PROPOSED PARYS UP TO 200MW SOLAR PHOTOVOLTAIC (PV) AND BATTERY ENERGY STORAGE SYSTEM (BESS) HYBRID PROJECT NEAR THE TOWN OF PARYS, FREE STATE PROVINCE

ENVIRONMENTAL IMPACT ASSESSMENT REPORT

DFFE REFERENCE NO.: 14/12/16/3/3/2/2201

DRAFT (UPDATED)

APRIL 2023

APPLICANT: GENESIS ECO-ENERGY DEVELOPMENTS (PTY) LTD

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TITLE AND APPROVAL PAGE

Project Name:	Proposed Parys up to 200MW Solar Photovoltaic (PV) and Battery Energy Storage System (BESS) Hybrid Project near the town of Parys, Free State Province
Report Title:	Environmental Impact Assessment Report
Authority Reference:	14/12/16/3/3/2/2201
Report Status:	Draft

Applicant:	Genesis Eco-Energy Developments (Pty) Ltd

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EXECUTIVE SUMMARY

A. PROJECT BACKGROUND AND MOTIVATION

Electricity generation sources need to be diversified to ensure security of supply and reduction in the carbon footprint created by the current heavy reliance of South Africa (SA), via Eskom, on coal to produce electricity. The electricity demand is increasing in SA, and in order to match that demand there is a need to supply a diversified power generation that includes renewable energy technologies. These technologies include solar, wind, small utility scale hydro, biomass, biogas and Battery Energy Storage Systems (BESS) that the Department of Mineral Resources and Energy (DMRE) intends to develop and implement as identified in the approved Integrated Resource Plan (IRP) 2019.

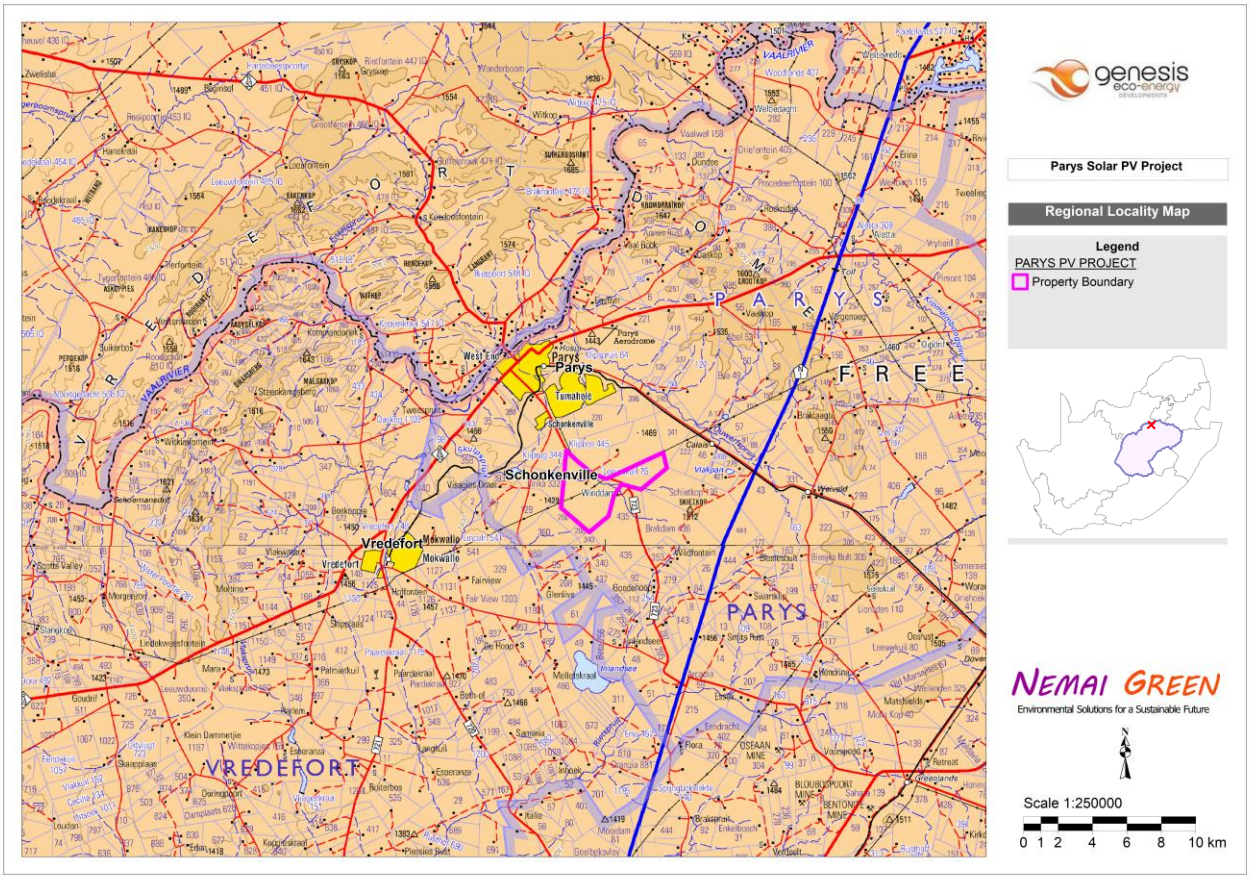
Genesis Eco-Energy Developments (Pty) Ltd (the Applicant) has proposed the development of the Parys up to 200MW Solar PV Project and BESS near the town of Parys, in the Free State Province (the “Project”). The electricity generated by the Project will be injected into the existing Eskom 132 kV distribution system. The Applicant intends to bid for the Renewable Energy Independent Power Producer Procurement Programme (REIPPPP) bid windows and /or other renewable energy markets within SA, such as the Corporate and Industrial (C&I) Sector.

This document serves as the **Updated draft EIA Report** for the proposed Project. Following the circulation of the draft EIA Report from 20 February 2023 to 23 March 2023, comments were received from the Free State Department of Police, Roads and Transport (FS DPRT) which requested that a Traffic Impact Assessment (TIA) be undertaken for the proposed project. The draft EIA Report was subsequently updated to incorporate the findings of the TIA that was commissioned for the project.

B. PROJECT LOCATION

The Project is located in the northern part of the Free State Province and falls within the Fezile Dabi District Municipality and Ngwathe Local Municipality. The site is located approximately 3.5 km to the south-east of the town of Parys and is crossed by the regional road 723 (R723).

The property earmarked for the Project covers a combined area of approximately 1234 ha, of which the buildable area determined by the engineering team is approximately 335 ha. The overall length of the proposed 132 kV power lines between the on-site substation and the grid connection point at Eskom’s existing Parys 132/11 kV Substation is approximately 0.57km.



Regional locality map

C. LEGISLATION AND GUIDELINES CONSIDERED

Pertinent legislation that has possible bearing on the proposed Solar PV Project from an environmental perspective is briefly discussed in the EIA Report.

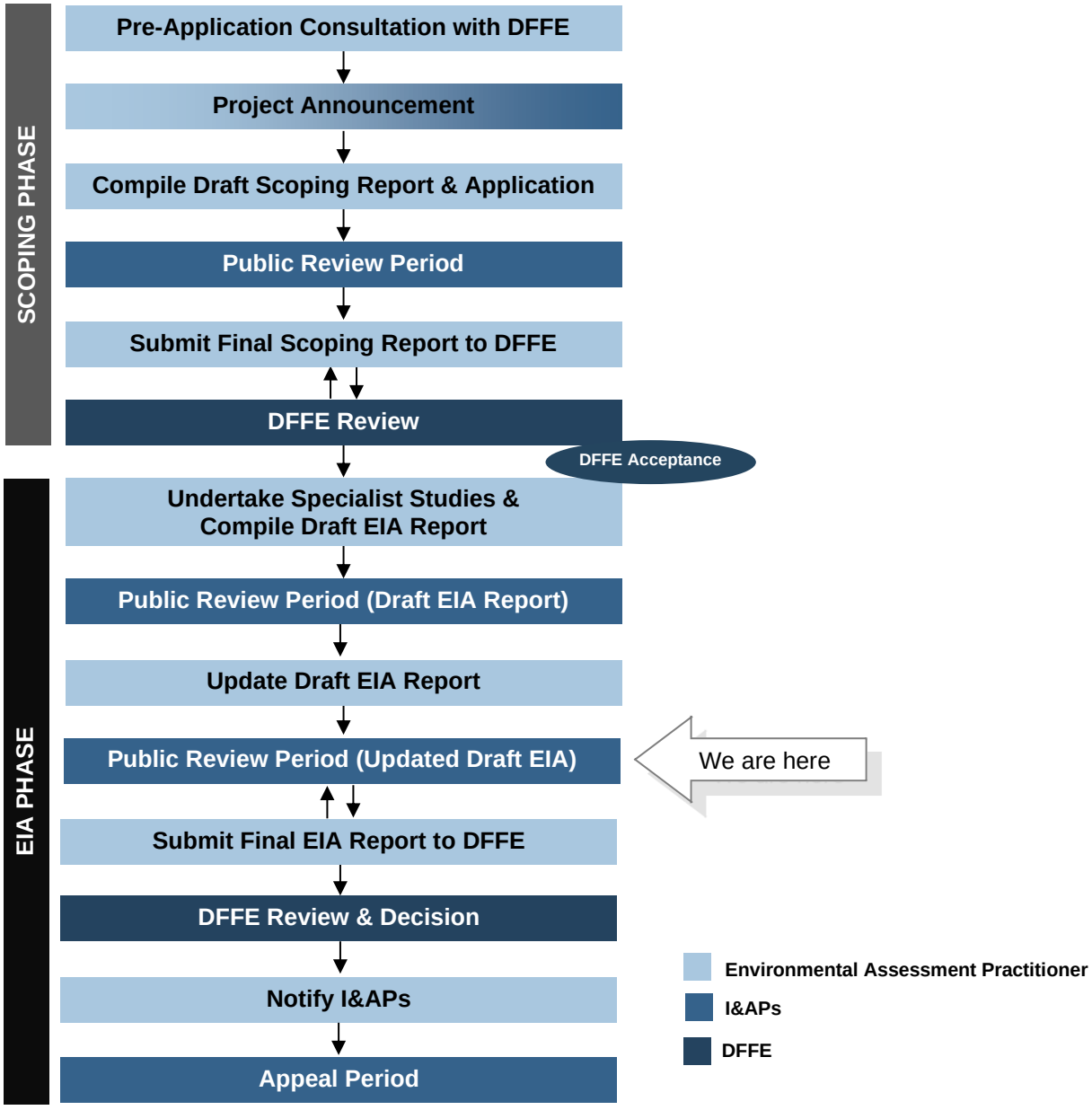
The relationship between the Project and the following key pieces of environmental legislation is also explained:

