farming activities will still be present within the immediate area surrounding the Soyuz 4 Solar PV Park.				
CONFIDENCE		High				
MITIGATION MEASURES		▪ Ongoing alien and invasive plant monitoring and clearing/control should take place throughout the operational and maintenance phase, and the project perimeters should be regularly checked for AIP establishment to prevent spread into surrounding natural areas which may alter the suitability of the habitat to faunal species; ▪ Alien vegetation that is removed must not be allowed to lay on unprotected ground as seeds might disperse upon it. All cleared plant material to be disposed of at a licensed waste facility, which comply with legal standards; • All footprints should be rehabilitated as close to their pre-development conditions as possible, with indigenous vegetation re-instated to support faunal recolonisation of the area; • No collection or hunting of any fauna species is to be allowed by personnel, especially with regards to faunal SCC (if encountered and not part of a rescue/relocation plan); • Edge effect control needs to be implemented to prevent further degradation and potential loss of faunal SCC habitat outside of the proposed development footprint; • Where bare soils are left exposed because of construction activities, they should be immediately rehabilitated. Rehabilitated efforts should continue to be monitored throughout the operational phase, until natural processes will allow the ecological functioning and biodiversity of the area to be re-instated; • Rehabilitation must proceed in accordance with the approved rehabilitation plan and must aim to achieve more than rehabilitation but must ensure that the veld is restored, at least, to a point where natural processes can re-instate the environment to a state that has the majority of the elements of biodiversity can be re-instated and supported; • Rehabilitation efforts must be implemented for a period of at least five years after decommissioning and closure; • It is recommended that vegetation regrowth during the Operational and Maintenance Phases must be promoted while appropriately maintained so as not to create a safety or production risk, as this will create habitat for faunal SCC and will aid in preventing soil erosion.				

24.3.3 Potential Floral Biodiversity Impacts

Loss of Floral Habitat and Diversity

<table>
<tr><th colspan="2">IMPACT NATURE</th><th colspan="3">Impact – Loss of floral habitat and potential species diversity</th><th>STATUS</th><th>LOW NEGATIVE</th></tr>
<tr><td colspan="2">Impact Description</td><td colspan="5">The most intense impact will occur with keeping the herbaceous material at a low height below the PV panels as part of the ongoing maintenance activities for the proposed Soyuz 4 Solar PV Park, which will lead to floral habitat loss. Potential ineffective rehabilitation of exposed and impacted areas leading to vegetation succession and a possible reduction of floral diversity over the long-term. Poorly implemented and monitored AIP Management programme leading to the reintroduction and proliferation of AIP species within the proposed Soyuz 4 Solar PV Park and access road. Potential poor management and failure to monitor rehabilitation efforts, leading to:
- Landscapes being left fragmented and a decrease in floral diversity;
- Increased storm water run-off;
- Compacted soils limiting the re-establishment of natural vegetation; and
- Increased risk of erosion in areas left disturbed.</td></tr>
<tr><td colspan="2">Impact Source(s)</td><td colspan="5">• Barrier effects, i.e., dispersal corridors altered / impaired due to long-term fragmentation of the remaining natural habitat in the Soyuz 4 Solar PV Park and surrounds (no planned vegetated corridors between or underneath the PV panels, and no indication of planned rehabilitation post-operation);
• Possible increased fire frequency during operational and maintenance activities; and
• Proliferation of AIP species that colonise disturbed areas.</td></tr>
<tr><td colspan="2">Receptor(s)</td><td colspan="5">Floral habitat and species</td></tr>
<tr><th>Habitat Unit</th><th>Driver / Activity</th><th>PARAMETER</th><th>WITHOUT MITIGATION</th><th>SCORE</th><th>WITH MITIGATION</th><th>SCORE</th></tr>
<tr><td rowspan="5">Open Karoo Veld Habitat, Low Open Shrubland</td><td rowspan="5">PV facility and associated infrastructure</td><td>EXTENT (A)</td><td>Preferred Alternative:</td><td>2</td><td>Preferred Alternative:</td><td>2</td></tr>
<tr><td>DURATION (B)</td><td>Preferred Alternative:</td><td>4</td><td>Preferred Alternative:</td><td>3</td></tr>
<tr><td>PROBABILITY (C)</td><td>Preferred Alternative:</td><td>3</td><td>Preferred Alternative:</td><td>2</td></tr>
<tr><td>INTENSITY OR MAGNITUDE (D)</td><td>Preferred Alternative:</td><td>-3</td><td>Preferred Alternative:</td><td>-2</td></tr>
<tr><td>SIGNIFICANCE RATING (F) = (A*B*D)*C</td><td>Preferred Alternative:</td><td>(-) High</td><td>Preferred Alternative:</td><td>(-) Low</td></tr>
<tr><td rowspan="4">Open Karoo Veld</td><td rowspan="4">Access road</td><td>EXTENT (A)</td><td>Preferred Alternative:</td><td>2</td><td>Preferred Alternative:</td><td>1</td></tr>
<tr><td>DURATION (B)</td><td>Preferred Alternative:</td><td>3</td><td>Preferred Alternative:</td><td>2</td></tr>
<tr><td>PROBABILITY (C)</td><td>Preferred Alternative:</td><td>3</td><td>Preferred Alternative:</td><td>2</td></tr>
<tr><td>INTENSITY OR MAGNITUDE (D)</td><td>Preferred Alternative:</td><td>-2</td><td>Preferred Alternative:</td><td>-1</td></tr>
</table>

		SIGNIFICANCE RATING (F) = (A*B*D)*C	Preferred Alternative:	**(-) Medium**	Preferred Alternative:	**(-) Low**
CUMULATIVE IMPACTS	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 4 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 several renewable energy facilities, which may alter the landscape character. Vegetation clearing due to Soyuz 4 Solar PV Park will be at a local extent and vegetation regrowth could possibly occur. The current farming activities will still be present within the immediate area surrounding the Soyuz 4 Solar PV Park.					
CONFIDENCE	High					
MITIGATION MEASURES	• All vehicles should be restricted to travelling only on designated roadways to limit the ecological footprint of the development activities; • Ongoing alien and invasive plant monitoring and clearing/control should take place throughout the operational phase, and the project perimeters should be regularly checked for AIP establishment to prevent spread into surrounding natural areas which may alter the suitability of the habitat to indigenous floral species; • Alien vegetation that is removed must not be allowed to lay on unprotected ground as seeds might disperse upon it. All cleared plant material to be disposed of at a licensed waste facility, which comply with legal standards; • No illicit fires must be allowed; • Where bare soils are left exposed as a result of construction activities, they should be immediately rehabilitated. Rehabilitated efforts should continue to be monitored throughout the operational phase, until natural processes will allow the ecological functioning and biodiversity of the area to be re-instated; • Monitor the Freshwater Habitat to ensure that floral communities are not degraded; • Edge effects arising from the operational and maintenance activities of the proposed development, such as erosion and AIP proliferation, which may affect adjacent natural areas, need to be strictly managed. Specific mention in this regard is made of Category 1b AIP species (as listed in the NEMBA Alien species lists, 2020), in line with the NEMBA Alien and Invasive Species Regulations (2020); and • It is recommended that vegetation regrowth during the Operational and Maintenance Phases must be promoted while appropriately maintained so as not to create a safety or production risk, as this will create habitat for floral species and will aid in preventing soil erosion.					

Loss of Floral Species of Conservation Concern

IMPACT NATURE	Impact – Loss of floral SCC	STATUS	NEGATIVE

Impact Description	The most significant impact will occur with keeping the herbaceous material at a low height below the PV panels as part of the ongoing maintenance activities for the proposed Soyuz 4 Solar PV Park, which will lead to floral SCC habitat loss. Potential ineffective rehabilitation of exposed and impacted areas leading to vegetation succession and a possible reduction of floral SCC habitat over the long-term. Poorly implemented and monitored AIP Management programme leading to the reintroduction and proliferation of AIP species within the proposed Soyuz 4 Solar PV Park and access road. Potential poor management and failure to monitor rehabilitation efforts, leading to: - Landscapes being left fragmented and a decrease in floral diversity; - Increased storm water run-off; - Compacted soils limiting the re-establishment of natural vegetation; and Increased risk of erosion in areas left disturbed.					
Impact Source(s)	• Potential failure to monitor rescue and relocation initiatives (if applicable) during the operation and maintenance phase of the project (pending outcome of the floral walkdown of the authorised footprints); and • Potential poorly implemented and monitored AIP Management programme leading to the reintroduction and proliferation of AIP species both within the footprint areas as well as beyond the footprint areas.					
Receptor(s)	Floral SCC habitat					
Habitat Unit	**Driver / Activity**	**PARAMETER**	**WITHOUT MITIGATION**	**SCORE**	**WITH MITIGATION**	**SCORE**
Open Karoo Veld Habitat, Low Open Shrubland	**PV facility and associated infrastructure**	**EXTENT (A)**	Preferred Alternative:	2	Preferred Alternative:	1
		DURATION (B)	Preferred Alternative:	3	Preferred Alternative:	2
		PROBABILITY (C)	Preferred Alternative:	4	Preferred Alternative:	2
		INTENSITY OR MAGNITUDE (D)	Preferred Alternative:	-2	Preferred Alternative:	-1
		SIGNIFICANCE RATING (F) = (A*B*D)*C	**Preferred Alternative:**	**(-) Medium**	Preferred Alternative:	**(-) Low**
Open Karoo Veld	**Access road**	**EXTENT (A)**	Preferred Alternative:	2	Preferred Alternative:	1
		DURATION (B)	Preferred Alternative:	3	Preferred Alternative:	2
		PROBABILITY (C)	Preferred Alternative:	4	Preferred Alternative:	3
		INTENSITY OR MAGNITUDE (D)	Preferred Alternative:	-2	Preferred Alternative:	-2
		SIGNIFICANCE RATING (F) = (A*B*D)*C	**Preferred Alternative:**	**(-) Medium**	**Preferred Alternative:**	**(-) Low**

CUMULATIVE IMPACTS	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 4 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 several renewable energy facilities, which may alter the landscape character. Vegetation clearing due to Soyuz 4 Solar PV Park will be at a local extent and vegetation regrowth could possibly occur but a potential floral SCC habitat loss will be present on a regional level. The current farming activities will still be present within the immediate area surrounding the Soyuz 4 Solar PV Park.
CONFIDENCE	High
MITIGATION MEASURES	• AIP management must continue throughout the operation of the proposed project to ensure that AIPs don't spread into adjacent natural areas where floral SCC numbers (and habitat) may be displaced; • Monitoring of relocation success should continue for at least three years after the completion of the construction phase, or until it is evident that the species have established self-sustaining populations; • Where feasible, rescued SCC must be used in the landscaping and rehabilitation activities for any remaining natural habitat that do not form part of the planned footprints; and • Collection of floral SCC and protected flora by operational and maintenance teams must be prohibited.

24.3.4 Potential Soil and Land Capability Impacts

IMPACT NATURE	**Impact –Soil, land capability and agricultural potential.**				**STATUS**	**LOW NEGATIVE**
Impact Description	Loss of Land Capability					
Impact Source(s)	• Movement of maintenance equipment and vehicles of good potential agricultural soils.					
Receptor(s)	Agricultural Resources					
Soil Impact	**Driver / Activity**	**PARAMETER**	**WITHOUT MITIGATION**	**SCORE**	**WITH MITIGATION**	**SCORE**
Loss of Land Capability	Frequent disturbances of soils, resulting in risk of reduced soil quality.	**EXTENT (A)**	Preferred Alternative:	1	Preferred Alternative:	1
		DURATION (B)	Preferred Alternative:	4	Preferred Alternative:	3
		PROBABILITY (C)	Preferred Alternative:	2	Preferred Alternative:	2
		INTENSITY OR MAGNITUDE (D)	Preferred Alternative:	-3	Preferred Alternative:	-2
		SIGNIFICANCE RATING (F) = (A*B*D)*C	Preferred Alternative:	**-24**	Preferred Alternative:	**-12**
Soil Erosion	Frequent disturbances of soils during the maintenance of the solar PV, resulting in risk of erosion.	**EXTENT (A)**	Preferred Alternative:	1	Preferred Alternative:	1
		DURATION (B)	Preferred Alternative:	4	Preferred Alternative:	3
		PROBABILITY (C)	Preferred Alternative:	2	Preferred Alternative:	1
		INTENSITY OR MAGNITUDE (D)	Preferred Alternative:	-3	Preferred Alternative:	-2

		SIGNIFICANCE RATING (F) = (A*B*D)*C	Preferred Alternative:	**-24**	Preferred Alternative:	**-6**
Soil Contamination	Leaching of hydrocarbons chemicals into the soils from maintenance equipment, leading to alteration of the soil chemical status as well as contamination of ground water.	**EXTENT (A)**	Preferred Alternative:	2	Preferred Alternative:	1
		DURATION (B)	Preferred Alternative:	4	Preferred Alternative:	2
		PROBABILITY (C)	Preferred Alternative:	2	Preferred Alternative:	2
		INTENSITY OR MAGNITUDE (D)	Preferred Alternative:	-2	Preferred Alternative:	-2
		SIGNIFICANCE RATING (F) = (A*B*D)*C	Preferred Alternative:	**-32**	Preferred Alternative:	**-8**
Soil Compaction	Frequent disturbances of soils during the maintenance of the solar PV, resulting in risk of compaction.	**EXTENT (A)**	Preferred Alternative:	1	Preferred Alternative:	1
		DURATION (B)	Preferred Alternative:	3	Preferred Alternative:	2
		PROBABILITY (C)	Preferred Alternative:	3	Preferred Alternative:	3
		INTENSITY OR MAGNITUDE (D)	**Preferred Alternative:**	**-3**	Preferred Alternative:	-2
		SIGNIFICANCE RATING (F) = (A*B*D)*C	**Preferred Alternative:**	**-27**	Preferred Alternative:	-12

CUMULATIVE IMPACTS	The Soyuz 4 Solar PV Park and associated access road are dominated by well-drained soils of Askham/Clovelly which collectively account for approximately 56.5% of total investigated. These soils are suitable for cultivation (Class III) but have a Restricted agricultural Potential (Class L5). If the above-mentioned land capability and potential conditions are considered as well as occurring climatic conditions with limited rainfall (200 – 400 mm per annum) the development footprint is deemed not suitable for any large-scale agricultural cultivation in the absence of supplementary irrigation and other intensive management practices. The cumulative impact on the local and regional scale is considered medium to low without mitigation and low to very low with mitigatory measures in place as the dominant soils are not sensitive from a soil and land capability point of view.
CONFIDENCE	High
MITIGATION MEASURES	• Disturbed areas adjacent to the footprint area should be revegetated with indigenous grass mix to limit potential soil erosion. • Maintenance vehicles should be checked for leakages of hydrocarbons prior to commencement of maintenance activities; • Maintenance vehicles should stick to demarcated road as far as practically possible to minimise soil compaction on adjacent soils; and • The solar panels should be cleaned with clean water and use of chemicals should be avoided to minimise the likelihood of potential soil contamination.