- ❑ National Environmental Management Act (Act No. 107 of 1998);
- ❑ National Environmental Management: Waste Act (Act No. 59 of 2008);
- ❑ National Water Act (Act No. 36 of 1998);
- ❑ Mineral and Petroleum Resources Development Act (Act No. 28 of 2002);
- ❑ National Environmental Management Air Quality Act (Act No. 39 of 2004);
- ❑ National Environmental Management: Biodiversity Act (Act No. 10 of 2004); and
- ❑ National Heritage Resources Act (Act No. 25 of 1999).

D. SCOPING AND ENVIRONMENTAL IMPACT ASSESSMENT PROCESS

The process for seeking Environmental Authorisation for the Project under the National Environmental Management Act (Act No. 107 of 1998) (NEMA) is being undertaken in accordance with the EIA Regulations of 2014 (as amended). In terms of NEMA, the lead decision-making authority for the environmental assessment is the Department of Forestry, Fisheries and the Environment (DFFE).

The process for seeking authorisation is undertaken in accordance with Government Notice No. R. 982 of 4 December 2014 (as amended). Based on the types of activities involved the requisite environmental assessment for the Project is a Scoping and Environmental Impact Reporting (S&EIR) process. An outline of the process is provided in the diagram to follow.



Overview of S&EIR Process

E. PROJECT DESCRIPTION

The Project consists of the following systems, sub-systems or components (amongst others):

- ❑ PV panel arrays, which are the subsystems which convert incoming sunlight into electrical energy;
- ❑ Mounting structures to support the PV panels;
- ❑ BESS to store electrical energy and discharge electrical energy when required;

- ❑ On-site inverters to convert direct current (DC) to facilitate alternating current (AC) connection between the solar energy facility and electricity grid;
- ❑ New 132 kV power lines between the on-site substation and the grid connection point;
- ❑ Cabling between the Project's components, to be laid underground (where practical);
- ❑ Administration Buildings (Offices);
- ❑ Workshop areas for maintenance and storage;
- ❑ Temporary laydown areas;
- ❑ Internal access roads and perimeter fencing of the footprint;
- ❑ High Voltage (HV) Transformers; and
- ❑ Security Infrastructure.

An overview of the project life-cycle, as well as the resources required to execute the Project, is provided in the EIA Report.

F. PROFILE OF THE RECEIVING ENVIRONMENT

The Environmental Impact Assessment Report provides a general description of the status quo of the receiving environment in the Project Area. This serves to provide the context within which the assessment was conducted and allows for an appreciation of sensitive environmental features and possible receptors of the effects of the proposed Project.

The receiving environment is explained in terms of the following:

- ❑ Land Use and Land Cover
- ❑ Climate
- ❑ Geology and Soil
- ❑ Topography
- ❑ Surface Water
- ❑ Flora & Fauna
- ❑ Socio-Economic Environment
- ❑ Health
- ❑ Agriculture
- ❑ Air quality
- ❑ Noise
- ❑ Cultural Heritage & Palaeontological Features
- ❑ Planning
- ❑ Existing Structures and Infrastructure
- ❑ Transportation

G. SPECIALIST STUDIES

The specialist studies 'triggered' by the nature of the proposed development and its receiving environment, which aimed at addressing the key issues and compliance with legal obligations, include the following:

1. Wetland Delineation and Risk Assessment;
2. Terrestrial Biodiversity Compliance Statement;
3. Avifaunal Baseline and Impact Assessment;
4. Agricultural Impact Assessment;
5. Phase 1 Cultural Heritage Impact Assessment;
6. Paleontological Desktop Assessment;
7. Visual Impact Assessment; and
8. Social Impact Assessment.

Apart from the above listed specialist studies, a Traffic Impact Assessment (TIA) was undertaken for the project following the circulation of the draft EIA Report based on comments received from the Free State Department of Police, Roads and Transport (FS DPRT).

The information obtained from the respective specialist studies was incorporated into the EIA Report in the following manner (amongst others):

1. The information was used to complete the description of the receiving environment in a more detailed and site-specific manner;
2. A summary of each specialist study is provided, focusing on the approach to each study, key findings and conclusions drawn;
3. The specialists' impacts assessment, and the identified mitigation measures, were included in the overall project impact assessment;
4. The evaluations performed by the specialists on the alternatives of the Project components were taken into consideration in the identification of the most favourable options; and
5. Salient recommendations made by the specialists were taken forward to the final Conclusions.

H. IMPACT ASSESSMENT

The EIA Report assessed the pertinent environmental impacts that could potentially be caused during the pre-construction, construction and operational phases of the Project.

Impacts were identified as follows:

- ❑ Impacts associated with listed activities contained in Government Notice No. R. 983, R. 984 and R. 985 of 4 December 2014, as amended, for which Environmental Authorisation have been applied for;
- ❑ Impacts identified during the Scoping phase;
- ❑ An appraisal of the Project's activities and components;
- ❑ An assessment of the receiving biophysical, social, economic and built environments;
- ❑ Findings from specialist studies;
- ❑ Issues highlighted by environmental authorities; and
- ❑ Comments received during public participation.

The impacts and the proposed management measures are discussed on a qualitative level and thereafter quantitatively assessed to ultimately determine the significance of the impacts. The assessment considered impacts before and after mitigation, where in the latter instance the residual impact following the application of the mitigation measures is evaluated.

The proposed mitigation of the impacts associated with the Project includes specific measures identified by the technical team (including engineering solutions) and environmental specialists, stipulations of environmental authorities and environmental best practices. The Environmental Management Programme (EMPr) provides a comprehensive list of mitigation measures for specific

elements of the Project, which extends beyond the impacts evaluated in the body of the Environmental Impact Assessment Report.

The implications of the "no-go option" are also assessed. The "no go option" was considered in light of the motivation as well as the need and desirability of the overall Project. In contrast, should the proposed Project not go ahead, any potentially significant environmental issues associated with the Project would be irrelevant and the status quo of the local receiving environment would not be affected by the Project-related activities. The objectives of this Project would, however, not be met. This will *inter alia* mean that the Project's intended benefits will not be realised. The "no-go option" is thus not preferred.

Cumulative impacts in terms of other renewable energy projects were not evaluated as no other renewable energy applications have been made for properties that are located within a 30km radius of the PV site. Other aspects considered in terms of cumulative impacts included:

- Traffic-related impacts in terms of the local road network;
- The cumulative area of indigenous vegetation to be cleared;
- The clearance of vegetative cover for the Project's development footprint will exacerbate erosion, which is already encountered in the greater area as a result of other land use disturbances;
- Increase in the dust levels during the construction phase;
- Increase in noise levels during the construction phase;
- Problems associated with the influx of employment seekers; and
- Positive cumulative economic effects from the construction of multiple developments in the area.

I. ANALYSIS OF ALTERNATIVES

An initial layout was proposed by the Applicant. The layout was however refined to take the sensitive environmental features identified through the environmental screening process and specialist input into consideration. The revised layout is currently the only layout alternative presented for inclusion in the study.

The preferred option in terms of solar PV technology includes a single axis tracker system and bifacial solar panels. This technology will optimise the Project's yield output. In terms of BESS technology alternatives, options include solid state and flow battery systems. The preferred alternative is a solid state lithium-ion technology.

J. PUBLIC PARTICIPATION

The EIA Report provides the details of the following tasks undertaken as part of the public participation process:

- Maintaining the database of Interested and Affected Parties;
- Notification of review of the draft EIA Report;
- Means of accessing the draft EIA Report;

- ❑ Supplying of copies of the draft EIA Report to Authorities;
- ❑ Scheduling authorities and public meetings to present the draft EIA Report; and
- ❑ Commenting on the draft EIA Report.

H. CONCLUSION

The following key tasks were undertaken during the EIA phase for the proposed Project:

- ❑ The specialist studies identified in the Plan of Study were undertaken and the findings were incorporated into the EIA Report in terms of understanding the environmental status quo and sensitive features, assessing the potential impacts and establishing concomitant mitigation measures, as well as identifying the preferred alternatives;
- ❑ Potentially significant impacts pertaining to the pre-construction, construction and operational phases of the Project were identified and assessed, and mitigation measures were provided; and
- ❑ Alternatives for achieving the objectives of the proposed activity were considered, and the best practicable environmental option was identified. The “no-go” option is not supported when considering the implications of not implementing the Project.

Attention is drawn to specific sensitive environmental features for which mitigation measures are included in the EIA Report and EMPr.

An Environmental Impact Statement is also provided, which includes highlighting key findings from the EIA, which may also influence the conditions of the Environmental Authorisation (if granted).

With the selection of the Best Practicable Environmental Option, the adoption of the mitigation measures included in the EIA Report and the dedicated implementation of the EMPr, it is believed that the significant environmental aspects and impacts associated with this Project can be suitably mitigated. With the aforementioned in mind, it can be concluded that there are no fatal flaws associated with the Project and that authorisation can be issued, based on the findings of the specialists and the impact assessment, through the compliance with the identified environmental management provisions.

AMENDMENTS PAGE

Date	Nature of Amendment	Amendment No.
April 2023	Updated Draft for Review by Authorities and the Public	0

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

LIST OF ACRONYMS & ABBREVIATIONS

AC	Alternating Current
AEL	Atmospheric Emission Licence
ASAPA	Association for Southern African Professional Archaeologists
BESS	Battery Energy Storage System
BPEO	Best Practicable Environmental Option
CBA	Critical Biodiversity Area
CBD	Central Business District
COD	Commercial Operation Date
COVID-19	Coronavirus Disease 2019
CPV	Concentrated Photovoltaics
CR	Critically Endangered
DARD	Department of Agriculture and Rural Development
DEA	Department of Environmental Affairs
DEA&DP	Department of Environmental Affairs and Development Planning
DEAT	Department of Environmental Affairs and Tourism
DEL	Department of Employment and Labour
DESTEA	Department of Economic, Small Business Development, Tourism and Environmental Affairs
DFFE	Department of Forestry, Fisheries and the Environment
DC	Direct Current
DMRE	Department of Mineral Resources and Energy
DPRT	Department of Police, Roads and Transport
DWAF	Department of Water Affairs and Forestry
DWS	Department of Water and Sanitation
EAP	Environmental Assessment Practitioner
EIA	Environmental Impact Assessment
EHS	Environmental, Health, and Safety
EMPr	Environmental Management Programme
EN	Endangered
ESA	Ecological Support Area
FSHRA	Free State Heritage Resources Authority
GHG	Greenhouse Gas
GIS	Geographical Information System
GN	Government Notice
GVA	Gross Value Added
HV	High Voltage
I&APs	Interested and Affected Parties
IBA	Important Bird & Biodiversity Area
IDP	Integrated Development Plan
IFC	International Finance Corporation
IPP	Independent Power Producer
IRP	Integrated Resource Plan

KZN	KwaZulu-Natal
MOSS	Metropolitan Open Space System
Na	Sodium
NaS	Sodium-Sulphur
NEMA	National Environmental Management Act (No. 107 of 1998)
NEM:AQA	National Environmental Management: Air Quality Act (Act No. 39 of 2004)
NEM:BA	National Environmental Management: Biodiversity Act (Act 10 of 2004)
NEM:PAA	National Environmental Management: Protected Areas Act (Act No. 57 of 2003)
NEM:WA	National Environmental Management: Waste Act (Act No. 59 of 2008)
NHRA	National Heritage Resources Act (Act No. 25 of 1999)
NWA	National Water Act (Act No. 36 of 1998)
OHS	Occupational Health and Safety
PS	Performance Standards
PV	Photovoltaic
REDZ	Renewable Energy Development Zones
REEA	Renewable Energy EIA Application
REIPPPP	Renewable Energy Independent Power Producer Procurement Programme
RFI	Radio Frequency Interference
S	Sulphur
S&EIR	Scoping and Environmental Impact Reporting
SA	South Africa
SACNASP	South African Council for Natural Scientific Professions
SAHRA	South African Heritage Resources Agency
SAHRIS	South African Heritage Resources Information System
SANBI	South African National Biodiversity Institute
SANRAL	South African National Roads Agency
SANS	South African National Standard
SAPAD	South African Protected Areas Database
SARAO	South African Radio Astronomy Observatory
SDF	Spatial Development Framework
SEA	Strategic Environmental Assessment
SIP	Strategic Integrated Projects
SOTER	Soil and Terrain
ToR	Terms of Reference
UFS	University of the Free State
VFB	Vanadium Flow Battery
VRB	Vanadium Redox Battery
VU	Vulnerable
WMA	Water Management Area

UNITS OF MEASUREMENT

Bq/g	Becquerels per gram
°C	Degrees Celsius
ha	Hectare
km	Kilometre
km^2	Square kilometre
km/h	Kilometres per hour
kV	Kilovolt
kVA	Kilovolt-ampere
m	Metre
m^2	Square metre
m^3	Cubic metre
m/s	Metre per Second
mm	Millimetre
MVA	Megavolt ampere
MW	Megawatt
MWh	Megawatt hour
TWh	Terawatt Hours
%	Percentage

1 PURPOSE OF THIS DOCUMENT

Nemai Green was appointed by Genesis Eco-Energy Developments (Pty) Ltd (the "Applicant") to conduct the Environmental Impact Assessment (EIA) for the **Proposed Parys up to 200MW Solar Photovoltaic (PV) and Battery Energy Storage Systems (BESS) Hybrid Project near Parys, in the Free State Province** (the "Project").

The EIA has been undertaken according to the process prescribed in the EIA Regulations of 2014, published under Government Notice (GN) No. 982 in Gazette No. 38282 of 4 December 2014 and amended by GN 326 of 7 April 2017 published in Gazette No. 40772 (the "EIA Regulations"). The EIA Regulations were promulgated in terms of the National Environmental Management Act (Act No. 107 of 1998) (NEMA). This document serves as the **Updated draft EIA Report** for the proposed Project. Following the circulation of the draft EIA Report from 20 February 2023 to 23 March 2023, comments were received from the Free State Department of Police, Roads and Transport (FS DPRT) which requested that a Traffic Impact Assessment (TIA) be undertaken for the proposed project. The draft EIA Report was subsequently updated to incorporate the findings of the TIA that was commissioned for the project.

To date, the Scoping phase of the overall environmental assessment for the Project has been completed. The final Scoping Report and Plan of Study for the EIA were approved by the Department of Forestry, Fisheries and the Environment (DFFE) on the 22nd of November 2022. DFFE is the competent authority to decide on the application in terms of NEMA.

According to the EIA Regulations, the objectives of the EIA process are to undertake the following, through a consultative process:

- ❑ 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.
- ❑ 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.
- ❑ 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.
- ❑ Determine the -
  - Nature, significance, consequence, extent, duration and probability of the impacts occurring to inform identified preferred alternatives.
  - Degree to which these impacts -
    - Can be reversed;

- May cause irreplaceable loss of resources; and
- Can be avoided, managed or mitigated.

- ❑ 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.
- ❑ 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.
- ❑ Identify suitable measures to avoid, manage or mitigate identified impacts.
- ❑ Identify residual risks that need to be managed and monitored.

The Updated draft EIA Report will be made available to Interested and Affected Parties (I&APs) for a 30-day review period from 21 April 2023 to 22 May 2023. All comments that are received will be addressed in the final EIA Report and will also be included in the Comments and Responses Report. The final EIA Report will then be submitted to the DFFE for review and decision-making.

2 DOCUMENT ROADMAP

As a minimum, this EIA Report aims to satisfy the requirements stipulated in Appendix 3 of the EIA Regulations. **Table 1** presents the document's composition in terms of the aforementioned regulatory requirements.

Table 1: EIA Report Roadmap

Chapter	Title	Correlation with GN No. R. 982	GN No. R. 982 Description
1	Purpose of this Document	–	–
2	Document Roadmap	–	–
3	Project Background and Motivation	–	–
4	Project Location	3(1)(b)	The location of the development footprint of the activity on the approved site as contemplated in the accepted Scoping Report, including: (i) the 21 digit Surveyor General code of each cadastral land parcel; (ii) where available, the physical address and farm name; and (iii) where the required information in items (i) and (ii) is not available, the coordinates of the boundary of the property or properties.
		3(1)(c)	A plan which locates the proposed activity or activities applied for as well as the associated structures and infrastructure at an appropriate scale, or, if it is - (i) a linear activity, a description and coordinates of the corridor in which the proposed activity or activities is to be undertaken; and (ii) on land where the property has not been defined, the coordinates within which the activity is to be undertaken.
5	Legislation and Guidelines Considered	3(1)(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.
6	Scoping and EIA Process	3(1)(a)	Details of- (i) the EAP who prepared the report; and (ii) the expertise of the EAP, including a curriculum vitae.
		3(1)(u)	An indication of any deviation from the approved scoping report, including the plan of study, including- (i) any deviation from the methodology used in determining the significance of potential environmental impacts and risks; and (ii) a motivation for the deviation.
		3(1)(v)	Any specific information that may be required by the competent authority.
7	Assumptions and Limitations	3(1)(p)	A description of any assumptions, uncertainties and gaps in knowledge which relate to the assessment and mitigation measures proposed.
8	Need and Desirability	3(1)(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.
9	Project Description	3(1)(d)	A description of the scope of the proposed activity, including- (i) all listed and specified activities triggered and being applied for; and