24.3.5 Potential Climate Change Impacts

Renewable Energy Goals

Based on the available information, it is reasonable to suggest that establishment of the proposed SOLAR PV PARK will have an impact during operations phase on the contribution to renewable energy goals of South Africa. The establishment of additional renewable energy facilities is considered significant considering the renewable energy targets set by South Africa. An additional 240MW, improves the capacity available to South African's, in a sustainable and environmentally responsible manner. Based on the available information it is reasonable to suggest that the impact will potentially have a **high positive** impact.

IMPACT NATURE	Contribution to renewable energy goals of South Africa		STATUS	HIGH POSITIVE
Impact Description	The establishment of additional renewable energy facilities is considered significant.			
Impact Source(s)	Operation of SOLAR PV PARK and associated infrastructure.			
Receptor(s)	Local, provincial and national community			
PARAMETER	**WITHOUT MITIGATION**	**SCORE**	**WITH MITIGATION**	**SCORE**
EXTENT (A)	Preferred Alternative:	3	Preferred Alternative:	3
	No-Go Alternative:	3	No-Go Alternative:	3
DURATION (B)	Preferred Alternative:	3	Preferred Alternative:	3
	No-Go Alternative:	2	No-Go Alternative:	2
PROBABILITY (C)	Preferred Alternative:	3	Preferred Alternative:	3
	No-Go Alternative:	3	No-Go Alternative:	3
INTENSITY OR MAGNITUDE (D)	Preferred Alternative:	3	Preferred Alternative:	3
	No-Go Alternative:	-2	No-Go Alternative:	-2
SIGNIFICANCE RATING (F) = (A*B*D)*C	Preferred Alternative:	**81**	Preferred Alternative:	**81**
	No-Go Alternative:	**-36**	No-Go Alternative:	**-36**
CUMULATIVE IMPACTS	This impact is considered cumulative. The 'No Go' option is a direct opportunity loss for South Africa to increase renewable energy.			
CONFIDENCE	High			
MITIGATION MEASURES	None required			

Contribution to Greenhouse Gas Reduction

Based on the available information, it is reasonable to suggest that establishment of the proposed SOLAR PV PARK will have an impact during operations phase on the Contribution to Greenhouse Gas (GHG) Reduction Facilities for South Africa.

IMPACT NATURE	Contribution to Greenhouse Gas Reduction in South Africa		STATUS	MEDIUM POSITIVE
Impact Description	The establishment of additional renewable energy facilities is considered significant in light of South Africa's commitments to GHG reduction.			
Impact Source(s)	Operation of Solar PV Park and associated infrastructure.			
Receptor(s)	Local, provincial and national community			
PARAMETER	**WITHOUT MITIGATION**	**SCORE**	**WITH MITIGATION**	**SCORE**
EXTENT (A)	Preferred Alternative:	3	Preferred Alternative:	3

IMPACT NATURE	Contribution to Greenhouse Gas Reduction in South Africa		STATUS	MEDIUM POSITIVE
	No-Go Alternative:	3	No-Go Alternative:	3
DURATION (B)	Preferred Alternative:	3	Preferred Alternative:	3
	No-Go Alternative:	3	No-Go Alternative:	3
PROBABILITY (C)	Preferred Alternative:	3	Preferred Alternative:	3
	No-Go Alternative:	3	No-Go Alternative:	3
INTENSITY OR MAGNITUDE (D)	Preferred Alternative:	3	Preferred Alternative:	3
	No-Go Alternative:	-3	No-Go Alternative:	-3
SIGNIFICANCE RATING (F) = (A*B*D)*C	Preferred Alternative:	81	Preferred Alternative:	81
	No-Go Alternative:	-81	No-Go Alternative:	-81
CUMULATIVE IMPACTS	Cumulatively, assuming the hybrid facility replaces generative capacity from other fossil fuel sources, the facility could lower South Africa's GHG emissions from the Energy sector since the PV arrays and BESS provide renewable energy at a lower carbon dioxide equivalent (CO_2-e)1 emission per unit electricity.			
CONFIDENCE	High			
MITIGATION MEASURES	None required			

24.3.6 Potential Freshwater Impacts

Most of the potential impacts to surface water resources are associated with the completed facility structures and their location in association to aquatic environments associated with the development site. Addressing these potential impacts is undertaken during the design phase and these impacts are therefore assessed in the construction phase as all design requirements to mitigate against impacts should be finalised prior to construction. However, operational activities do have the potential to cause contamination of surface water if not properly managed.

Operational-phase impacts of the proposed solar PV arrays and associated infrastructure on the freshwater environment.

IMPACT NATURE	Impact of the solar PV arrays and associated infrastructure on freshwater ecosystem provisioning and resource quality		STATUS	LOW NEGATIVE
Impact Description	• Permanent removal of vegetation in the solar array footprint by that could lead to altered patterns of runoff and drainage in the landscape that could adversely affect downgradient freshwater ecosystems; • Containment loss of hazardous substances related to BESS batteries and substation transformer oils could lead to soil and water pollution impacts.			
Impact Source(s)	Solar PV Park development site; infrastructure components that contain hazardous substances.			
Receptor(s)	The five (5) EDLs in the area surrounding the development site.			
PARAMETER	WITHOUT MITIGATION	SCORE	WITH MITIGATION	SCORE
EXTENT (A)	Preferred Alternative:	1	Preferred Alternative:	1
	No-Go Alternative:	No impact	No-Go Alternative:	No impact
DURATION (B)	Preferred Alternative:	3	Preferred Alternative:	3
	No-Go Alternative:	No impact	No-Go Alternative:	No impact
PROBABILITY (C)	Preferred Alternative:	2	Preferred Alternative:	1
	No-Go Alternative:	No impact	No-Go Alternative:	No impact
	Preferred Alternative:	1	Preferred Alternative:	-1

IMPACT NATURE	Impact of the solar PV arrays and associated infrastructure on freshwater ecosystem provisioning and resource quality		STATUS	LOW NEGATIVE
INTENSITY OR MAGNITUDE (D)	No-Go Alternative:	No impact	No-Go Alternative:	No impact
SIGNIFICANCE RATING (F) = (A*B*D)*C	Preferred Alternative:	-6	Preferred Alternative:	-3
	No-Go Alternative:	0	No-Go Alternative:	0
CUMULATIVE IMPACTS	Freshwater ecosystems within the Karoo and the broader Northern Cape region are under continued threat due a variety of factors primarily related to landuse which, in the long term and cumulatively, may prove to be unsustainable. The predominant landuse and economic activity in the wider area is commercial livestock farming. This has resulted in degradation of freshwater features due to over-utilisation by livestock, as well as physical transformation of freshwater ecosystems, primarily in the form of impoundments that have been developed along most of the episodic drainage lines in the area. Such impoundments exert various types of impacts, including freshwater habitat transformation, hydrological impacts, as well as hydromorphological impacts. Other factors such as existing linear infrastructure (roads and railways) as well as climate change also exert impacts on the freshwater ecosystems in the wider area and in a Northern Cape Karoo context. The development of the Soyuz 4 Solar PV Park will not directly impact any freshwater ecosystems in terms of the development of its solar arrays as no freshwater ecosystems are located within the proposed solar array footprint, however indirect impacts could occur. Such indirect impacts could result in the creation of a cumulative impact on the freshwater environment in the wider area if these indirect impacts resulted in a measurable impact on ecosystem provisioning or on the PES of any of the EDLs. The implementation of the recommended mitigation measures would however significantly reduce or negate the potential for cumulative impacts to materialise..			
CONFIDENCE	Medium			
MITIGATION MEASURES	• Maintenance activities must be confined to the developed footprint of the solar energy facility which must be fenced off to prevent accidental access into the adjacent freshwater ecosystems (riparian zones); • The intervening areas between the southern, western and eastern site boundaries and the EDLs must be kept free of any development and effectively retained as buffer zones to assist in preventing indirect impacts from occurring; • Components of infrastructure that contain pollutants – i.e. substation transformers and batteries in the BESS component must be properly maintained and checked for leaks. All such components that could leak pollutants, or which could result in soil or water pollution must be designed to be placed on an impervious surface that would be able to hold the full volume of any pollutants.			

24.3.7 Potential Noise Impact

IMPACT NATURE	Noise from the BESS activities		STATUS	LOW NEGATIVE
Impact Description	Change in the prevailing ambient noise levels associated with the fully operational facility.			
Impact Source(s)	Extract and impelling ventilation fans			
Receptor(s)	Nearby farm house and employees			
PARAMETER	WITHOUT MITIGATION	SCORE	WITH MITIGATION	SCORE
EXTENT (A)	Preferred Alternative:	-1	Preferred Alternative:	-1
	No-Go Alternative:	1	No-Go Alternative:	1
DURATION (B)	Preferred Alternative:	-4	Preferred Alternative:	-4
	No-Go Alternative:	4	No-Go Alternative:	4
PROBABILITY (C)	Preferred Alternative:	-2	Preferred Alternative:	-1
	No-Go Alternative:	3	No-Go Alternative:	2

IMPACT NATURE	Noise from the BESS activities		STATUS	LOW NEGATIVE
INTENSITY OR MAGNITUDE (D)	Preferred Alternative:	-1	Preferred Alternative:	-1
	No-Go Alternative:	1	No-Go Alternative:	1
SIGNIFICANCE RATING (F) = (A*B*D)*C	Preferred Alternative:	-8	Preferred Alternative:	-8
	No-Go Alternative:	24	No-Go Alternative:	16
CUMULATIVE IMPACTS	The noise level change during the power generation activities has been modelled and is expected to be well below the nuisance threshold value of 7.0dBA.			
CONFIDENCE	High			
MITIGATION MEASURES	Conduct annal environmental noise monitoring to confirm that the noise impact from the fully operational Soyuz 4 Solar PV Park remains insignificant/low to off-site sensitive receptors. Implement the Noise Management Plan as best practice.			

24.3.8 Potential Social Impacts

Improve Energy Security and support renewable energy sector

The primary goal of the proposed project is to improve energy security in South Africa by generating additional energy. The proposed SEF also reduces the carbon footprint associated with energy generation. The project should therefore be viewed within the context of the South Africa's current reliance on coal powered energy to meet most of its energy needs, and secondly, within the context of the success of the REIPPPP.

IMPACT NATURE	Energy security		STATUS	HIGH POSITIVE
Impact Description	Development of infrastructure to improve energy security and support the renewable sector			
Impact Source(s)	Operational of the Solar PV Park			
Receptor(s)	Local, provincial and regional communities			
PARAMETER	WITHOUT MITIGATION	SCORE	WITH MITIGATION	SCORE
EXTENT (A)	Preferred Alternative:	4	Preferred Alternative:	5
	No-Go Alternative:	0	No-Go Alternative:	0
DURATION (B)	Preferred Alternative:	4	Preferred Alternative:	4
	No-Go Alternative:	0	No-Go Alternative:	0
PROBABILITY (C)	Preferred Alternative:	4	Preferred Alternative:	5
	No-Go Alternative:	0	No-Go Alternative:	0
INTENSITY OR MAGNITUDE (D)	Preferred Alternative:	8	Preferred Alternative:	8
	No-Go Alternative:	0	No-Go Alternative:	0
SIGNIFICANCE RATING (F) = (A*B*D)*C	Preferred Alternative:	64	Preferred Alternative:	85
	No-Go Alternative:	0	No-Go Alternative:	0
CUMULATIVE IMPACTS	This impact is cumulative			
RESIDUAL IMPACTS	Overall reduction in CO_2 emission, reduction in water consumption for energy generation, contribution to establishing an economically viable commercial renewables generation sector in the Northern Cape and South Africa.			
CONFIDENCE	High			

IMPACT NATURE	Energy security	STATUS	HIGH POSITIVE
CAN IMPACT BE ENHANCED	Yes		
ENHANCEMENT MEASURES	Should the project be approved, the applicant should: ▪ Implement a skills development and training programme aimed at maximizing the number of employment opportunities for local community members. ▪ Maximise opportunities for local content, procurement, and community shareholding.		

Creation of Employment Opportunities

Each SOLAR PV PARK will create in the region of 40-50 employment opportunities during the operational phase, of which 70% will be unskilled, 25% semi-skilled 25%, and 5% skilled 5%. Most of the unskilled and low skilled workers will be local HDI residents of Britstown and De Aar. Based on similar projects the annual operating budget will be in the region of R 30 million (2023 Rand values), including wages.