Chapter	Title	Correlation with GN No. R. 982	GN No. R. 982 Description
			(ii) a description of the associated structures and infrastructure related to the development.
		3(1)(g)	A motivation for the preferred development footprint within the approved site as contemplated in the accepted scoping report.
		3(1)(h)(i)	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: (i) details of the development footprint alternatives considered.
		3(1)(h)(ix)	If no alternative development footprints for the activity were investigated, the motivation for not considering such.
		3(1)(t)	Where applicable, details of any financial provisions for the rehabilitation, closure, and ongoing post decommissioning management of negative environmental impacts.
10	Alternatives	3(1)(h)(i)	Details of the development footprint alternatives considered.
11	Profile of the Receiving Environment	3(1)(h)(iv)	The environmental attributes associated with the development footprint alternatives focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects.
12	Summary of Specialist Studies	3(1)(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.
13	Impact Assessment	3(1)(h)(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- (i) can be reversed; (ii) may cause irreplaceable loss of resources; and (iii) can be avoided, managed or mitigated.
		3(1)(h)(vi)	The methodology used in determining and ranking the nature, significance, consequences, extent, duration and probability of potential environmental impacts and risks.
		3(1)(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(1)(h)(viii)	The possible mitigation measures that could be applied and level of residual risk.
		3(1)(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 - (i) a description of all environmental issues and risks that were identified during the environmental impact assessment process; and (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.
		3(1)(j)	An assessment of each identified potentially significant impact and risk, including- (i) cumulative impacts; (ii) the nature, significance and consequences of the impact and risk; (iii) the extent and duration of the impact and risk; (iv) the probability of the impact and risk occurring; (v) the degree to which the impact and risk can be reversed;

Chapter	Title	Correlation with GN No. R. 982	GN No. R. 982 Description
			(vi) the degree to which the impact and risk may cause irreplaceable loss of resources; and (vii) the degree to which the impact and risk can be mitigated.
		3(1)(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 Environmental Management Programme (EMPr) as well as for inclusion as conditions of authorisation.
14	Analysis of Alternatives	3(1)(h)(ix)	If no alternative development locations for the activity were investigated, the motivation for not considering such.
		3(1)(h)(x)	A concluding statement indicating the location of the preferred alternative development footprint within the approved site as contemplated in the accepted Scoping Report.
		3(1)(n)	The final proposed alternatives which respond to the impact management measures, avoidance, and mitigation measures identified through the assessment.
15	Public Participation – EIA Phase	3(1)(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.
16	EIA Conclusions	3(1)(l)	An environmental impact statement which contains- (i) a summary of the key findings of the environmental impact assessment; (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 (iii) a summary of the positive and negative impacts and risks of the proposed activity and identified alternatives.
		3(1)(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.
		3(1)(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.
17	References	-	-
Appendix A	Map	3(1)(c)	A plan which locates the proposed activity or activities applied for as well as the associated structures and infrastructure at an appropriate scale.
Appendix E	Specialists' Reports	R23(5)	Specialist Reports containing all information set out in Appendix 6 of GN No. R. 982 of 4 December 2014 (as amended).
Appendix H	EMPr	R23(4)	Environmental Management Programme containing all information set out in Appendix 4 of GN No. R. 982 of 4 December 2014 (as amended).
Appendix G	Comments and Responses Report	3(1)(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.
		3(1)(h)(iii)	A summary of the issues raised by Interested and Affected Parties (IAPs), and an indication of the manner in which the issues were incorporated, or the reasons for not including them.
Appendix I	Oath of Environmental Assessment Practitioner	3(1)(s)	An undertaking under oath or affirmation by the EAP in relation to: (i) the correctness of the information provided in the reports;

Chapter	Title	Correlation with GN No. R. 982	GN No. R. 982 Description
			(ii) the inclusion of comments and inputs from stakeholders and IAPs; (iii) the inclusion of inputs and recommendations from the specialist reports where relevant; and (iv) any information provided by the EAP to IAPs and any responses by the EAP to comments or inputs made by IAPs.
N/A		3(1)(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**.**
N/A		3(1)(w)	Any other matters required in terms of section 24(4)(a) and (b) of the Act.

3 PROJECT BACKGROUND AND MOTIVATION

The South African Government ratified the Paris Agreement in 2016, and thereby showed the country's commitment to contribute to the global effort to address the challenge of climate change. Electricity generation sources need to be diversified to ensure security of supply and reduction in the carbon footprint created by the current heavy reliance of South Africa (SA) on coal to produce electricity. The electricity demand is increasing in SA, and in order to match that demand there is a need to supply a diversified power generation that includes renewable energy technologies. These technologies include solar, wind, small utility scale hydro, biomass, biogas and energy storage that the Department of Mineral Resources and Energy (DMRE) intends to develop and implement as identified in the approved Integrated Resource Plan (IRP) 2019.

The Applicant has proposed the development of the Parys total of 200MW Solar PV with BESS Hybrid Project near Parys, in the Free State Province. The electricity generated by the Project will be injected into the existing Eskom 132 kV distribution system.

The Applicant intends to bid for the current and future Renewable Energy Independent Power Producer Procurement Programme (REIPPPP) bid windows and/or other renewable energy markets within SA.

4 PROJECT LOCATION

4.1 Location of the Project relative to Solar Yield Area

The location of the Project in relation to SA's PV power potential is shown in **Figure 1** below. The Project Area is considered to have favourable solar irradiation levels, which makes it ideal for the production of solar power via PV Panels.

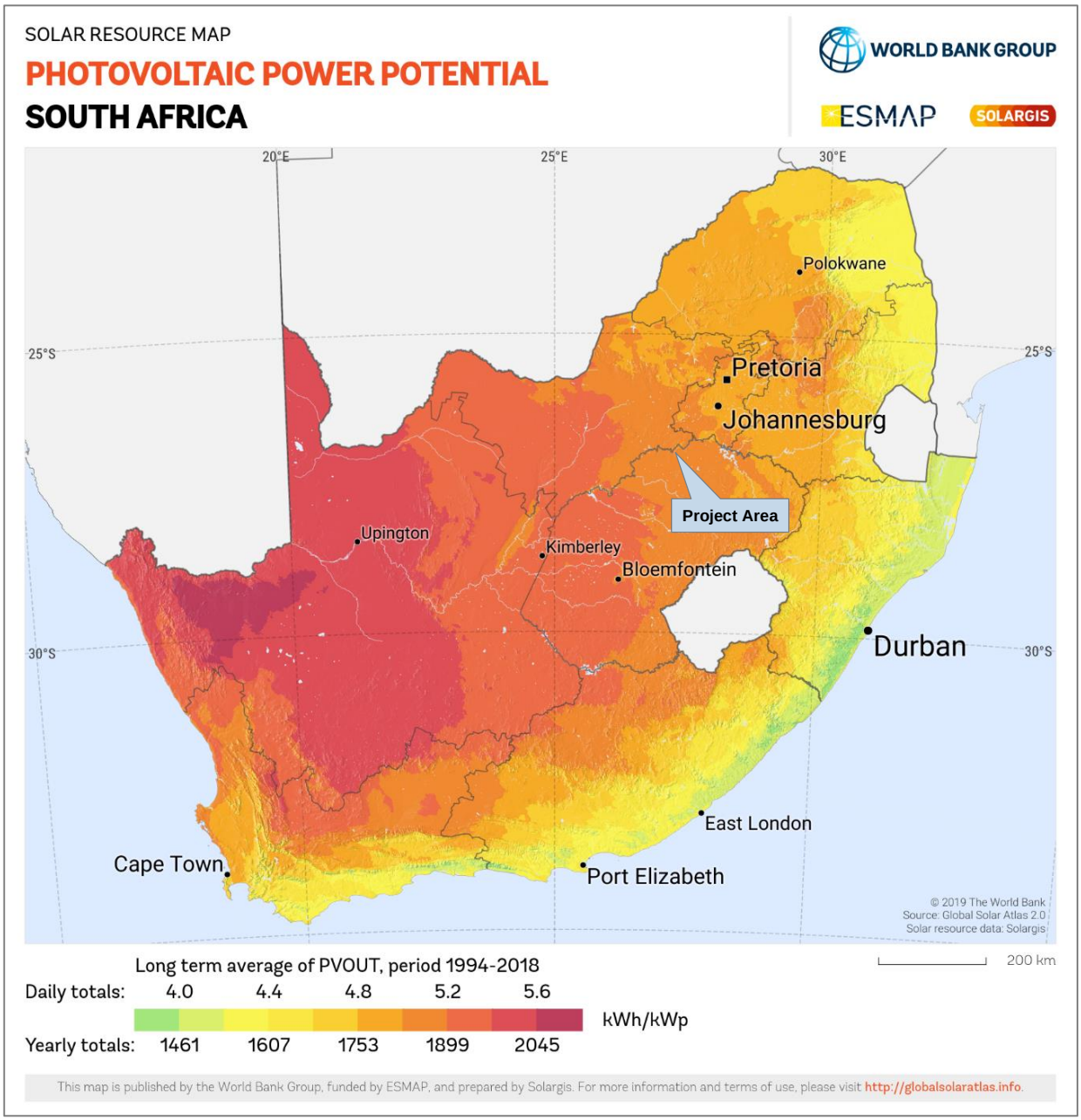


Figure 1: Location of the Project relative to PV Power Potential
(© 2019 The World Bank, Source: Global Solar Atlas 2.0, Solar resource data: Solargis)

4.2 Geographical Context

The Project is located approximately 8km to the south of the town of Parys' business district (CBD) and falls within Ward 15 of the Ngwathe Local Municipality (NLM), in the Free State Province. The R723 runs through the site. The locality maps are provided in **Figure 2** and **Figure 3** below, and are also contained in **Appendix A**. For the location of the PV array and associated infrastructure within the Project, refer to **Figure 9**, **10** and **11** in **Section 9.3.2** below. Sensitivity maps are included under **Appendix A**.

The property earmarked for the Project covers a combined area of approximately 1234 ha, of which the buildable area determined by the project team is approximately 335 ha. The overall length of the proposed 132 kV power lines between the on-site substation and the grid connection point at Eskom's existing Parys Rural 132/11 kV Substation is approximately 0.57km.

The details of the affected properties are provided in **Table 2** below.

Table 2: Details of the affected properties

Farm Details	21-digit Surveyor General No.
PV Site	
RE of the Farm Leeuwkuil 76	F02500000000007600000
Power Line Route Tie-in to Existing Substation	
Portion 4 of the Farm Leeuwkuil 76	F02500000000007600004
Power Line and Access Road Routes	
RE of the Farm Leeuwkuil 76	F02500000000007600000

The Project's coordinates are as follows (shown in **Table 3, 4** and **5** below):

- **PV Site Boundaries** –

Table 3: PV Site Coordinates

Description	Coordinates
PV Area 1 (Eastern Site)	
Corner and Bend Coordinates of buildable area	26°57'26.45"S; 27°31'15.63"E
	26°57'7.93"S; 27°32'0.79"E
	26°57'22.51"S; 27°32'4.91"E
	26°57'23.82"S; 27°32'6.32"E
	26°57'31.72"S; 27°32'8.36"E
	26°57'57.25"S; 27°31'33.96"E
	26°57'56.25"S; 27°31'26.22"E
	26°57'58.67"S; 27°31'21.85"E
	26°58'3.57"S; 27°31'18.79"E

Description	Coordinates
	26°58'5.84"S; 27°31'15.82"E
	26°58'1.35"S; 27°31'10.06"E
	26°57'52.74"S; 27°31'14.95"E
	26°57'43.91"S; 27°31'28.89"E
	26°57'43.48"S; 27°31'31.73"E
	26°57'37.86"S; 27°31'40.02"E
	26°57'33.48"S; 27°31'42.16"E
	26°57'28.99"S; 27°31'42.00"E
	26°57'26.64"S; 27°31'43.19"E
	26°57'25.02"S; 27°31'42.86"E
	26°57'23.64"S; 27°31'40.43"E
	26°57'24.86"S; 27°31'34.97"E
	26°57'26.16"S; 27°31'32.38"E
	26°57'34.64"S; 27°31'23.08"E
	26°57'29.66"S; 27°31'17.18"E
PV Area 2 (Central/southern Site)	
Corner and Bend Coordinates of buildable area	26°58'6.28"S; 27°29'49.17"E
	26°58'9.88"S; 27°30'3.26"E
	26°58'15.12"S; 27°30'6.20"E
	26°58'14.90"S; 27°30'10.94"E
	26°58'14.28"S; 27°30'12.32"E
	26°58'18.31"S; 27°30'21.07"E
	26°58'24.02"S; 27°30'17.56"E
	26°58'54.51"S; 27°30'8.80"E
	26°58'55.14"S; 27°29'54.62"E
	26°58'29.30"S; 27°29'30.60"E
	26°58'18.17"S; 27°29'29.25"E
PV Area 3 (Western Site)	
Corner and Bend Coordinates of buildable area	26°57'44.88"S; 27°29'22.30"E
	26°57'47.06"S; 27°29'18.21"E
	26°57'47.70"S; 27°29'10.67"E
	26°57'48.01"S; 27°28'57.61"E
	26°57'46.71"S; 27°28'53.42"E
	26°57'45.37"S; 27°28'53.77"E
	26°57'43.92"S; 27°28'55.98"E
	26°57'42.35"S; 27°28'56.99"E

Description	Coordinates
	26°57'40.40"S; 27°28'59.80"E
	26°57'37.78"S; 27°29'2.02"E
	26°57'35.60"S; 27°29'1.37"E
	26°57'33.05"S; 27°28'57.33"E
	26°57'32.84"S; 27°28'54.87"E
	26°57'34.07"S; 27°28'52.01"E
	26°57'35.53"S; 27°28'51.20"E
	26°57'38.73"S; 27°28'50.63"E
	26°57'43.18"S; 27°28'46.23"E
	26°57'44.97"S; 27°28'45.81"E
	26°57'45.09"S; 27°28'43.20"E
	26°57'44.99"S; 27°28'42.54"E
	26°57'44.11"S; 27°28'39.96"E
	26°57'42.98"S; 27°28'38.87"E
	26°57'42.18"S; 27°28'36.01"E
	26°57'18.04"S; 27°28'37.91"E
	26°57'8.93"S; 27°28'39.18"E
	26°57'9.78"S; 27°28'41.49"E
	26°57'13.24"S; 27°28'41.94"E
	26°57'18.78"S;27°28'48.67"E
	26°57'22.42"S; 27°28'47.95"E
	26°57'25.99"S; 27°28'52.92"E
	26°57'26.35"S; 27°28'56.42"E
	26°57'26.07"S; 27°28'57.63"E

- **Powerline routes** (start and end points, as well as bend points) –

Table 4: Powerline Route Coordinates

Description	Coordinates
PV Area 1 (Eastern Site) connecting powerline	
Start point (at PV area onsite substation)	26°57'26.14"S; 27°31'17.61"E
Bend 1	26°57'25.94"S; 27°31'11.54"E
Bend 2	26°57'52.88"S; 27°30'6.93"E
Bend 3	26°57'56.14"S; 27°30'5.66"E
Bend 4	26°58'5.37"S; 27°29'50.78"E
End point (at Collector substation)	26°58'8.95"S; 27°29'52.05"E

Description	Coordinates
PV Area 2 (Central/southern Site) connecting powerline	
Start point (at PV area collector substation)	26°58'9.00"S; 27°29'52.49"E
Bend 1	26°58'8.28"S; 27°29'52.56"E
Bend 2	26°58'5.76"S; 27°29'51.11"E
Bend 3	26°58'3.53"S; 27°29'48.92"E
Bend 4	26°57'57.09"S; 27°29'59.98"E
End point (at Eskom substation)	26°57'56.61"S ; 27°30'0.65"E
PV Area 3 (Western Site) connecting powerline	
Start point (at PV area onsite substation)	26°57'47.14"S; 27°29'13.42"E
Bend 1	26°57'47.81"S; 27°29'15.05"E
Bend 2	26°57'47.86"S; 27°29'27.73"E
Bend 3	26°57'49.45"S; 27°29'30.56"E
Bend 4	26°57'54.50"S; 27°29'28.82"E
Bend 5	26°57'54.96"S; 27°29'28.79"E
Bend 6	26°57'55.18"S; 27°29'28.83"E
Bend 7	26°57'58.86"S; 27°29'29.61"E
Bend 8	26°58'2.93"S; 27°29'46.43"E
Bend 9	26°58'5.82"S; 27°29'50.20"E
Bend 10	26°58'5.82"S; 27°29'50.20"E
End point (at Collector substation)	26°58'8.96"S; 27°29'52.04"E

- **Access road routes** (start and end points, as well as bend points) –

Table 5: Access Road Coordinates

Description	Coordinates
PV Area 1 (Eastern Site) access road	
Start point (at PV area)	26°57'24.16"S; 27°31'21.44"E
Bend 1	26°57'50.32"S; 27°30'15.77"E
Bend 2	26°57'50.59"S; 27°30'15.38"E
Bend 3	26°57'51.92"S; 27°30'13.86"E
Bend 4	26°57'53.33"S; 27°30'12.91"E
End point (at existing road tie-in)	26°57'55.44"S; 27°30'12.14"E
PV Area 2 (Central/southern Site) access road	
Start point (at PV area)	26°58'8.27"S; 27°29'50.28"E
Bend 1	26°58'7.55"S; 27°29'50.76"E
Bend 2	26°58'7.07"S; 27°29'50.57"E

Description	Coordinates
Bend 3	26°58'5.63"S; 27°29'48.27"E
Bend 4	26°58'1.56"S; 27°29'31.20"E
End point (at existing road tie-in)	26°58'1.51"S; 27°29'28.87"E
PV Area (Western Site) access road	
Start point (at PV area)	26°57'44.91"S; 27°29'21.80"E
Bend 1	26°57'45.49"S; 27°29'22.69"E
Bend 2	26°57'46.14"S; 27°29'24.28"E
Bend 3	26°57'46.47"S; 27°29'26.02"E
Bend 4	26°57'46.77"S; 27°29'27.11"E
End point (at existing road tie-in)	26°57'48.13"S; 27°29'30.05"E