IMPACT NATURE	Employment opportunities and social upliftment		STATUS	MEDIUM POSITIVE
Impact Description	Creation of employment and business opportunities associated with the operational phase			
Impact Source(s)	Operation of the SOLAR PV PARK			
Receptor(s)	Local communities			
PARAMETER	WITHOUT MITIGATION	SCORE	WITH MITIGATION	SCORE
EXTENT (A)	Preferred Alternative:	1	Preferred Alternative:	2
	No-Go Alternative:	0	No-Go Alternative:	0
DURATION (B)	Preferred Alternative:	4	Preferred Alternative:	4
	No-Go Alternative:	0	No-Go Alternative:	0
PROBABILITY (C)	Preferred Alternative:	4	Preferred Alternative:	4
	No-Go Alternative:	0	No-Go Alternative:	0
INTENSITY OR MAGNITUDE (D)	Preferred Alternative:	2	Preferred Alternative:	4
	No-Go Alternative:	0	No-Go Alternative:	0
SIGNIFICANCE RATING (F) = (A*B*D)*C	Preferred Alternative:	28	Preferred Alternative:	40
	No-Go Alternative:	0	No-Go Alternative:	0
CUMULATIVE IMPACTS	This impact is cumulative			
RESIDUAL IMPACTS	Creation of permanent employment and skills development opportunities for members from the local community and creation of additional business and economic opportunities in the area			
CONFIDENCE	High			
CAN IMPACT BE ENHANCED	Yes			
ENHANCEMENT MEASURES	The enhancement measures listed in the construction phase social impact assessment i.e. to enhance local employment and business opportunities during the construction phase, also apply to the operational phase.			

Generate Income for affected landowner

The proponent will enter into rental agreements with the affected landowners for the use of the land for the establishment of the proposed PV SEFs. In terms of the rental agreement the affected landowner will be paid an annual amount dependent upon the area affected. The additional income will reduce the risk to his livelihoods posed by droughts and fluctuating market prices for sheep and farming inputs, such as fuel, feed etc. Given the low carrying capacity of the veld the additional income represents a significant benefit for the affected landowner.

IMPACT NATURE	Income generation for landowner		STATUS	HIGH POSITIVE
Impact Description	The generation of additional income represents a significant benefit for the local affected farmer(s) and reduces the risks to their livelihoods posed by droughts and fluctuating market prices for sheep and farming inputs, such as feed etc.			
Impact Source(s)	Operational of the SOLAR PV PARK			
Receptor(s)	Local communities			
PARAMETER	WITHOUT MITIGATION	SCORE	WITH MITIGATION	SCORE
EXTENT (A)	Preferred Alternative:	1	Preferred Alternative:	3
	No-Go Alternative:	0	No-Go Alternative:	0
DURATION (B)	Preferred Alternative:	4	Preferred Alternative:	4
	No-Go Alternative:	0	No-Go Alternative:	0
PROBABILITY (C)	Preferred Alternative:	3	Preferred Alternative:	5
	No-Go Alternative:	0	No-Go Alternative:	0
INTENSITY OR MAGNITUDE (D)	Preferred Alternative:	4	Preferred Alternative:	6
	No-Go Alternative:	0	No-Go Alternative:	0
SIGNIFICANCE RATING (F) = (A*B*D)*C	Preferred Alternative:	**27**	Preferred Alternative:	**65**
	No-Go Alternative:	**0**	No-Go Alternative:	**0**
CUMULATIVE IMPACTS	This impact is cumulative			
RESIDUAL IMPACTS	Support for local agricultural sector and farming			
CONFIDENCE	High			
CAN IMPACT BE ENHANCED	Yes			
ENHANCEMENT MEASURES	Implement agreements with affected landowners.			

Socio-economic development impacts

The REIPPPP has been designed not only to procure energy but has also been structured to contribute to the broader national development objectives of job creation, social upliftment and broadening of economic ownership. Socio-economic development (SED) contributions are an important focus of the REIPPPP and are aimed at ensuring that local communities benefit directly from the investments attracted into the area. These contributions are linked to Community Trusts and accrue over the project operation life and, in so doing, create an opportunity to generate a steady revenue stream over an extended period. This revenue can be used to fund development initiatives in the area and support the local community. The long-term duration of the revenue stream also allows local municipalities and communities to undertake long term planning for the area. The revenue from the proposed SEF can be used to support several social and economic initiatives in the area, including:

- Creation of jobs.
- Education.
- Support for and provision of basic services.

- School feeding schemes.
- Training and skills development.
- Support for SMME's.

IMPACT NATURE	Improve socio-economic development		STATUS	HIGH POSITIVE
Impact Description	Benefits associated with support for local community's form SED contributions			
Impact Source(s)	Operation of the SOLAR PV PARK			
Receptor(s)	Local communities			
PARAMETER	**WITHOUT MITIGATION**	**SCORE**	**WITH MITIGATION**	**SCORE**
EXTENT (A)	Preferred Alternative:	2	Preferred Alternative:	3
	No-Go Alternative:	0	No-Go Alternative:	0
DURATION (B)	Preferred Alternative:	4	Preferred Alternative:	4
	No-Go Alternative:	0	No-Go Alternative:	0
PROBABILITY (C)	Preferred Alternative:	3	Preferred Alternative:	5
	No-Go Alternative:	0	No-Go Alternative:	0
INTENSITY OR MAGNITUDE (D)	Preferred Alternative:	4	Preferred Alternative:	6
	No-Go Alternative:	0	No-Go Alternative:	0
SIGNIFICANCE RATING (F) = (A*B*D)*C	Preferred Alternative:	**30**	Preferred Alternative:	**65**
	No-Go Alternative:		No-Go Alternative:	
CUMULATIVE IMPACTS	This impact is cumulative			
RESIDUAL IMPACTS	Promotion of social and economic development and improvement in the overall well-being of the community			
CONFIDENCE	High			
CAN IMPACT BE ENHANCED	Yes			
ENHANCEMENT MEASURES	To maximise the benefits and minimise the potential for corruption and misappropriation of funds the following measures should be implemented: • The proponents should liaise with the ELM to identify projects that can be supported by SED contributions. • Clear criteria for identifying and funding community projects and initiatives in the area should be identified. The criteria should be aimed at maximising the benefits for the community as a whole and not individuals within the community. • Strict financial management controls, including annual audits, should be instituted to manage the SED contributions.			

Visual Impact and Sense of place

The proposed PV SEF has the potential to impact on the areas existing rural sense of place. The findings of the Visual Impact Assessment (VIA) (Scientific Aquatic Services, June 2023) note that 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 4 Solar PV Park is considered low.

In terms of potential nighttime lighting, the VIA notes that this is also expected to be low and will be limited to a local area. The 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.

IMPACT NATURE	Visual impact and sense of place		STATUS	LOW NEGATIVE
Impact Description	Visual façade of facility may alter the sense of place of the area			
Impact Source(s)	Operation of the SOLAR PV PARK			
Receptor(s)	Local communities			
PARAMETER	WITHOUT MITIGATION	SCORE	WITH MITIGATION	SCORE
EXTENT (A)	Preferred Alternative:	1	Preferred Alternative:	1
	No-Go Alternative:	0	No-Go Alternative:	0
DURATION (B)	Preferred Alternative:	4	Preferred Alternative:	4
	No-Go Alternative:	0	No-Go Alternative:	0
PROBABILITY (C)	Preferred Alternative:	3	Preferred Alternative:	3
	No-Go Alternative:	0	No-Go Alternative:	0
INTENSITY OR MAGNITUDE (D)	Preferred Alternative:	-4	Preferred Alternative:	-4
	No-Go Alternative:	0	No-Go Alternative:	0
SIGNIFICANCE RATING (F) = (A*B*D)*C	Preferred Alternative:	**-27**	Preferred Alternative:	**-27**
	No-Go Alternative:	**0**	No-Go Alternative:	**0**
CUMULATIVE IMPACTS	This impact is cumulative			
RESIDUAL IMPACTS	Potential impact on current rural sense of place.			
CONFIDENCE	High			
CAN IMPACT BE MITIGATED	Yes			
MITIGATION MEASURES	The recommendations contained in the VIA should be implemented.			

Potential impact on property values

The potential visual impacts associated with the proposed SOLAR PV PARKs have the potential to impact on property values. Based on the results of a literature review undertaken for wind farms the potential impact on property values in rural areas is likely to be limited. The findings are also likely to be relevant to SOLAR PV PARKs.

IMPACT NATURE	Impact on property values		STATUS	LOW NEGATIVE
Impact Description	Potential impact of the SEF on property values			
Impact Source(s)	Operational of the SOLAR PV PARK			
Receptor(s)	Local communities			
PARAMETER	WITHOUT MITIGATION	SCORE	WITH MITIGATION	SCORE
EXTENT (A)	Preferred Alternative:	2	Preferred Alternative:	1
	No-Go Alternative:	0	No-Go Alternative:	0
DURATION (B)	Preferred Alternative:	4	Preferred Alternative:	4

IMPACT NATURE	Impact on property values		STATUS	LOW NEGATIVE
	No-Go Alternative:	0	No-Go Alternative:	0
PROBABILITY (C)	Preferred Alternative:	3	Preferred Alternative:	3
	No-Go Alternative:	0	No-Go Alternative:	0
INTENSITY OR MAGNITUDE (D)	Preferred Alternative:	-2	Preferred Alternative:	-2
	No-Go Alternative:	0	No-Go Alternative:	0
SIGNIFICANCE RATING (F) = (A*B*D)*C	Preferred Alternative:	**-24**	Preferred Alternative:	**-21**
	No-Go Alternative:	**0**	No-Go Alternative:	**0**
CUMULATIVE IMPACTS	This impact is cumulative			
RESIDUAL IMPACTS	Linked to visual impact on sense of place.			
CONFIDENCE	High			
CAN IMPACT BE MITIGATED	Yes			
MITIGATION MEASURES	The recommendations contained in the VIA should be implemented.			

Potential Tourism Impacts

The potential visual impacts associated with the proposed SOLAR PV PARK has the potential to impact on tourism facilities and tourism in the area. Based on the findings of the literature review there is limited evidence to suggest that the proposed SOLAR PV PARK would impact on the tourism in the PKSDM and ELM at a local and regional level. The potential impact on local tourism facilities in the vicinity of the sites will be confirmed during the Assessment Phase.

IMPACT NATURE	Impact on tourism operations		STATUS	LOW NEGATIVE
Impact Description	Potential impact of the SOLAR PV PARK on local tourism			
Impact Source(s)	Operation of the SOLAR PV PARK			
Receptor(s)	Local communities			
PARAMETER	WITHOUT MITIGATION	SCORE	WITH MITIGATION	SCORE
EXTENT (A)	Preferred Alternative:	2	Preferred Alternative:	1
	No-Go Alternative:	0	No-Go Alternative:	0
DURATION (B)	Preferred Alternative:	4	Preferred Alternative:	4
	No-Go Alternative:	0	No-Go Alternative:	0
PROBABILITY (C)	Preferred Alternative:	3	Preferred Alternative:	3
	No-Go Alternative:	0	No-Go Alternative:	0
INTENSITY OR MAGNITUDE (D)	Preferred Alternative:	-2	Preferred Alternative:	-2
	No-Go Alternative:	0	No-Go Alternative:	0
SIGNIFICANCE RATING (F) = (A*B*D)*C	Preferred Alternative:	**-24**	Preferred Alternative:	**-21**
	No-Go Alternative:	**0**	No-Go Alternative:	**0**
CUMULATIVE IMPACTS	This impact is cumulative			
RESIDUAL IMPACTS	Linked to visual impact on sense of place.			

IMPACT NATURE	Impact on tourism operations	STATUS	LOW NEGATIVE
CONFIDENCE	High		
CAN IMPACT BE MITIGATED	Yes		
MITIGATION MEASURES	The recommendations contained in the VIA should be implemented.		

24.3.9 Potential Traffic Impact

The operational phase of this project is not expected to generate significant traffic volumes. The typical day-to-day activities will probably only be service vehicles undertaking general maintenance at the site.

IMPACT NATURE	Increase in traffic volumes on the surrounding road network during the operational phase.		STATUS	LOW NEGATIVE
Impact Description	During the operational phase there will be a slight increase in traffic volumes on the surrounding road network that might impact on the general road users and result in gravel loss along Windpoort Road.			
Impact Source(s)	Operational activities traffic			
Receptor(s)	General public/Road users			
PARAMETER	**WITHOUT MITIGATION**	**SCORE**	**WITH MITIGATION**	**SCORE**
EXTENT (A)	Preferred Alternative:	1	Preferred Alternative:	1
	No-Go Alternative:	1	No-Go Alternative:	1
DURATION (B)	Preferred Alternative:	1	Preferred Alternative:	1
	No-Go Alternative:	1	No-Go Alternative:	1
PROBABILITY (C)	Preferred Alternative:	3	Preferred Alternative:	2
	No-Go Alternative:	3	No-Go Alternative:	2
INTENSITY OR MAGNITUDE (D)	Preferred Alternative:	-1	Preferred Alternative:	-1
	No-Go Alternative:	-1	No-Go Alternative:	-1
SIGNIFICANCE RATING (F) = (A*B*D)*C	Preferred Alternative:	**-3**	Preferred Alternative:	**-2**
	No-Go Alternative:	**-3**	No-Go Alternative:	**-2**
CUMULATIVE IMPACTS	Low			
CONFIDENCE	HIgh			
MITIGATION MEASURES	Routine road maintenance by the relevant Roads Authority.			

24.3.10 Potential Visual Impacts

The potential visual impacts are associated with the completed facility structures and their location in association to sensitive receptors. Addressing these potential impacts is undertaken during the design phase and these impacts are therefore assessed in the planning and design section of this report. However, the impacts of night-time lighting are assessed.

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

IMPACT NATURE	Potential visual intrusion and exposure of the landscape	STATUS	LOW 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 Solar PV Parks on airfields can vary depending on several factors: **<u>3.</u> <u>Scale and size:</u>** Large Solar PV Parks 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 4 Solar PV Park is relative, therefore there will be a noticeable change in the surrounding cultivated landscape. **<u>4.</u> <u>Glare and reflection:</u>** 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 4 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. <u>5.</u> 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. <u>6.</u> 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. ➢ 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.