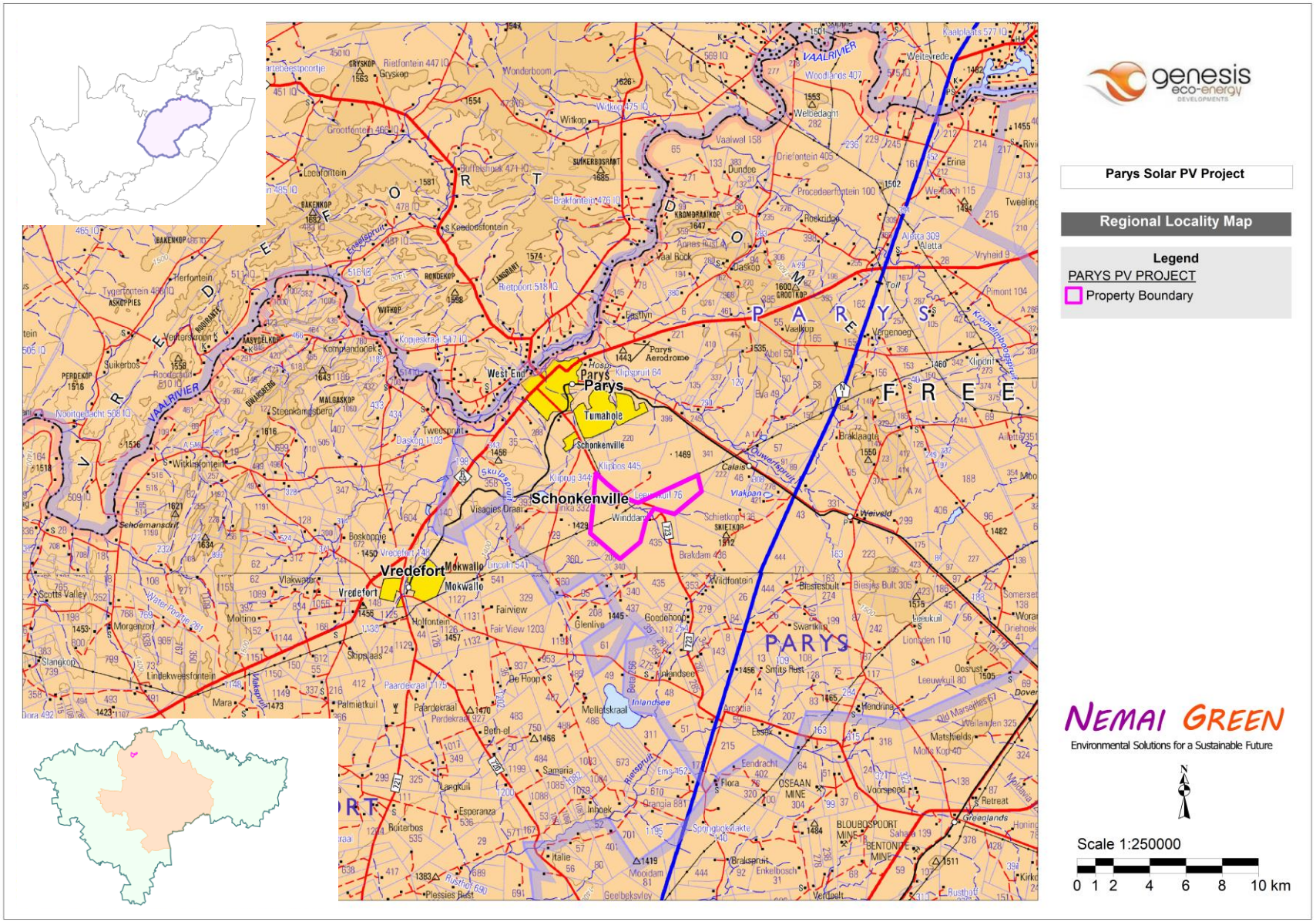


Figure 2: **Regional locality map**

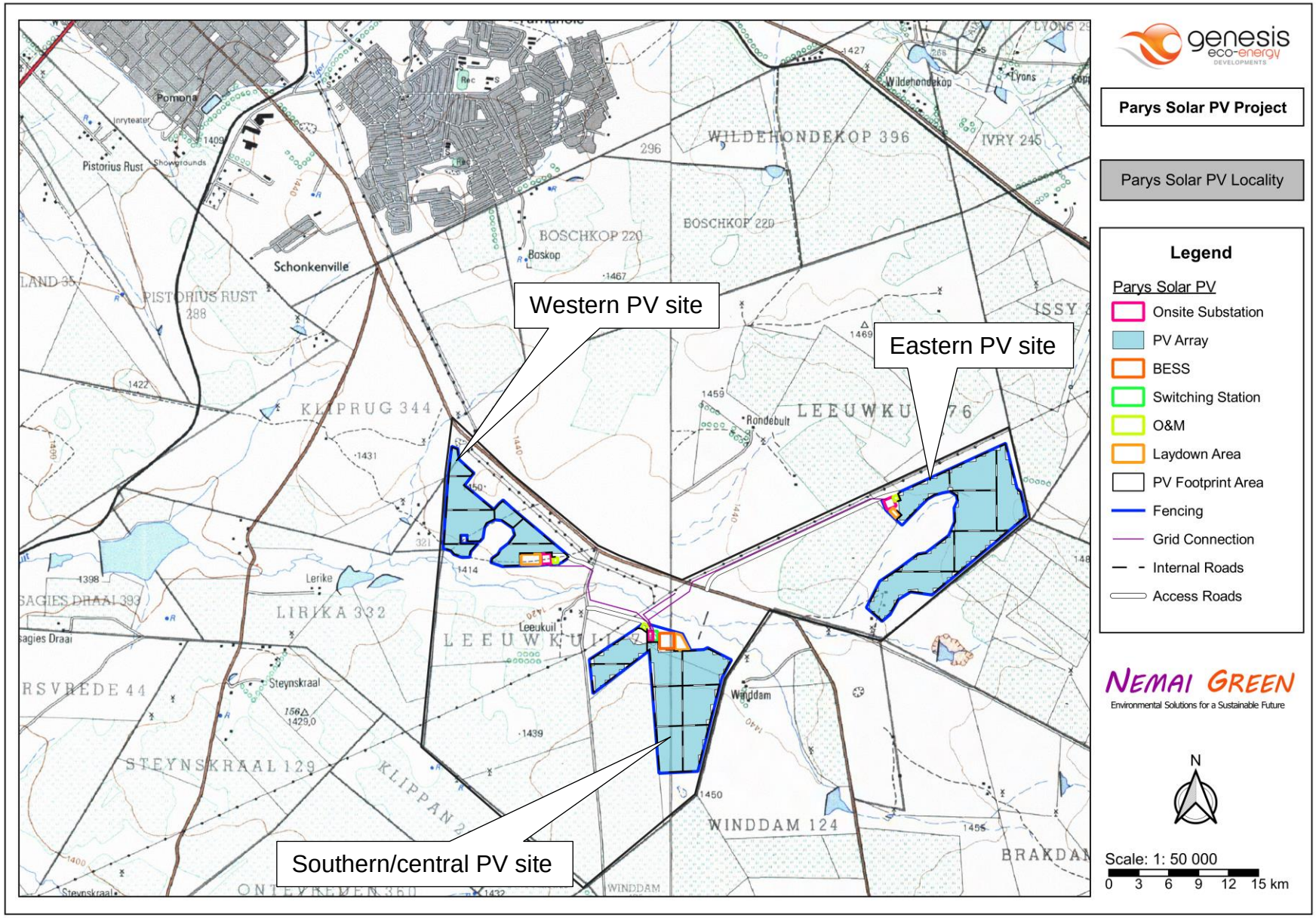


Figure 3: **Locality map (topographical map)**

5 LEGISLATION AND GUIDELINES CONSIDERED

5.1 International Finance Corporation - Performance Standards & Guidelines

Where relevant, the Project would strive to satisfy and incorporate the International Finance Corporation (IFC) Performance Standards (PS), which serve as an international benchmark for identifying and managing environmental and social risks.

The IFC PS offer a framework for understanding and managing environmental and social risks for high profile, complex, international and potentially high impact projects. The IFC PS encompass the following eight topics:

- ❑ 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.

IFC's Environmental, Health, and Safety (EHS) Guidelines provide technical guidelines with general and industry-specific examples of good international industry practice to meet IFC PS.

5.2 Legislation

5.2.1 Environmental Statutory Framework

The legislation that has possible bearing on the proposed Project from an environmental perspective is captured in **Table 6** below. **Note:** *this list does not attempt to provide an exhaustive explanation, but rather represents an identification of some of the most appropriate sections from pertinent pieces of legislation.*

Table 6: Environmental Statutory Framework

Legislation	Description and Relevance
Constitution of the Republic of South Africa (No. 108 of 1996)	▪ Chapter 2 – Bill of Rights. ▪ Section 24 – Environmental Rights.
National Environmental Management Act (Act No. 107 of 1998)	▪ Key sections (amongst others): o Section 24 – Environmental Authorisation (control of activities which may have a detrimental effect on the environment).

Legislation	Description and Relevance	
	○ Section 28 – Duty of care and remediation of environmental damage. ▪ Environmental management principles. ▪ Authorisation type – Environmental Authorisation. ▪ Authorities – DFFE (national) (competent authority for this application) and the Free State Department of Economic, Small Business Development, Tourism and Environmental Affairs (DESTEA) (provincial).	
EIA Regulations	▪ Purpose - regulate the procedure and criteria as contemplated in Chapter 5 of NEMA relating to the preparation, evaluation, submission, processing and consideration of, and decision on, applications for environmental authorisations for the commencement of activities, subjected to EIA, in order to avoid or mitigate detrimental impacts on the environment, and to optimise positive environmental impacts, and for matters pertaining thereto.	
GN No. R. 983 of 4 December 2014 (as amended) (Listing Notice 1)	▪ Purpose - identify activities that would require environmental authorisations prior to commencement of that activity and to identify competent authorities in terms of sections 24(2) and 24D of NEMA. ▪ The investigation, assessment and communication of potential impact of activities must follow a Basic Assessment process, as prescribed in regulations 19 and 20 of the EIA Regulations. However, according to Regulation 15(3) of the EIA Regulations, Scoping and Environmental Impact Reporting (S&EIR) must be applied to an application if the application is for two or more activities as part of the same development for which S&EIR must already be applied in respect of any of the activities. ▪ The following activities under Listing Notice 1 are relevant to this Project:	
	GN No. R.983 – Activity 11(i): *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 the 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.*	*Proposed 132 kV overhead power lines outside an urban area, and onsite substation of up to a maximum of 134 MW per PV site, 132 kV/22kV.*
	GN No. R.983 – Activity 12(ii)(a) & (c): *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;* *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; -* *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;*	*Crossing of watercourses by the overhead powerlines from the onsite substations to the existing Eskom substation.*

Legislation	Description and Relevance	
	(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.*	
	GN No. R.983 – Activity 19: *The infilling or depositing of any material of more than 10 cubic metres into, or the dredging, excavation, removal or moving of soil, sand, shells, shell grit, pebbles or rock of more than 10 cubic metres from a watercourse;* *but excluding where such infilling, depositing, dredging, excavation, removal or moving -* *(a) will occur behind a development setback;* *(b) is for maintenance purposes undertaken in accordance with a maintenance management plan;* *(c) falls within the ambit of activity 21 in this Notice, in which case that activity applies;* *(d) occurs within existing ports or harbours that will not increase the development footprint of the port or harbour; or* *(e) where such development is related to the development of a port or harbour, in which case activity 26 in Listing Notice 2 of 2014 applies.*	*Crossing of watercourses by the overhead powerlines from the onsite substations to the existing Eskom substation.*
	GN No. R.983 – Activity 24(ii): *The development of a road -* *(i) 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* *(ii) 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* *(c) which is 1 kilometre or shorter.*	*Access roads (construction and operational phases) are expected to exceed thresholds. Internal roads within the PV sites will have a reserve of 12m and be 4m wide. Access roads from the PV sties to the existing roads will have a reserve of 14m and be 8m wide.*
	GN No. R.983 – Activity 28(ii): *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.*	*Footprint of Project on land that was previously used for agricultural purposes, outside of an urban area.*
	GN No. R.983 – Activity 56 (i & ii): *The widening of a road by more than 6 metres, or the lengthening of a road by more than 1 kilometre-* *(i) where the existing reserve is wider than 13,5*	*The upgrading of existing access roads (existing farm roads) to the PV sites.*

Legislation	Description and Relevance	
	meters; or *(ii) where no reserve exists, where the existing road is wider than 8 metres;* *excluding where widening or lengthening occur inside urban areas.*	
GN No. R. 984 of 4 December 2014 (as amended) (Listing Notice 2)	▪ Purpose - identify activities that would require environmental authorisations prior to commencement of that activity and to identify competent authorities in terms of sections 24(2) and 24D of NEMA. ▪ The investigation, assessment and communication of potential impact of activities must follow a S&EIR process, as prescribed in regulations 21 to 24 of the EIA Regulations. ▪ The following activities under Listing Notice 2 are relevant to this Project:	
	GN No. R.984 – Activity 1: *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, excluding where such development of facilities or infrastructure is for photovoltaic installations and occurs -* *(a) within an urban area; or* *(b) on existing infrastructure.*	*The proposed Project involves the development of a PV facility and BESS hybrid with a total generation capacity of up to 200MW renewable solar energy.*
	GN No. R.984 – 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.*	*Cumulative area of indigenous vegetation to be cleared for entire Project (excluding linear components) will exceed 20 hectares.*
GN No. R. 985 of 4 December 2014 (as amended) (Listing Notice 3)	▪ Purpose - list activities and identify competent authorities under sections 24(2), 24(5) and 24D of NEMA, where environmental authorisation is required prior to commencement of that activity in specific identified geographical areas only. ▪ The investigation, assessment and communication of potential impact of activities must follow a Basic Assessment process, as prescribed in regulations 19 and 20 of the EIA Regulations. However, according to Regulation 15(3) of the EIA Regulations, S&EIR must be applied to an application if the application is for two or more activities as part of the same development for which S&EIR must already be applied in respect of any of the activities. ▪ The following activities under Listing Notice 3 are relevant to this Project:	
	GN No. R.985 – Activity 4 - (b)(i)(ee) & (gg): *The development of a road wider than 4 metres with a reserve less than 13,5 metres.* *b. Free State* *i. Outside urban areas:* *(ee) Critical biodiversity areas as identified in systematic biodiversity plans* *adopted by the competent authority or in bioregional plans;* *(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, excluding disturbed areas.*	*Access roads will be 8m width within Critical Biodiversity Area (CBA) in terms of the Free State Biodiversity Plan; access roads fall within 10km of a World Heritage Site (WHS), namely the Vredefort Dome WHS.*
	GN No. R.985 – Activity 12 - (b)(ii) & (iv): *The clearance of an area of 300 square metres or more of indigenous vegetation except where such clearance of indigenous vegetation is required for maintenance purposes undertaken in accordance with a maintenance management plan.* *b. Free State*	*Clearance of areas of indigenous vegetation as part of the development footprint (access roads, powerline, PV site sections), including within areas consisting of CBA 2 and within 100 m from the edge of a watercourse or wetland.*

Legislation	Description and Relevance	
	ii. Within critical biodiversity areas identified in bioregional plans; *iv. Areas within a watercourse or wetland; or within 100 metres from the edge of a watercourse or wetland.*	
	GN No. R.985 – Activity 14(ii)(a) & (c) - (b)(i)(ff) & (hh): *The development of—* *(i) dams or weirs, where the dam or weir, including infrastructure and water surface area exceeds 10 square metres; or* *(ii) <u>infrastructure or structures with a physical footprint of 10 square metres or more</u>;* *where such development occurs—* *(a) within a watercourse;* *(b) in front of a development setback; or* *(c) if no development setback has been adopted, within 32 metres of a watercourse, measured from the edge of a watercourse;* *b. Free State* *i. Outside urban areas:* *(ff) Critical biodiversity areas or ecosystem service areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans;* *(hh) 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 area of a biosphere reserve.*	*Crossing of watercourses by the overhead powerlines from the onsite substations to the existing Eskom substation within CBA 2 and falling within the Ngwathe EMF, and within 10km of a World Heritage Site (WHS), namely the Vredefort Dome WHS.*
	GN No. R.985 – Activity 18(b)(i)(ee)(gg) & (hh) *The widening of a road by more than 4 metres, or the lengthening of a road by more than 1 kilometre.* *b. Free State* *i. Outside urban areas:* *(ee) Critical biodiversity areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans;* *(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 area of a biosphere reserve; or* *(hh) Areas within a watercourse or wetland; or within 100 metres from the edge of a watercourse or wetland.*	*The upgrading of existing access roads (existing farm roads) to the PV sites within CBAs and within 100 m from the edge of a watercourse or wetland and within 10km of a World Heritage Site (WHS), namely the Vredefort Dome WHS, and falling within the Ngwathe EMF.*
National Water Act (Act No. 36 of 1998)	▪ Sustainable and equitable management of water resources. ▪ Key sections (amongst others): o Chapter 3 – Protection of water resources. o Section 19 – Prevention and remedying effects of pollution. o Section 20 – Control of emergency incidents. o Chapter 4 – Water use. ▪ Authorisation type – General Authorisation / Water Use Licence. ▪ Authority – Department of Water and Sanitation (DWS).	
National Environmental Management: Waste Act (Act No. 59 of 2008)	▪ Management of waste. ▪ Key sections (amongst others): o Section 16 – General duty in respect of waste management. o Chapter 5 – licensing of waste management activities listed in GN No. R. 921 of 29 November 2013 (as amended). ▪ Authorisation type – Waste Management Licence (*not required for the Project*). ▪ Authority – DFFE (national) and DESTEA (provincial).	
National Environmental Management Air Quality Act (Act No. 39 of 2004)	▪ Air quality management. ▪ Key sections (amongst others): o Section 32 – Dust control.	