Visual Impacts of Night-time Lighting

IMPACT NATURE	Potential impact of night-time lighting on the visual environment		STATUS	LOW 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)	Windpoort Guest House			
PARAMETER	WITHOUT MITIGATION	SCORE	WITH MITIGATION	SCORE
EXTENT (A)	Preferred Alternative:	1	Preferred Alternative:	1
	No-Go Alternative:	1	No-Go Alternative:	1
DURATION (B)	Preferred Alternative:	3	Preferred Alternative:	3
	No-Go Alternative:	3	No-Go Alternative:	3
PROBABILITY (C)	Preferred Alternative:	2	Preferred Alternative:	1
	No-Go Alternative:	2	No-Go Alternative:	2
INTENSITY OR MAGNITUDE (D)	Preferred Alternative:	-2	Preferred Alternative:	-1
	No-Go Alternative:	1	No-Go Alternative:	1
SIGNIFICANCE RATING (F) = (A*B*D)*C	Preferred Alternative:	-12	Preferred Alternative:	-3
	No-Go Alternative:	6	No-Go Alternative:	6
CUMULATIVE IMPACTS	Cumulative visual impacts resulting from landscape modifications because of the proposed project in conjunction Soyuz 1 – 6 Solar PV Parks and the eleven 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 near 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	• 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;			

IMPACT NATURE	Potential impact of night-time lighting on the visual environment	STATUS	LOW NEGATIVE
	• 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).		

Potential Waste Management Impacts

Potential waste impacts as a result from improper waste management practices on site during the the operational phase of the Soyuz 4 Solar PV Park. Based on the available information it is reasonable to suggest that the impact will potentially have a **low negative** impact provided waste management plan is designed and costed for before construction starts.

IMPACT NATURE	Waste management impacts		STATUS	LOW NEGATIVE
Impact Description	Potential waste impacts due to the operations. General wastes can be handled by the local municipal waste management services. However, the disposal of Damaged BESS baterries and PV panels will require specific waste management which is unlikely to be available in the local or regional area. This could result in illegal disposal or treatment of these waste types which will impact negatively on the local and regional environment.			
Impact Source(s)	Operational phase – damaged BESS batteries and PV panels			
Receptor(s)	Local and regional waste management facilities			
PARAMETER	**WITHOUT MITIGATION**	**SCORE**	**WITH MITIGATION**	**SCORE**
EXTENT (A)	Preferred Alternative:	3	Preferred Alternative:	3
	No-Go Alternative:	0	No-Go Alternative:	0
DURATION (B)	Preferred Alternative:	4	Preferred Alternative:	4
	No-Go Alternative:	0	No-Go Alternative:	0
PROBABILITY (C)	Preferred Alternative:	4	Preferred Alternative:	1
	No-Go Alternative:	0	No-Go Alternative:	0
INTENSITY OR MAGNITUDE (D)	Preferred Alternative:	-2	Preferred Alternative:	-1
	No-Go Alternative:	0	No-Go Alternative:	0
SIGNIFICANCE RATING (F) = (A*B*D)*C	Preferred Alternative:	**-72**	Preferred Alternative:	**-36**
	No-Go Alternative:	**0**	No-Go Alternative:	**0**

IMPACT NATURE	Waste management impacts	STATUS	LOW NEGATIVE
CUMULATIVE IMPACTS	This impact could be cumulative.		
CONFIDENCE	Medium		
MITIGATION MEASURES	Develop a detailed operational waste management plan that identifies all potential waste types to be generated and how they will be handled including the reuse, recycle before disposal. Ensure that the cost of handling waste is included in the annual operational budget of the solar PV facility.		

24.4 DECOMISSIONING PHASE IMPACTS

Certain generic decommissioning phase impacts related to the deconstruction of the SOLAR PV PARK such as vehicle operation, materials/waste storage etc are very similar as the construction phase activities. In addition, at the time of decommissioning, the Soyaus 1 Solar PV Park will require environmental authorisation following a Basic Assessment process. This process will identify the specific environmental impacts potentially associated with decommissioning at that time.

However, the intention of the assessment of potential decommissioning phase impacts at this EIA phase is to determine if the decommissioning phase is likely to generate environmental impacts that could be considered fatal flaws post-operation.

Management of PV Solar Panel and BESS Battery Waste

Currently there is very limited potential worldwide regarding the recycling of used of discarded PV solar panels and there is currently no system for managing PV solar panel waste in South Africa. As the number of solar SOLAR PV PARK’s in this region increase, there is a potential for this waste stream to inundate a region which does not have the required waste management skills and infrastructure.

IMPACT NATURE	Handling of Solar PV panel waste		STATUS	LOW NEGATIVE
Impact Description	As the number of solar Solar PV Park in this region increase, there is a potential for this waste stream to inundate a region which does not have the required waste management skills.			
Impact Source(s)	Decommissioning of the Solar PV Park at end of life			
Receptor(s)	Immediate site, natural environment, local, regional and national waste management facilities			
PARAMETER	WITHOUT MITIGATION	SCORE	WITH MITIGATION	SCORE
EXTENT (A)	Preferred Alternative:	3	Preferred Alternative:	3
	No-Go Alternative:	No Impact	No-Go Alternative:	No Impact
DURATION (B)	Preferred Alternative:	2	Preferred Alternative:	1
	No-Go Alternative:	No Impact	No-Go Alternative:	No Impact
PROBABILITY (C)	Preferred Alternative:	4	Preferred Alternative:	1
	No-Go Alternative:	No Impact	No-Go Alternative:	No Impact
INTENSITY OR MAGNITUDE (D)	Preferred Alternative:	-3	Preferred Alternative:	-1
	No-Go Alternative:	No Impact	No-Go Alternative:	No Impact
	Preferred Alternative:	-72	Preferred Alternative:	-3

IMPACT NATURE	Handling of Solar PV panel waste		STATUS	LOW NEGATIVE
SIGNIFICANCE RATING (F) = (A*B*D)*C	No-Go Alternative:	**No impact**	No-Go Alternative:	**No impact**
CUMULATIVE IMPACTS	This impact will be cumulative.			
CONFIDENCE	Low			
MITIGATION MEASURES	Develop a detailed decommissioning waste management plan that identifies all potential waste types to be generated and how they will be handled including the reuse, recycle before disposal. Ensure that the cost of handling waste is included in the decommissioning costing budget of the solar PV facility.			

24.5 CUMULATIVE IMPACTS

The EIA Regulations (as amended in 2017) determine that cumulative impacts, "*in relation to an activity, means the past, current and reasonably foreseeable future impact of an activity, considered together with the impact of activities associated with that activity, that in itself may not be significant, but may become significant when added to the existing and reasonably foreseeable impacts eventuating from similar or diverse activities.*" Cumulative impacts can be incremental, interactive, sequential or synergistic.

The specialists were required to assess the potential cumulative environmental impacts of the proposed development and operation of the Soyuz 4 Solar PV Park. The findings of the specialists regarding the potential cumulative impacts of this proposed development are addressed under each specialist section in Section 23 of this EIA Report. The cumulative impacts as discussed by the specialists are summarised in this section.

24.5.1 Geographical Area of Evaluation

The geographic area of evaluation is the spatial boundary in which the cumulative effects analysis was undertaken. The spatial boundary evaluated for the cumulative environmental impact assessment generally includes an area of a 30 km radius surrounding the preferred development site for the proposed Soyuz 4 Solar PV Park (Error! Reference source not found.).

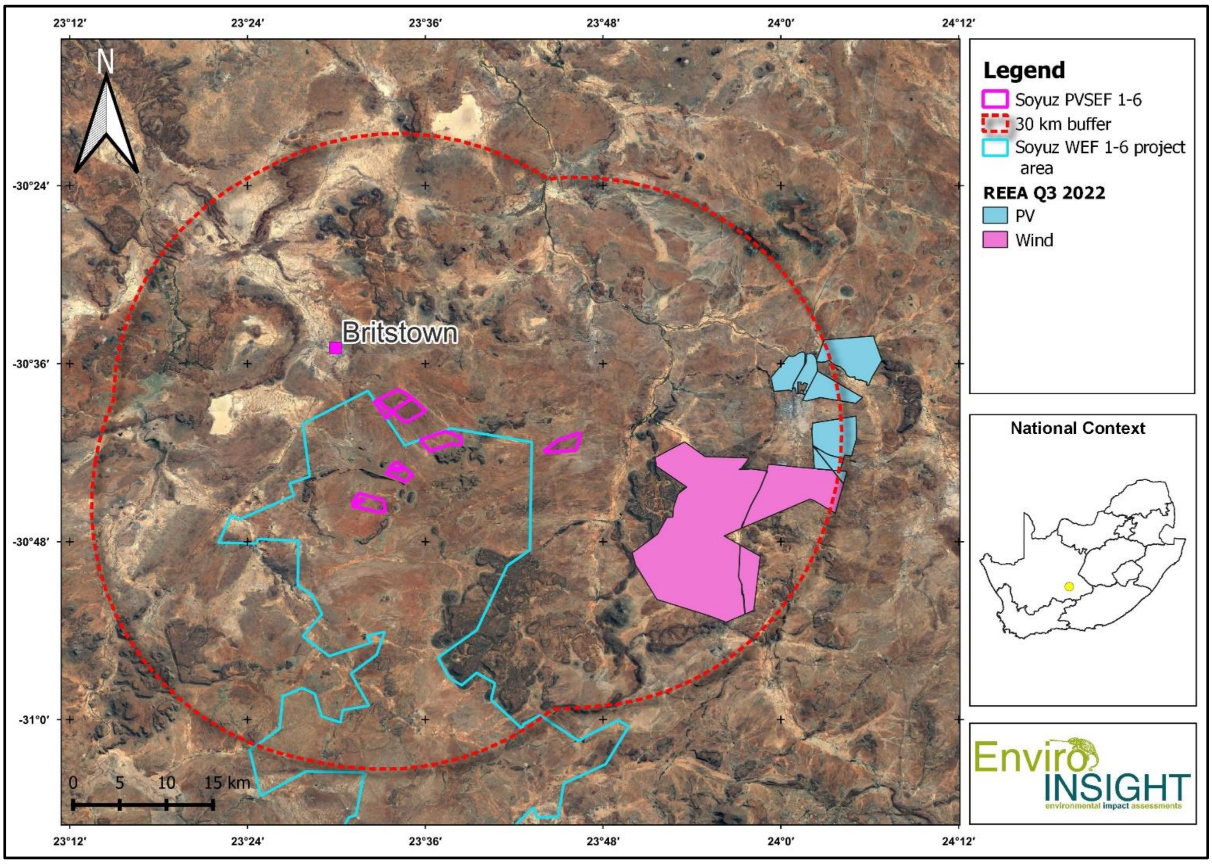


Figure 65: Cumulative Impact Assessment Geographical Evalution boundary with location of known regional renewable energy projects

24.5.2 Temporal Evaluation Boundary

A temporal boundary is the timeframe during which the cumulative environmental impacts may be expected to occur and in this assessment is the anticipated lifespan of the proposed project (inclusive of the construction phase) which has been provided as 25 years.

24.5.3 Other Renewable Energy Projects

There are 7 known Solar PV Facilities and two known Wind Energy Farms within a 30 km radius of the proposed Soyuz Solar PV Park Cluster **(Figure 65**). In addition, the evaluation has included all the proposed Solar PV Parks that form part of the proposed Soyuz Solar PV Cluster as well as the proposed Soyuz Wind Energy Cluster. The area of land that is or will be subjected to a degree of transformation by the renewable energy projects in the region is presented in **Table 49**.

Table 49: Cumulative impact from renewable energy developments in the region.

Elements	Area (ha)	Proportion of total area
Total area of 30 km buffer surrounding (and including) the proposed Soyuz SOLAR PV PARK cluster.	498350.2	100.0%
Total area of known renewable energy developments within a 30 km buffer surrounding the proposed Soyuz SOLAR PV PARK cluster.	122528.8	24.6%

Elements	Area (ha)	Proportion of total area
Total area of known WIND energy developments within a 30 km buffer surrounding the proposed Soyuz SOLAR PV PARK cluster.	116111.8	23.3%
Total area of known PV energy developments within a 30 km buffer surrounding the proposed Soyuz SOLAR PV PARK cluster.	6417.0	1.3%
Total area of the proposed Soyuz SOLAR PV PARK cluster.	3134.9	0.6%

24.5.4 Avifauna Specialist

Assuming that the total areas represented by the renewable energy developments shown in **Figure 65** will be transformed (worst case scenario), **Table 49**.

Table 49 shows that the maximum transformed area from renewable energy development boundaries within a 30 km radius of the proposed development cluster currently amounts to 24.6% of the total land area. The proposed Soyuz Solar PV Park Cluster itself only represents 0.6% of the 30 km radius area, indicating an insignificant proportion of transformation in the regional. The proposed Soyuz 4 Solar PV Park will result in 0.03% transformation of the greater area. The proposed development footprint plans have ensured that sensitive habitats are avoided while the implementation of the avifaunal mitigation measures will ensure that the most sensitive habitats remain undisturbed in the region.

Even with the best mitigation measures applied there are still cumulative negative impacts expected to bustard species in the region due to their propensity for collision with overhead powerlines which cannot be completely mitigated with current measures such as bird flight diverters. Some cumulative impact to these species is therefore expected in the region from the renewable energy developments but it is not possible to accurately calculate the magnitude of this impact at this stage. Additional research at a national level is required to assess these impacts appropriately and develop mitigation solutions that are more effective than those currently available.

Given the small additional land area that will be taken up by the proposed Soyuz SOLAR PV PARK Cluster, which is only due to facilities 2,3 and 6 as facilities 1, 4 & 5 fall within the boundaries of the Soyuz WEF cluster (**Figure 65**), an additional maximum of 1705 ha of land transformation is expected which cannot be considered as significant in the region.

24.5.5 Terrestrial Biodiversity Specialist

Fauna

Based on the general landscape and habitat within the project areas the site has the potential to host a moderately low to intermediate assemblage of fauna and potentially 4 SCC with one SCC namely *Orycteropus afer* (Aardvark, P) confirmed. Three SCC have foraging and breeding habitat within the project footprint, as such, the development will result in the loss of breeding or foraging habitat for these species. One mammal SCC may potentially lose breeding habitat within the project areas as a result of the developments. While this SCC potentially breed within the project areas it is not considered an important breeding locality for these species and the development is not likely to result in changes to breeding productivity, however, reductions in abundance within the project areas are likely. As a result of the extent over which the project area and other approved projects area proposed, faunal dispersal corridors are likely to be impacted. It is suggested that corridors using e.g. Freshwater Ecosystem Habitat be kept intact and remain open to the surrounding area as far as possible by only installing perimeter fences where necessary, having culverts in the border fence line or other mechanisms to improve connectivity. The increased human activity may however result in animals avoiding the broader area due to consistent human activity during the construction phase, however human activity will likely reduce during the operational phase. The proposed activities will lead to the loss of faunal habitat within the development footprints and to a reduction in the abundance of fauna and a potential for local reductions in SCC presence. This will lead to the displacement of faunal species currently inhabiting these areas, driving them out into the surrounding vegetated areas, leading to increased competition for territories and breeding sites. Moreover, there is likely to be a knock-on dispersal effect, leading to increased resource competition and possible increased mortality rates as the carrying capacity is impacted, resulting in a decreased species abundance, decreased breeding potential and possible further loss of species diversity in the region.

However, as for avifauna assessment given above, the small additional land area that will be taken up by the proposed Soyuz SOLAR PV PARK Cluster, which is only due to facilities 2,3 and 6 as facilities 1, 4 & 5 fall within the boundaries of the Soyuz WEF cluster (**Figure 65**), an additional maximum of 1705 ha of land transformation is expected which cannot be considered as significant in the region. Provided the mitigation measures recommended are applied, the cumulative negative impact to fauna will be low.

Flora

For the assessment of potential cumulative impacts to vegetation and plant species associated with Soyuz 4 Solar Park, consideration was given to past, present, and future (known) projects and natural drivers that affect these aspects. Three areas of concern were identified for Soyuz 4 Solar Park:

- Habitat fragmentation;
- Spread of AIPs and bush encroachment; and
- Additional (known) planned projects in the area.

The proposed project could further impact on the floral habitat and diversity as well as floral SCC through fragmentation of habitat within the landscape. The cumulative impact from additional fragmentation to the landscape is not anticipated to be significant in the long-term.

As for avifauna assessment above, given the small additional land area that will be taken up by the proposed Soyuz SOLAR PV PARK Cluster, which is only due to facilities 2,3 and 6 as facilities 1, 4 & 5 fall within the boundaries of the Soyuz WEF cluster (**Figure 65**), an additional maximum of 1705 ha of land transformation is expected which cannot be considered as significant in the region. Provided the mitigation measures recommended are applied, the cumulative negative impact to flora will be **LOW**.

24.5.6 Climate Change Specialist

Assuming the Soyuz 4 Solar PCV Park replaces generative capacity from other fossil fuel sources, the cumulative downstream impact from the proposed Soyuz Solar PV Cluster could lower South Africa's GHG emissions from the Energy sector by 4% since the Solar PV Parks will have a lower emission per unit compared with the Eskom which is largely dependent on coal fired power stations. The cumulative impact significance on climate change could therefore be positive, although the loss of vegetation for the duration of the project (30 years) should be accounted for and will reduce the positive impacts unless it can be offset with crop developments or forestation.

24.5.7 Freshwater Ecological Specialist

Freshwater ecosystems within the Karoo and the broader Northern Cape region are under continued threat due a variety of factors primarily related to landuses which, in the long term, may prove to be unsustainable. The predominant landuse and economic activity in the wider area related to the proposed Soyuz Solar PV Cluster is commercial livestock farming. This has resulted in degradation of freshwater features due to over-utilisation by livestock, as well a physical transformation of freshwater ecosystems, primarily in the form of impoundments that have been developed along most of the episodic drainage lines in the area. Such impoundments exert various types of impacts, including freshwater habitat transformation, hydrological impacts, as well as hydromorphological impacts. Other factors such as existing linear infrastructure (roads and railways) as well as climate change also exert impacts on the freshwater ecosystems in the wider area and in a Northern Cape Karoo context.

The development of the Soyuz 4 Solar PV Park will not directly impact any freshwater ecosystems in terms of the development footprint as no freshwater ecosystems are located within the proposed preferred development footprint. However, indirect impacts could result in the creation of a cumulative impact on the freshwater environment in the wider area if these indirect impacts resulted in a measurable impact on ecosystem provisioning or on the PES of any of the episodic drainage lines (EDLs). The implementation of the recommended mitigation measures would however significantly reduce or negate the potential for indirect cumulative impacts to materialise.

24.5.8 Heritage Specialist

The local and wider area within which the preferred Soyuz 4 Solar PV Park development site located is a remote and evolving agricultural landscape which has undergone use and incremental alteration into its current form during the last two centuries.

The widespread but relatively thin spread of archaeological sites and material within the Soyuz 4-6 Solar PV cluster and in the wider region suggests that while impacts to the heritage resources across the area are possible, they are unlikely to be cumulatively significant.

Although the region is generally palaeontologically sensitive, the occurrence of fossils within the relevant rock strata and the Quaternary sediments which cover much of the area is not consistent. Bamford (2023a) states that while impacts to the resource across the area are possible, the mixed nature of the regional geology, and the low level of surface and near surface exposure of fossil-bearing rocks where they do occur, means that cumulative impacts on palaeontological resources are <u>not likely</u>.

Archaeological material and sites are potentially at risk from cumulative impacts, given their widespread occurrence and exposure across the area. Multiple human activities in the landscape, of which the construction of the proposed Soyuz 4-6 Solar PV Parks, can erode the integrity of these resources through physical damage or destruction. At an individual project level these impacts may not appear to be significant, but the cumulative effects of multiple developments on archaeological resources can be high. The implementation of measures at individual project level can, however mitigate and reduce cumulative impacts.

For the cultural landscape, the renewable energy facilities shown as approved in the vicinity of the Soyuz 4 SPV park on South African Renewable Energy EIA Application Database (REEA, 2021) indicates that the region has been earmarked for renewable energy facilities, which may alter the landscape character which will add to the cumulative effects of modern development on the cultural landscape.

24.5.9 Noise Specialist

The Noise Impact Assessment has confirmed that a cumulative noise increase of significantly less than 7 dbA for all phases of the proposed Soyuz 4 Solar PV Park development and operation can be expected. As there are no other noise sources within impactable distance, the cumulative noise impact is expected to be negligible during the construction phase and non-existent during the operational phase.

24.5.10 Social Specialist - Cumulative Impact on Sense of Place

The potential cumulative impacts on the area's sense of place will be largely linked to potential visual impacts. In this regard the Scottish Natural Heritage (2005) describes a range of potential cumulative landscape impacts associated with wind farms on landscapes. These issues are also likely to be relevant to solar facilities and associated infrastructure. The relevant issues identified by Scottish Natural Heritage study include:

- Combined visibility (whether two or more wind farms will be visible from one location).
- Sequential visibility (e.g. the effect of seeing two or more wind farms along a single journey, e.g. road or walking trail).
- The visual compatibility of different wind farms in the same vicinity.
- Perceived or actual change in land use across a character type or region.
- Loss of a characteristic element (e.g. viewing type or feature) across a character type caused by developments across that character type.

The guidelines note that cumulative impacts need to be considered in relation to dynamic as well as static viewpoints. The experience of driving along a tourist road, for example, needs to be considered as a dynamic sequence of views and visual impacts, not just as the cumulative impact of several developments on one location. The viewer may only see one renewable energy facility and the associated infrastructure at a time, but if each successive stretch of the road is dominated by views of renewable energy facilities, then that can be argued to be a cumulative visual impact.

The potential impact of the proposed individual Soyuz Solar PV Parks on the region's sense of place is likely to be limited. This was confirmed during interviews with affected landowners. This is confirmed by the findings of the Visual Impact Assessment which concluded that the cumulative visual impact of the Soyuz Solar PV Cluster is expected to be of low significance.

24.5.11 Social Specialist - Cumulative Impact on Local Services and Accommodation

The establishment of several Solar PV Parks and other renewable energy facilities (REFs) has the potential to place pressure on local services and accommodation, specifically during the construction phase. The objective will be to source as many low and semi-skilled workers for the construction phase from the ELM. This will reduce the pressure on local services and accommodation and the nearby town of Britstown and De Aar. The potential impact should also be viewed within the context of the potential positive cumulative impacts for the local economy associated with the establishment of the proposed facility and associated renewable energy projects in the ELM. These benefits will create opportunities for investment in the ELM, including the opportunity to up-grade and expand existing services and the construction of new houses.

Socio-economic development (SED) contributions also represent an important focus of the REIPPPP and is aimed at ensuring that the build programme secures sustainable value for the country and enables local communities to benefit directly from the investments attracted into the area. The proposed Soyuz Solar PV Parks will be required to contribute a percentage of projected revenues accrued over the 20-year period to SED. This will provide revenue that can be used by the PKSDM to invest in up-grading local services where required. In should also be noted that it is the function of national, provincial, and local government to address the needs created by development and provide the required services. The additional demand for services and accommodation created by the establishment of development renewable energy projects should therefore be addressed in the Integrated Development Planning process undertaken by the ELM.

24.5.12 Social Specialist - Cumulative Impact on Local Economy

In addition to the potential negative impacts, the establishment of renewable energy facilities and associated infrastructure, including the proposed Soyuz Solar PV Parks, will also create several socio-economic opportunities for the ELM. The positive cumulative opportunities include creation of employment, skills development and training opportunities, and downstream business opportunities.

The review of the REIPPPP (December 2021) indicates that to date (across BW1-4) a total contribution of R22.8 billion has been committed to SED initiatives. Assuming an even, annual revenue spread, the average contribution per year would be R1.1 billion. Of the total commitment, R18.5 billion is specifically allocated for local communities where the IPPs operate. With every new IPP on the grid, revenues and the respective SED contributions will increase. The potential cumulative benefits for the local and regional economy are therefore associated with both the construction and operational phase of renewable energy projects and associated infrastructure and extend over a period of 20-25 years. However, steps must be taken to maximise employment opportunities for members from the local communities in the area and support skills development and training programmes.

24.5.13 Soil, Land Use & Land Capability Specialist

The Soyuz 4 Solar PV Park and associated access road are dominated by well-drained soils of Askham/Clovelly which collectively account for approximately 56.5% of total investigated. These soils are suitable for cultivation (Class III) but have a Restricted agricultural Potential (Class L5). If the above-mentioned land capability and potential conditions are considered as well as occurring climatic conditions with limited rainfall (200 – 400 mm per annum) the development footprint is deemed not suitable for any large-scale agricultural cultivation in the absence of supplementary irrigation and other intensive management practices. The cumulative impact on the local and regional scale is considered medium to low without mitigation and low to very low with mitigatory measures in place as the dominant soils are not sensitive from a soil and land capability point of view.

24.5.14 Traffic Specialist

It has been assumed that all proposed and/or approved renewable energy projects within a 30 km radius of the proposed Soyuz 4 Solar PV development site will be constructed simultaneously. The construction and decommissioning phases of these projects are the only significant traffic generators. These are short term phases and the impacts on the surrounding road network is temporary. Even if all these projects are constructed and decommissioned simultaneously, the road authority will evaluate the applications for heavy loads associated with these projects and liaise with the developers to ensure that loads on the public roads are staggered to ensure that the traffic impact is acceptable.

24.5.15 Visual Specialist

Cumulative impacts can result from individually minor but collectively significant actions taking place over time. Cumulative visual impacts may be:

- Combined - where the PV arrays of several Solar PV Parks are within the observer's arc view concurrently;
- Successive - where the observer must turn his / her head to see the various SOLAR PV PARK's arrays; and
- Sequential - when the observer must 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 Solar PV Parks on the landscape and visual amenity is a product of:

- The distance between individual solar PV parks;
- 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 solar PV parks themselves; and
- The way in which the landscape is experienced.

Cumulative visual impacts resulting from landscape modifications because of the proposed Soyuz Solar PV Park in conjunction with the Soyuz Solar PV Cluster and the eleven 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 near each other could significantly alter the sense of place and visual character in the broader region. With the Soyuz Solar PV Cluster solar parks situated so far apart, the cumulative impact is considered sequential and therefore low. Furthermore, with the very low viewer incidence, the cumulative visual impact is expected to be of low significance. Furthermore, the limited lighting required for a Solar PV Parks will not significantly increase sky glow, even when considering all proposed renewable energy projects within a 50 km radius. No negative cumulative visual impacts are anticipated from the proposed project and other future projects in the area which are of unacceptably high significance.

25 ENVIRONMENTAL IMPACT ASSESSMENT SUMMARY FOR THE PREFERRED ALTERNATIVE

Based on the information presented in this report and the assessment of identified impacts as presented in the impact section (Section 24) of this report, the key potential impacts (post-mitigation) and the key recommended mitigation measures are summarised in this section.

25.1.1 Impacts to be Mitigated During the Planning and Design Phase

Planning and Design Phase				
Aspect	**Impact**	**Pre-Mitigation Significance**	**Post-mitigation Significance**	**Summary of Mitigation Measures**
Avifauna	Direct loss of avifaunal habitat	Low Negative	Low Negative	• Ensure the development is confined to the preferred site layout as assessed by the avifauna specialist ad presented in this EIA Report.
	Attraction to the facility	Low Negative	Low Negative	• All power cables within the project area should be fully insulated and preferably buried in demarcated corridors. • Install white strips or expose (lustrous) aluminium frames along the edges of the solar panels to increase visibility and deter birds. • Installation of bird deterrent devices on and around solar panels and on transmission line poles, pylons and / or monopoles as well as security/boundary fences to reduce collision risk. • The BESS must be covered in non-reflective surfaces and protected against thermal discharge. • In areas where service roads intersect with semi natural or natural habitat, fences must be set back 75 metres from the edge of the road to allow for vulnerable species such as bustards, storks, cranes and korhaans to obtain adequate height after being flushed by vehicle traffic. Alternatively, the fences must be placed completely adjacent to the roads with a maximum of 3 metres buffer and marked with fence flappers to reduce flush related collisions.
Terrestrial Fauna	Loss of habitat and potential species diversity	Medium to High Negative	Low Negative	• Ensure the development is confined to the preferred site layout as assessed by the terrestrial fauna specialist ad presented in this EIA Report. • Access roads should be kept to existing roads so to reduce fragmentation of existing natural habitat. • Perimeter fences must be designed to allow for small faunal species movement in and out of the Soyuz 4 Solar PV Park. The use of electric perimeter fencing is discouraged. Small culverts should be placed every 200m in the fence to allow for the movement of small species through the fence.

Planning and Design Phase				
Aspect	**Impact**	**Pre-Mitigation Significance**	**Post-mitigation Significance**	**Summary of Mitigation Measures**
	Loss of faunal Species of Conservation Concern	Medium to High Negative	Low Negative	• Ensure the development is confined to the preferred site layout as assessed by the terrestrial fauna specialist ad presented in this EIA Report. • Perimeter fences must be designed to allow for small faunal species movement in and out of the Soyuz 4 Solar PV Park. The use of electric perimeter fencing is discouraged. Small culverts should be placed every 200m in the fence to allow for the movement of small species through the fence. • A documented rescue and relocation plan of action must be in place prior to commencement of construction and operational activities so all personnel are aware of the requirements should a faunal SCC be encountered. • Prior to vegetation clearing activities, the site should be inspected for the presence of SCC, including burrowing scorpion burrows, and reptiles. If located, these species should be carefully rescued and relocated as per an approved rescue and relocation plan that must be developed.
Terrestrial Flora	Loss of floral habitat and potential species diversity	Low to medium Negative	Low Negative	• Ensure the development is confined to the preferred site layout as assessed by the terrestrial fauna specialist ad presented in this EIA Report. • Minimise loss of indigenous vegetation and natural habitat where possible through adequate planning and, where necessary, by incorporating the sensitivity of the biodiversity report as well as other specialist studies • Where possible, and feasible, all planning of access roads should be kept to existing roads so to reduce fragmentation of existing natural habitat; • Design of infrastructure should be environmentally sound and all construction equipment to be utilised must be in a good working condition, and all possible precautions taken to prevent potential mechanical spills and/or leaks. • Prior to the commencement of construction activities, an Alien Invasive Management Programme should be compiled

Planning and Design Phase				
Aspect	**Impact**	**Pre-Mitigation Significance**	**Post-mitigation Significance**	**Summary of Mitigation Measures**
				for implementation. • Prior to the commencement of construction activities on site, a rehabilitation plan should be developed. • At all times, ensure that sound environmental management is in place during the planning phase.
	Loss of Floral Species of Conservation Concern	Medium Negative	Low Negative	• Ensure the development is confined to the preferred site layout as assessed by the terrestrial flora specialist ad presented in this EIA Report. • A walkdown of the development footprint area must take place before construction activities commence, where all anticipated floral SCC are searched for and marked to determine the number of individuals that will be impacted. Based on the outcome of the walkdown, the appropriateness of rescue and relocation initiatives must be determined, and a rescue and relocation plan may be required. The following permit application will be necessary: - Where provincially protected species will be impacted, permits from the Northern Cape DAEARDLR should be obtained to remove, cut, or destroy the above-mentioned protected species before any vegetation clearing may take place. • Geophytes and succulents are good candidates for rescue and relocation, and these should be targeted for such initiatives.
Soil and Land Capability	Loss of land capability – agriculture	High Negative	Low Negative	• Ensure the development is confined to the preferred site layout as assessed by the soil and land capability specialist and presented in this EIA Report..
Surface Water	Direct transformation of freshwater habitat	Low Negative	Low Negative	• Ensure the development is confined to the preferred site layout as assessed by the aquatic specialist and presented in this EIA Report. This layout delineates the episodic drainage lines and the associated buffer. •
	Altered surface water velocities	Low Negative	Low Negative	• Vegetation be retained in the parts of the development site where clearing for PV and associated infrastructure is not

Planning and Design Phase				
Aspect	**Impact**	**Pre-Mitigation Significance**	**Post-mitigation Significance**	**Summary of Mitigation Measures**
				required in order to improve infiltration of runoff and to trap surface runoff during precipitation events; • Stormwater infrastructure on the development site must be designed in line with the principles of SUDS to polish stormwater by trapping sediments and by removing pollutants that could pollute downgradient freshwater ecosystems, and in order to allow the gradual discharge of stormwater into the drainage lines following rainfall events. • As such the use of 'soft' engineering features such as bioswales that are vegetated with suitable vegetation that is tolerant of both wet and dry conditions is strongly recommended. • The use of stone pitching to reduce velocity of stormwater is strongly recommended. • The proposed stormwater infrastructure must also be incorporated into a suitable and site-specific Stormwater Management Plan (SWMP).
Environmental Noise	Noise from the BESS activities	Low Negative	Low Negative	• Ensure that there is a buffer zone between the BESS, central inverter and substation and the closest farmhouse/tourism facility.
Visual	Impact on the overall landscape, visual intrusion and exposure of the landscape	Low Negative	Low Negative	• Ensure the development is confined to the preferred site layout as assessed by the aquatic specialist and presented in this EIA Report. This layout delineates the episodic drainage lines and the associated buffer. • A transparent fence, such as a clear VU fence or equally approved, should be muted in colour and located as close as possible to the development boundary of the Solar Park to avoid impeding visibility and ensure that it is visually pleasing to observers.
	Impact to aircraft using nearby airstrip because of glare and glint.	Low Negative	Low Negative	• 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

Planning and Design Phase				
Aspect	**Impact**	**Pre-Mitigation Significance**	**Post-mitigation Significance**	**Summary of Mitigation Measures**
				material on the outer surface of the glass can further limit sunlight reflection. This should be helpful to reduce the potential glint and glare experienced especially where the gravel road is slightly elevated above the Solar PV Park; • Another design feature to limit glint and glare is to roughen the protective glass surface, reducing specular reflection.
	Visual impacts of night-time lighting	Low Negative	Low Negative	• 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.
Heritage	Disturbance and/or destruction of archaeological sites and/or materials	Low Negative	Low Negative	• Ensure the development is confined to the preferred site layout as assessed by the heritage specialist and presented as the preferred layout alternative in this EIA Report. • Avoid the engraved boulder (G012) through the implementation of a permanent 20 m no-go area or buffer around it. This buffer must be physically demarcated during construction and decommissioning. • Avoid the cluster of sites adjacent to the access road between the Soyuz 4 and Soyuz 5 SPV parks (JG009-JG013 / G009) through the implementation of a permanent 20 m no-go area or buffer around it.
Water Management	Excessive use of natural water (groundwater) for the washing of solar PV panels in a water deficit region.	High negative	Low Negative	• Investigate panel cleaning options prior to finalising the design of the Soyuz 4 Solar PV Park and where possible implement 'waterless' alternatives. • If borehole water is to be considered, then a WUL must be applied for and the necessary geohydrological assessments undertaken to ensure the aquifer can provide the required quantities without affecting other users water rights.

25.1.2 Impacts and Mitigation Measures during Construction Phase

Construction Phase				
Aspect	**Impact**	**Pre-Mitigation Significance**	**Post-mitigation Significance**	**Summary of Mitigation Measures**
Avifauna	Direct loss of avifaunal habitat	Low Negative	Low Negative	• Ensure the construction activities are confined within the development footprint as presented in this EIA Report (preferred site layout). • Limit the areas cleared for construction purposes (e.g. laydown areas). • Do not implement a bare earth policy for construction of solar panels, rather mow the vegetation. • Demarcate sensitive areas and allocated buffers as 'no go' areas. • Rehabilitate all areas disturbed immediately after construction. • Prioritise existing roads for access routes. • Develop and implement an Alien and Invasive Plant Control Plan.
	Disturbance and displacement	Low Negative	Low Negative	• Adopt temporal avoidance strategies. Attempt, as far as possible to conduct most of the high intensity earthmoving and building activities during winter (June to September) to minimize disturbance of avifauna during sensitive life stages such as lekking, courting, nesting and fledging. • Minimise light pollution and fit external lighting with downward facing hoods. • Demarcate natural areas beyond the surface infrastructure footprint and restrict access of personnel into these areas through education and signposting. • Train staff and contractors on the importance of birds and other biodiversity and the sensitive areas for these species which should be avoided. • Introduce and enforce a speed limit (40 km/h)
Fauna	Loss of faunal habitat and potential species diversity	Medium – High Negative	Low Negative	• Ensure the construction activities are confined within the development footprint as presented in this EIA Report (preferred site layout). • Limit the areas cleared for construction purposes (e.g. laydown areas). • Demarcate sensitive areas and allocated buffers as 'no go' areas.

Construction Phase				
Aspect	**Impact**	**Pre-Mitigation Significance**	**Post-mitigation Significance**	**Summary of Mitigation Measures**
				• Prioritise existing roads for access routes. • Smaller species of invertebrates and reptiles are likely to be less mobile during colder periods, as such should any be observed in the footprint areas during clearing and operational activities, they are to be carefully and safely moved to an area of similar habitat outside of the disturbance footprint. • Maintain habitat connectivity and corridors for species movement; • Edge effect control needs to be implemented to ensure no further degradation and potential loss of faunal SCC outside of the proposed project footprint area. • It is recommended that after vegetation clearing during the construction phase, vegetation regrowth must be promoted while appropriately maintained so as not to create a safety or production risk, as this will create habitat for faunal species and will aid in preventing soil erosion.
	Loss of Faunal SCC	Medium to High Negative	Low Negative	• Ensure the construction activities are confined within the development footprint as presented in this EIA Report (preferred site layout). • Should any other faunal species protected under the National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004) or the Northern Cape Nature Conservation Act (schedule 1) be encountered, construction should be halted and authorisation to relocate such species must be obtained from the DFFE or NCDENC; • Prior to vegetation clearing activities, it is recommended that the site should be inspected for the presence of burrowing SCC scorpions. If located, these species should be carefully excavated ensuring no harm to the specimens and relocated to similar surrounding habitat outside of the footprint area. A night-time survey utilising UV lights is recommended to aid in the collection of potential scorpion SCC. The survey should be undertaken in summer where these arachnids are more active. Where this is not feasible, as species are observed when vegetation clearance takes

Construction Phase				
Aspect	**Impact**	**Pre-Mitigation Significance**	**Post-mitigation Significance**	**Summary of Mitigation Measures**
				place, they are to be appropriately rescued and relocated; • A suitable rescue and relocation plan should be developed and overseen by a suitably qualified specialist should SCC be identified within the project areas in order to ensure that species loss during construction activities is kept to a minimum
Flora	Loss of floral habitat and potential species diversity	Medium Negative	Low Negative	• Ensure the construction activities are confined within the Footprint areas should be kept as small as possible. Site boundaries should be clearly demarcated so as to ensure that vegetation beyond the authorised footprint is not cleared; • No development should occur within the Freshwater Ecosystem Habitat or within the relevant zones of regulation around these features present within the proposed PV plant area; • Construction equipment should be restricted to travelling only on designated roadways or within the intended development footprint to limit the ecological footprint of the development activities. Additional road construction should be limited to what is absolutely necessary, and the footprint thereof kept to a minimum; • Access road for construction should be gravel. Post construction and before operation of PV plant permeable paving is recommended (e.g., grassblock) in areas where areas should be paved; • Care should be taken during the construction and before operation of the proposed development to limit edge effects to surrounding natural habitat. This can be achieved by: - Demarcating all footprint areas during construction activities; - No construction rubble or cleared alien invasive species are to be disposed of outside of demarcated areas, and should be taken to a registered waste disposal facility; - Suppress dust to mitigate the impact of dust on flora within a close proximity of construction activities;

Construction Phase				
Aspect	**Impact**	**Pre-Mitigation Significance**	**Post-mitigation Significance**	**Summary of Mitigation Measures**
				- All soil compacted by construction activities (outside of the development footprint) should be ripped, profiled and reseeded; and • Manage the spread of AIP species, which may affect remaining natural habitat within surrounding areas. • If any spills occur, they should be immediately cleaned up to avoid soil contamination that can hinder floral rehabilitation later down the line. In the event of a breakdown, maintenance of vehicles must take place with care, and the collection of spillages should be practised preventing the ingress of hydrocarbons into the topsoil; • Any natural areas beyond the development footprint, which have been affected by the construction activities, must be rehabilitated using indigenous plant species; • Revegetation of disturbed areas should be carried out in order to restore habitat availability and minimise soil erosion and surface water runoff; • Edge effect control needs to be implemented to ensure no further degradation and potential loss of floral species outside of the proposed project footprint area. An on-site Environmental Control Officer (ECO) should monitor and mitigate any edge effects throughout the life of the operation; • No additional habitat is to be disturbed outside of the approved footprints areas. Weekly (recommended) to monthly (minimum requirement) monitoring and recording of the footprint areas must be done during the construction phase by the ECO and photographic records kept – special attention should also be paid to the potential increase and spread of AIPs; • No dumping of waste on site should take place. As such it is advised that waste disposal containers and bins be provided during the construction phase for all dilapidates, rubble and general waste;

Construction Phase				
Aspect	**Impact**	**Pre-Mitigation Significance**	**Post-mitigation Significance**	**Summary of Mitigation Measures**
				• At all times, ensure that sound environmental management is in place; and • It is recommended that after vegetation clearing during the construction phase, vegetation regrowth must be promoted while appropriately maintained so as not to create a safety or production risk, as this will create habitat for species and will aid in preventing soil erosion.
	Loss of Floral Species of Conservation Concern	Medium Negative	Low Negative	• Ensure the construction activities are confined within the development footprint as presented in this EIA Report (preferred site layout). • The relocation success of floral SCC or protected floral species (where applicable) must be monitored during the construction phase to ensure immediate actions can be taken if it becomes evident that relocation is not successful; • No collection of floral SCC must be allowed by construction personnel; • Edge effect control needs to be implemented to prevent further degradation and potential loss of floral SCC or protected floral species outside of the proposed development footprint area; and • It is recommended that after vegetation clearing during the construction phase, vegetation regrowth must be promoted while appropriately maintained so as not to create a safety or production risk, as this will create habitat for floral SCC and will aid in preventing soil erosion.
Soil and Land Capability	Loss of land capability – agriculture	High Negative	Low Negative	• Ensure the construction activities are confined within the development footprint as presented in this EIA Report (preferred site layout). • Revegetate the disturbed soils with an indigenous grass mix, to re-establish a protective cover, in order to minimise soil erosion and dust emissions; • Temporary erosion control measures should be used to

Construction Phase				
Aspect	**Impact**	**Pre-Mitigation Significance**	**Post-mitigation Significance**	**Summary of Mitigation Measures**
				protect the disturbed soils during the construction phase until adequate vegetation has established; • The footprint areas should be lightly ripped to alleviate compaction;
	Soil erosion	Medium Negative	Low Negative	• Always strip a suitable time before the placement or construction of the solar PV facilities, to avoid soil loss and contamination. • Infrastructure footprint area should be clearly demarcated to avoid unnecessary disturbance of adjacent soils; • Temporary erosion control measures should be used to protect the disturbed soils during the construction phase until adequate vegetation has established • Revegetate adjacent areas with an indigenous grass mix, to re-establish a protective cover, in order to minimise soil erosion and dust emissions; and
	Soil Compaction	Low Negative	Low Negative	• Construction vehicle movement should be limited to within the project perimeter fence to avoid unnecessary compaction of adjacent soils
	Soil Contamination	Medium Negative	Low Negative	• A spill prevention and emergency spill response plan, as well as dust suppression, and fire prevention plans should also be compiled to guide the construction works;
Surface Water	Access Road upgrading – direct impacts	Low Negative	Low Negative	• All construction and site clearing must take place during the dry season to limit potential impacts to downgradient drainage lines • The construction footprint of the roads as they cross the two EDLs must be limited to the approved construction Right of Way. This Construction Right of Way must be narrowed to only the width of the proposed road and 2m on either side of the road width. • •This construction right of way must be clearly demarcated prior to the commencement of any vegetation clearing to prevent any such damage to vegetation outside of the construction Right of Way. • Construction phase stormwater controls must be implemented in to protect the adjacent EDLs.

Construction Phase				
Aspect	**Impact**	**Pre-Mitigation Significance**	**Post-mitigation Significance**	**Summary of Mitigation Measures**
				• Construction material laydown areas must be located outside of the respective Zones of Regulation to prevent damage to vegetation in the catchments of the EDLs that could lead to altered stormwater runoff into the EDLs; • Fresh concrete and cement mortar must not be mixed near the site boundaries (i.e. within the 100m Zone of Regulation) of the drainage lines;
	Impact on freshwater ecosystem provisioning and resource quality	Low Negative	Low Negative	• Ensure the construction activities are confined within the development footprint as presented in this EIA Report (preferred site layout). • prior to the commencement of construction and vegetation clearing to ensure that no vehicle or other construction personnel access occurs off the site and within the 32m ZoR of the EDLs or into the EDLs themselves; • All construction and site clearing must take place during the dry season to limit potential impacts to downgradient drainage lines • A construction-phase stormwater control system must be implemented as part of the development and implementation of stormwater controls across all development phases. Temporary measures must be used to control construction phase stormwater - e.g. the use of berms, silt traps / silt curtains, along with the retention of natural vegetation where possible; • Dust suppression measures must be implemented (such as spray watering on gravel roads) throughout the proposed development activities to prevent excessive dust which may adversely affect riparian vegetation within the EDLs. • Fresh concrete and cement mortar must not be mixed near the site boundaries (i.e. within the 100m Zone of Regulation) of the drainage lines; • Stormwater infrastructure on the development site must be designed in line with the principles of SUDS in order to polish stormwater by trapping sediments and by removing pollutants that could pollute downgradient freshwater ecosystems, and in

Construction Phase				
Aspect	**Impact**	**Pre-Mitigation Significance**	**Post-mitigation Significance**	**Summary of Mitigation Measures**
				order to allow the gradual discharge of stormwater into the drainage lines following rainfall events.
Geotech and Soil	Soil erosion, soil contamination and soil destabilisation	Low Negative	Low Positive	• Ensure the construction activities are confined within the development footprint as presented in this EIA Report (preferred site layout). • rehabilitate any disturbed areas following completion of the construction period, whether complete or on hold.
Environmental Noise	Noise generated by construction equipment operation	Low Negative	Low Negative	• Construction activities to take place during daytime only. • Noise Management Plan to be included in EMPr and implemented.
Visual	Visual impacts of night-time lighting	Low Negative	Low Negative	• Ensure night-time lighting is limited.
Heritage	Disturbance and/or destruction of paleontological material during construction	Low Negative	Low Positive	• Implement a Fossil Chance Find Protocol. • Environmental Compliance Officer to monitor earthworks for fossils. • Report any chance finds of palaeontological material to a palaeontologist who must collect a representative sample.
	Disturbance and/or destruction of archaeological sites and/or materials during construction and decommissioning	Low Negative	Low Positive	• Report any chance finds of archaeological material to SAHRA and/or an archaeologist.
	Disturbance and/or destruction of graves or burials during construction and decommissioning	Low Negative	Low Positive	• Cease work immediately in the immediate area if human remains are encountered. • Leave remains in situ and make site safe. • Report the finds to SAHRA and/or an archaeologist.
	Alteration of the cultural landscape due to the presence of the SPV project	Low Negative	Low Positive	• Minimise disturbance footprint during construction and rehabilitate all disturbed areas that will not be needed during operation.
Social	Employment and business opportunities	Medium Positive	Medium Positive	**Employment** • Preparation and implementation of a Stakeholder Engagement Plan (SEP) prior to and during the construction phase. • Where reasonable and practical, the proponent should appoint local contractors and implement a 'locals first' policy, especially for

Construction Phase				
Aspect	**Impact**	**Pre-Mitigation Significance**	**Post-mitigation Significance**	**Summary of Mitigation Measures**
				semi and low-skilled job categories. However, due to the low skills levels in the area, most skilled posts are likely to be filled by people from outside the area. • Where feasible, efforts should be made to employ local contactors that are compliant with Broad Based Black Economic Empowerment (BBBEE) criteria. • Before the construction phase commences the proponent should meet with representatives from the ELM to establish the existence of a skills database for the area. If such as database exists, it should be made available to the contractors appointed for the construction phase. • The local authorities, community representatives, and organisations on the interested and affected party database should be informed of the final decision regarding the project and the potential job opportunities for locals and the employment procedures that the proponent intends following for the construction phase of the project. • Where feasible, training and skills development programmes for locals should be initiated prior to the initiation of the construction phase. • The recruitment selection process should seek to promote gender equality and the employment of women wherever possible. **Business** • The proponent should liaise with the ELM with regards the establishment of a database of local companies, specifically BBBEE companies, which qualify as potential service providers (e.g. construction companies, catering companies, waste collection companies, security companies etc.) prior to the commencement of the tender process for construction contractors. These companies should be notified of the tender process and invited to bid for project-related work.

Construction Phase				
Aspect	**Impact**	**Pre-Mitigation Significance**	**Post-mitigation Significance**	**Summary of Mitigation Measures**
				• Where possible, the proponent should assist local BBBEE companies to complete and submit the required tender forms and associated information. • The ELM, in conjunction with the local business sector and representatives from the local hospitality industry, should identify strategies aimed at maximising the potential benefits associated with the project.
	Social impact of construction workers	Low Negative	Low Negative	• Preparation and implementation of a Community Health, Safety and Security Plan (CHSSP) prior to and during the construction phase. • The SEP and CHSSP should include a Grievance Mechanism that enables stakeholders to report resolve incidents. • Where possible, the proponent should make it a requirement for contractors to implement a 'locals first' policy for construction jobs, specifically for semi and low-skilled job categories. •
	Influx of job seekers	Low Negative	Low Negative	• Preparation and implementation of a Stakeholder Engagement Plan (SEP) prior to and during the construction phase. • Preparation and implementation of a Community Health, Safety and Security Plan (CHSSP) prior to and during the construction phase. • The proponent should implement a "locals first" policy, specifically regarding unskilled and low skilled opportunities.
	Farm safety	Low Negative	Low Negative	• The proponent should consider the option of establishing a MF (see above) that includes local farmers and develop an agreement for construction workers. This committee should be established prior to commencement of the construction phase. This agreement should be signed by the proponent and the contractors before the contractors move onto site. • The proponent should hold contractors liable for compensating farmers and communities in full for any stock losses and/or damage to farm infrastructure that can be linked to construction workers.

Construction Phase				
Aspect	**Impact**	**Pre-Mitigation Significance**	**Post-mitigation Significance**	**Summary of Mitigation Measures**
	Grass fires	Low Negative	Low Negative	• Develop a construction phase fire management plan
	Nuisance impacts	Low Negative	Low Negative	• Establishment of a Grievance Mechanism that provides local farmers and other road users with an effective and efficient mechanism to address issues related to construction related impacts, including damage to local gravel farm roads. • The movement of heavy vehicles associated with the construction phase should be timed to avoid times days of the week, such as weekends, when the volume of traffic travelling along the access roads may be higher.
	Loss of farmland	Low Negative	Low Negative	• Ensure the construction activities are confined within the development footprint as presented in this EIA Report (preferred site layout).
Traffic	Increase in traffic volumes on the surrounding road network because of construction traffic	Low Negative	Low Negative	• Construction traffic should not be allowed on the public road network during the typical weekday a.m. and p.m. peak hours in built up areas. • These measures will be included in the Traffic Management Plan
	Gravel loss and possible damage to the road layer works. because of additional truck traffic during the construction phase.	Low Negative	Low Negative	• Resurfacing of sections along Windpoort Road, where required and regular road maintenance i.e. grading of the road once every two weeks during the construction phase. • The road can also be sprayed with a dust suppressant as required to limit dust pollution and gravel loss.
Waste Management	Handling of hazardous waste including damaged PV panels and BESS batteries	Handling of solar PV waste panels and BESS waste batteries	Medium Negative	• Construction waste management plan to be developed and implemented and to include how these wastes will be handled.
	Handling of packaging waste	Very High Negative	Low Negative	• Develop a detailed construction phase waste management plan that identifies all potential waste types to be generated and how they will be handled including the reuse, recycle before disposal. Ensure that the cost of handling waste is included into the tender requirements for the construction phase.;

25.1.3 Operational Phase Impacts

Operational Phase				
Aspect	**Impact**	**Pre-Mitigation Significance**	**Post-mitigation Significance**	**Summary of Mitigation Measures**
Avifauna	Sensory disturbance – night-time lighting	Low Negative	Low Negative	• Minimise light pollution and fit external lighting with downward facing hoods.
	Chemical use	Low Negative	Low Negative	• Avoid or minimise the use of chemical surfactants and dust suppressants on site; and • Where necessary ensure that none of the cleaning water enters nearby watercourses through runoff; • Do not clean before an imminent rainstorm.
Fauna	Loss of faunal habitat and potential species diversity	Medium Negative	Low Negative	• Lights should face downwards to reduce the abundance of insects and any other fauna attracted to light. • Preserve, enhance, restore or replace faunal movement corridors and habitat, important the freshwater ecosystem habitat; • Vegetation regrowth during the Operational and Maintenance Phases must be promoted while appropriately maintained so as not to create a safety or production risk, as this will create habitat for faunal species and will aid in preventing soil erosion. • Rehabilitation should only cease once a suitably qualified team of ecologists sign off that the rehabilitation and restoration is adequate; • Ongoing alien and invasive plant monitoring and clearing/control should take place throughout the operational phase, and the project perimeters should be regularly checked for AIP establishment to prevent spread into surrounding natural areas which may alter the suitability of the habitat to faunal species; • Alien vegetation that is removed must not be allowed to lay on unprotected ground as seeds might disperse upon it. All cleared plant material to be disposed of at a licensed waste facility, which comply with legal standards;
	Loss of Faunal SCC	Medium Negative	Low Negative	

Flora	Loss of floral habitat and potential species diversity	Medium to High Negative	Low Negative	• All vehicles should be restricted to travelling only on designated roadways to limit the ecological footprint of the development activities; • Ongoing AIP monitoring and clearing/control should take place throughout the operational phase, and the project perimeters should be regularly checked for AIP establishment to prevent spread into surrounding natural areas which may alter the suitability of the habitat to indigenous floral species; • Alien vegetation that is removed must not be allowed to lay on unprotected ground as seeds might disperse upon it. All cleared plant material to be disposed of at a licensed waste facility, which comply with legal standards; • No illicit fires must be allowed; • Where bare soils are left exposed as a result of construction activities, they should be immediately rehabilitated. Rehabilitated efforts should continue to be monitored throughout the operational phase, until natural processes will allow the ecological functioning and biodiversity of the area to be re-instated; • Monitor the Freshwater Habitat to ensure that floral communities are not degraded; • Edge effects arising from the operational and maintenance activities of the proposed development, such as erosion and AIP proliferation, which may affect adjacent natural areas, need to be strictly managed. Specific mention in this regard is made of Category 1b AIP species (as listed in the NEMBA Alien species lists, 2020), in line with the NEMBA Alien and Invasive Species Regulations (2020); and • It is recommended that vegetation regrowth during the Operational and Maintenance Phases must be promoted while appropriately maintained so as not to create a safety or production risk, as this will create habitat for floral species and will aid in preventing soil erosion.
	Loss of Floral Species of Conservation Concern	Medium Negative	Low Negative	• AIP management must continue throughout the operation of the proposed project to ensure that AIPs don't spread into adjacent natural areas where floral SCC numbers (and

Operational Phase				
Aspect	**Impact**	**Pre-Mitigation Significance**	**Post-mitigation Significance**	**Summary of Mitigation Measures**
				habitat) may be displaced; • Monitoring of relocation success should continue for at least three years after the completion of the construction phase, or until it is evident that the species have established self-sustaining populations; • Where feasible, rescued SCC must be used in the landscaping and rehabilitation activities for any remaining natural habitat that do not form part of the planned footprints; and • Collection of floral SCC and protected flora by operational and maintenance teams must be prohibited.
Soil and Land Capability	Loss of land capability – agriculture	High Negative	Low Negative	• Maintenance vehicles should be checked for leakages of hydrocarbons prior to commencement of maintenance activities; • Maintenance vehicles should stick to demarcated road as far as practically possible to minimise soil compaction on adjacent soils; and • The solar panels should be cleaned with clean water and use of chemicals should be avoided to minimise the likelihood of potential soil contamination.
	Soil erosion	Medium Negative	Low Negative	
	Soil Compaction	Low Negative	Low Negative	
	Soil Contamination	Medium Negative	Low Negative	
Surface Water	Stormwater design and operational maintenance of the access roads in terms of freshwater ecosystem provisioning and resource quality	Low Negative	Low Negative	• Stormwater will naturally flow from the portions of the roads in the immediate catchments of the EDLs towards the crossing points; • Stormwater generated from the road surfaces in the catchments of the EDLs must be directed at intervals into the catchment areas rather than being channelled towards the crossing points; •Design measures such as flow breakers to slow the velocity of stormwater must be included in the design of the roads at the 2 EDL crossing points. • Road maintenance activities must be confined to the developed footprint of the access roads;

Operational Phase				
Aspect	**Impact**	**Pre-Mitigation Significance**	**Post-mitigation Significance**	**Summary of Mitigation Measures**
				• If unsurfaced, the surface of the roads must be regularly checked for erosion and any such erosion / rilling remediated.
	Impact of the solar PV arrays and associated infrastructure on freshwater ecosystem provisioning and resource quality	Low Negative	Low Negative	• Maintenance activities must be confined to the developed footprint of the solar energy facility which must be fenced off to prevent accidental access into the adjacent freshwater ecosystems (riparian zones). • The intervening areas between the southern, western and eastern site boundaries and the EDLs must be kept free of any development and effectively retained as buffer zones to assist in preventing indirect impacts from occurring. • Components of infrastructure that contain pollutants – i.e. substation transformers and batteries in the BESS component must be properly maintained and checked for leaks. All such components that could leak pollutants, or which could result in soil or water pollution must be designed to be placed on an impervious surface that would be able to hold the full volume of any pollutants.
Environmental Noise	Noise generated by fully operational facility	Low Negative	Low Negative	• Implement noise management plan
Visual	Potential impact of night-time lighting on the visual environment	Low Negative	Low Negative	• As per planning phase recommendations
	Impact to aircraft using nearby airstrip because of glare and glint.	Low Negative	Low Negative	• 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. • 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

Operational Phase				
Aspect	**Impact**	**Pre-Mitigation Significance**	**Post-mitigation Significance**	**Summary of Mitigation Measures**
				configurations that produce no glare and the design with maximum energy production can be selected.
Social	Energy Security and support renewable energy sector	Medium Positive	Medium Positive	• Implement a skills development and training programme aimed at maximizing the number of employment opportunities for local community members. • Maximise opportunities for local content, procurement, and community shareholding.
	Employment opportunities and social upliftment	Low Positive	Low Positive	• Enhance local employment opportunities
	Income generation for landowner	Low Positive	High Positive	• Implement agreements with affected landowners
	Improve socio-economic development	Low Positive	High Positive	• The proponents should liaise with the ELM to identify projects that can be supported by SED contributions. • Clear criteria for identifying and funding community projects and initiatives in the area should be identified. The criteria should be aimed at maximising the benefits for the community as a whole and not individuals within the community. • Strict financial management controls, including annual audits, should be instituted to manage the SED contributions.
Traffic	Increase in traffic volumes on the surrounding road network as a result of construction traffic	Low Negative	Low Negative	• Routine road maintenance by the relevant Roads Authority.
Climate Change	Contribution to renewable energy goals of South Africa	High Positive	High Positive	• None required
	Contribution to Greenhouse Gas Reduction in South Africa	High Positive	High Positive	
Waste Management	Handling of damaged solar PV waste panels and BESS waste batteries	Medium Negative	Low Negative	• Develop a detailed operational waste management plan that identifies all potential waste types to be generated and how they will be handled including the reuse, recycle before disposal. Ensure that the cost of handling waste is included in the annual operational budget of the solar PV facility.

25.1.4 Decommissioning Phase Impacts

Decommissioning Phase				
Aspect	**Impact**	**Pre-Mitigation Significance**	**Post-mitigation Significance**	**Summary of Mitigation Measures**
Waste Management	Handling of solar PV waste panels and BESS waste batteries	Medium Negative	Low Negative	• At the time of decommissioning develop a detailed decommissioning waste management plan that identifies all potential waste types to be generated and how they will be handled including the reuse, recycle before disposal. Ensure that the cost of handling waste is included in the decommissioning costing budget of the solar PV facility.

The specialists have confirmed that all potential negative impacts can be avoided or mitigated to ensure that the impacts remain of low significance. The specialists have also confirmed that the potential negative cumulative impacts to the region can also be mitigated.

Based on consideration of the information contained in this EIA Report and the environmental impact assessment undertaken on the proposed development of the Soyuz 4 Solar PV Park on the preferred site and according to the preferred site layout, the following is relevant:

- The EIA phase has not identified any environmental or social "fatal flaws".
- The specialists have confirmed that the proposed development is environmentally and socially acceptable provided the specified mitigation measures are implemented.
- The proposed development is not expected to have any significant negative impacts on the receiving environment.
- The potential to cause negative cumulative impacts is negligible to low.
- All the recommendations by the specialists are acceptable and have been included in the EMPr.

25.1.5 No Go Alternative

The impacts of the "No Go" alternative have been assessed by the Specialists as 'no impacts' to 'low' negative impacts. However, the No Go in the context of this project implies that the development and operation of the Soyuz 4 Solar PV Park will not go ahead and the following benefits will **not be realised**:

26 ASSUMPTIONS AND LIMITATIONS

*In accordance with **Appendix 1 Regulation 3(o) of GN No. R. 326 of the NEMA EIA Regulations (2014, as amended)**:*

A description of any assumptions, uncertainties and gaps in knowledge which relate to the assessment and mitigation measures proposed;

Based on the available information assessed during the EIA Phase, it is reasonable to suggest that the following assumptions and limitations have been used throughout this Report.

- That the information provided by the Specialists, Applicant and Developer are true and correct.
- That this is EIA Phase Impact Assessment and that Specialists have identified potential impacts in accordance with the requirements of Appendix II to the best of their ability.

27 ENVIRONMENTAL IMPACT STATEMENT AND EAP OPINION

*In accordance with **Appendix 1 Regulation 3(l) of GN No. R. 326 of the NEMA EIA Regulations (2017 as amended)**:*

An environmental impact statement which contains:

__3(l) i__ – A summary of the key findings of the environmental impact assessment;
__3(l) ii__ – A map at an appropriate scale which superimposes the proposed activity and its associated structures and infrastructure on the environmental sensitivities of the preferred site indicating any areas that should be avoided, including buffers; and
__3(l) iii__ - A summary of the positive and negative impacts and risks of the proposed activity and identified alternatives.

This Environmental Impact Statement provides an overview of the findings of the EIA.

Soyuz 4 Solar PV Park (Pty) Ltd proposes the development of the Soyuz 4 Solar PV Park and associated infrastructure, near Britstown, Northern Cape Province. The Project will be located on Portion 5 of the Farm 127, Twyfelhoek. The Soyuz 4 Solar PV Park will have a generating capacity of up to 300MW and Battery Energy Storage Systems (BESS) of 1200MWh. Bi-facial, single axis trackers will be utilised for the PV panels. An on-site substation with a capacity of 33 – 132 kV, will enable the connection of a 132kV Overhead Powerline. The purpose of the facility is to generate clean electricity from a renewable energy source (i.e. solar radiation) to contribute to the national energy grid and/or any private off takers.

The following key **negative** social and environmental impacts have been identified:

- Loss of terrestrial and aquatic biodiversity due to the potential for the development to encroach physically into these sensitive environments.
- Impact on the mating behaviours (lekking) of a Species of Conservation Concern (Ludwig's Bustard) due the potential location of the solar PV park in areas where these activities could occur.
- Negative social impacts on family life due to the potential ingress of migrant workers.

Based on consideration of the information contained in this Draft EIA Report and the impact assessment undertaken with specialist input, the following is relevant:

- The proposed site is environmentally and socially suitable for the development and operation of the Soyuz 4 Solar PV Park.

- The proposed development and operation of the Soyuz 4 Solar PV Park is not expected to have any significant direct negative social or environmental impacts on the receiving environment that cannot be avoided or suitably mitigated.

- The proposed development and operation of the Soyuz 4 Solar PV Park is not expected to have any significant cumulative negative social or environmental impacts on the receiving environment that cannot be avoided or suitably mitigated.

The following key **positive** social and environmental impacts have been identified:

- Creation of local employment and business opportunities
- Economic and technical support to the local agricultural community
- Positive contribution towards the South African renewable energy goals
- Contribution to reduction of greenhouse gas at a national and global scale
- Improved local and regional energy supply security

The need and desirability assessment has confirmed the following:

- **National Need and Desirability:** The development of Soyuz 4 Solar PV Park in South Africa is a desirable and necessary strategy for meeting the energy needs of the country. This development can enhance energy security, contribute to the electricity supply, mitigate climate change, support economic development, improve energy affordability, promote environmental sustainability, and support social development.

- **Regional Need and Desirability**: the development of the Soyuz 4 Solar PV Park in the Northern Cape province of South Africa is a desirable and necessary strategy for meeting the energy needs of the region. A solar PV Park can enhance the electricity supply, contribute to economic development, improve energy affordability, promote environmental sustainability, support social development, contribute to meeting national renewable energy targets, and take advantage of the abundant solar resources available in the region.

- **Local Need and Desirability:** The proposed Soyuz 4 Solar PV Park is highly desirable due to its unique site-specific benefits. The area offers ample open space that is suitable for solar facility development, along with an amply high solar resource to generate renewable energy. The proposed facility is earmarked for an area where environmental sensitivities to such a development are low, ensuring that it is a responsible and sustainable project that will have nominal negative impacts on the surrounding environment but significantly contribute to socio-economic development by locally and regionally. The facility will create employment opportunities for the local community, providing a much-needed boost to the local economy. In addition, the skills development that will be provided to employees and contractors involved in the construction and operation of the facility will have a lasting impact on the community.

In conclusion, the proposed Soyuz 4 Solar PV Park near Britstown is highly desirable due to its many benefits, including renewable energy generation, employment opportunities, skills development, and responsible environmental stewardship.

The EAP therefore recommends that **t**he proposed development and operation of the Soyuz 4 Solar PV Park, as per the preferred site layout presented in this EIA and on the preferred development site (Portion 5 of the Farm 127, Twyfelhoek) near Britstown in the Northern Cape, should be authorised by the competent authority.

28 OATH OF EAP UNDERTAKING ASSESSMENT

In accordance with ***Appendix 1 Regulation 3(r) of GN No. R. 326 of the NEMA EIA Regulations (2014, as amended****), the following information is presented in Section 16.*

R3(r) *– An undertaking under oath of affirmation by the EAP in relation to:*

> ***R3(r) (i)*** *– The correctness of the information provided in the reports*
>
> ***R3(r) (ii)*** *– The inclusion of comments and inputs from stakeholders and I&APs*
>
> ***R3(r) (iii)*** *– The inclusion of inputs and recommendations form the specialist reports where relevant; and*
>
> ***R3(r) (iv)*** *– Any information provided by the EAP to interested and affected parties and any responses by the EAP to comments or inputs made by interested or affected parties.*

Natasha Williams (the appointed EAP), on behalf of Terramanzi Group (Pty) Ltd ("TMG"), the consulting firm appointed to undertake the environmental permitting process as detailed in this report, hereby declares that the EAP and the firm have no conflicts of interest related to the work of this Report. Specifically, the EAP and the firm declare that they have no personal financial interests in the property and/or activity being assessed in this report, and that they have no personal or financial connections to the relevant property owners, developers, planners, financiers or consultants of the property or activity, other than fair remuneration for professional services rendered for this Report to the Competent Authority. The EAP and the firm declare that the opinions expressed in this Report are independent and a true reflection of the professional expertise exercised.

Please do not hesitate to contact us should you require any clarification or additional information.

Yours Faithfully,

Natasha Williams
Senior Environmental Consultant (EAPASA)
On behalf of the Terramanzi Group