Legislation	Description and Relevance
	○ Section 34 – Noise control. ▪ Authorisation type – Atmospheric Emission License (*not required for the Project*). ▪ Authority – DFFE (national), DESTEA (provincial) and municipality.
National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004)	▪ Management and conservation of the country's biodiversity. ▪ Protection of species and ecosystems. ▪ Authorisation type – Permit (*relevance to the Project to be confirmed*). ▪ Authority – DFFE (national) and DESTEA (provincial).
National Forests Act (Act No. 84 of 1998)	▪ Supports sustainable forest management and the restructuring of the forestry sector, as well as protection of indigenous trees in general. ▪ Section 15 – Authorisation required for impacts to protected trees. ▪ Authorisation type – Licence (*relevance to the Project to be confirmed*). ▪ Authority – DFFE.
National Environmental Management: Protected Areas Act (Act No. 57 of 2003)	▪ Protection and conservation of ecologically viable areas representative of SA's biological diversity and natural landscapes. ▪ No protected areas are directly affected by the Project.
Minerals and Petroleum Resources Development Act (Act No. 28 of 2002)	▪ Equitable access to and sustainable development of the nation's mineral and petroleum resources and to provide for matters related thereto. ▪ Key sections (amongst others): ○ Section 22 – Application for mining right. ○ Section 27 – Application for, issuing and duration of mining permit. ○ Section 53 – Use of land surface rights contrary to objects of Act. ▪ Authorisation type – Mining Permit / Mining Right (*not required for the Project*). ▪ Authority – Department of Mineral Resources and Energy (DMRE).
National Heritage Resources Act (Act No. 25 of 1999)	▪ Key sections: ○ Section 34 – protection of structure older than 60 years. ○ Section 35 – protection of heritage resources. ○ Section 36 – protection of graves and burial grounds. ○ Section 38 – Heritage Impact Assessment for linear development exceeding 300m in length; development exceeding 5 000m^2 in extent, etc. ▪ Authorisation type – Permit (*relevance to the Project to be confirmed*). ▪ Authority – South African Heritage Resources Agency (SAHRA) and Free State Heritage Resources Authority (FSHRA).
Conservation of Agricultural Resources Act (Act No. 43 of 1983)	▪ Control measures for erosion. ▪ Control measures for alien and invasive plant species. ▪ Authority – Free State Department of Agriculture and Rural Development (DARD).
Free State Province Nature Conservation Ordinance 8 of 1969	▪ Provides for the listing of certain protected plant species.
Occupational Health & Safety Act (Act No. 85 of 1993)	▪ Provisions for Occupational Health & Safety. ▪ Authority – Department of Employment and Labour (DEL). ▪ Relevant regulations, such as Electrical Installation Regulations, Construction Regulations, etc.
Hazardous Substance Act (No 15 of 1973) and Regulations	▪ Provides for the control of substances which may cause injury or ill-health to or death of human beings by reason of their toxic, corrosive, irritant, strongly sensitizing or flammable nature or the generation of pressure thereby in certain circumstances, and for the control of certain electronic products ▪ Provides for the division of such substances or products into groups in relation to the degree of danger. ▪ Provides for the prohibition and control of the importation, manufacture, sale, use, operation, application, modification, disposal or dumping of such substances and products.

The relationship between the Project and certain key pieces of environmental legislation is discussed in the subsections to follow.

5.2.2 National Environmental Management Act

NEMA is the framework legislation regulating the environment in SA. According to Section 2(3) of NEMA, "*development must be socially, environmentally and economically sustainable*", which

means the integration of these three factors into planning, implementation and decision-making so as to ensure that development serves present and future generations.

The proposed Project requires authorisation in terms of NEMA and the EIA is being undertaken in accordance the EIA Regulations, which consist of the following:

- ❑ EIA procedure - GN No. R 982 (4 December 2014), as amended;
- ❑ Listing Notice 1 - GN No. R 983 (4 December 2014), as amended;
- ❑ Listing Notice 2 - GN No. R 984 (4 December 2014), as amended; and
- ❑ Listing Notice 3 - GN No. R 985 (4 December 2014), as amended.

The Project triggers activities under Listing Notices 1, 2 and 3, and thus needs to be subjected to a Scoping and Environmental Impact Reporting (S&EIR) process. The listed activities are explained within the context of the Project in **Table 6** above and **Table 7** below.

Table 7: Listed Activities Triggered by the Project

Project Components	Relevant Listed Activities	Description of relevance
Solar PV Plant	***GN No. R.983 (as amended)***	
	Activity no. 28(ii)	Footprint of proposed Solar PV Plant on land that was previously used for agricultural purposes, outside of an urban area.
	GN No. R.984 (as amended)	
	Activity no. 1	The planned generation capacity of the proposed Solar PV Plant is 200 MW with 40MW BESS.
	Activity no. 15	The cumulative area to be cleared for entire Project (excluding linear components) will exceed 20 hectares.
	GN No. R.985 (as amended)	
	Activity no. 12 - (b)(i),(ii) & (iv)	Clearance of indigenous vegetation as part of the development footprint within areas consisting of critical biodiversity areas (CBA2) and within 100m from the edge of a watercourse or wetland.
Power Line & Facility Substation	***GN No. R.983 (as amended)***	
	Activity no. 11(i)	Proposed 132 kV overhead power lines outside an urban area, and onsite substation of up to a maximum of 134 MW per PV site, 132 kV/22kV
	Activity no. 12(ii)(a) & (c)	Crossing of watercourses by the overhead powerlines from the onsite substations to the existing Eskom substation.
	Activity no. 19	Crossing of watercourses by the overhead powerlines from the onsite substations to the existing Eskom substation.
	GN No. R.985 (as amended)	
	Activity no. 12 - (b)(i), (ii) & (iv)	Clearance of indigenous vegetation as part of the development footprint within areas consisting of critical biodiversity areas (CBA2) and within 100m from the edge of a watercourse or wetland.
	Activity no. 14(ii)(a) & (c) - (b)(i)(ff)	Crossing of watercourses by the overhead powerlines from the onsite substations to the existing Eskom substation within CBA 2 and falling within the Ngwathe EMF, and within 10km of a World Heritage Site (WHS), namely the Vredefort Dome WHS.
Roads	***GN No. R.983 (as amended)***	
	Activity no. 24(ii)	New roads required for the Project (construction and operational phases). Internal roads within the PV sites will have a reserve of 12m and be 4m wide. Access roads from the PV sites to the existing roads will have a reserve of 14m and be 8m wide.
	Activity 56 (i & ii)	The upgrading of existing access roads (existing farm roads) to the PV sites.
	GN No. R.985 (as amended)	
	Activity no. 4 - (b)(i)(ee) & (gg)	New roads required for the Project (construction and operational phases). Internal roads within the PV sites will have a reserve of 12m and be 4m wide. Access roads from the PV sites to the existing roads will have a reserve of 14m and be 8m wide. Certain sections of internal roads and the main access road will encroach into CBA2 in terms of the Free State Biodiversity Plan. Roads further fall within 10km of a World Heritage Site (WHS), namely the Vredefort Dome WHS.
	Activity no. 12 - (b)(i), (ii) & (iv)	Clearance of indigenous vegetation for roads within areas consisting of CBA2 and within 100m from the edge of a watercourse or wetland.
	Activity no. 18 – (b)(i)(ee)(gg) & (hh)	The upgrading of existing access roads (existing farm roads) to the PV sites within CBAs and within 100 m from the edge of a watercourse or wetland and within 10km of a World Heritage Site (WHS), namely the Vredefort Dome WHS, and falling within the Ngwathe EMF

Note that the dimensions of the Project's proposed infrastructure and components should be regarded as approximates due to the dynamic nature of the planning and design process. As a conservative approach, all activities that could possibly be triggered by the Project were included in the Application Form that was submitted to the DFFE with the draft Scoping Report. Based on

the comments received from DFFE on the draft Scoping Report, the proposed BESS does not trigger the storage of dangerous goods in terms of the EIA Listing Notices. Hence, and amended Application Form was compiled and submitted to DFFE with the final Scoping Report.

5.2.3 National Environmental Management: Waste Act

Amongst others, the purpose of the National Environmental Management: Waste Act (Act No. 59 of 2008) (NEM:WA) includes the following:

1. To reform the law regulating waste management in the country by providing reasonable measures for the prevention of pollution and ecological degradation and for securing ecologically sustainable development;
2. To provide for institutional arrangements and planning matters;
3. To provide for specific waste management measures;
4. To provide for the licensing and control of waste management activities;
5. To provide for the remediation of contaminated land; and
6. To provide for compliance and enforcement.

"Waste" is defined in NEM:WA as "*any substance, material or object, that is unwanted, rejected, abandoned, discarded or disposed of, or that is intended or required to be discarded or disposed of, by the holder of that substance, material or object, whether or not such substance, material or object can be re-used, recycled or recovered and includes all wastes as defined in Schedule 3 to this Act*".

Schedule 3 of the NEM:WA groups waste into two categories, namely hazardous waste and general waste. The classification of waste determines the associated management and licencing requirements. ''Hazardous waste'' is defined as "*any waste that contains organic or inorganic elements or compounds that may, owing to the inherent physical, chemical or toxicological characteristics of that waste, have a detrimental impact on health and the environment and includes hazardous substances, materials or objects within business waste, residue deposits and residue stockpiles*".

GN No. R. 921 of 29 November 2013 (as amended) contains a list of waste management activities that have, or are likely to have, a detrimental impact on the environment. If any of the waste management activities are triggered in Category A and Category B, a Waste Management Licence is required. Activities listed in Category C need to comply with the relevant National Norms and Standards.

No authorisation will be required in terms of NEM:WA, as the Project will not include any listed waste management activities. The following is noted with regards to waste management for the Project:

- ❑ Construction phase –

- Temporary waste storage facilities will remain below the thresholds contained in the listed activities under Schedule 1 of NEM:WA; and
- The Environmental Management Programme (EMPr) (contained in **Appendix H**) makes suitable provisions for waste management, including the storage, handling and disposal of waste.

❑ Operational phase –

- Minimum volumes of waste will be generated during the operational phase;
- Waste from the on-site office and workshop will be sent to licenced municipal waste disposal sites; and
- Waste generated during maintenance or replacement of panels and inverters will be sent to suitable disposal sites.

5.2.4 National Water Act

The purpose of the National Water Act (Act No. 36 of 1998) (NWA) is to ensure that the nation's water resources are protected, used, developed, conserved, managed and controlled in ways which take into account amongst other factors:

- ❑ Meeting the basic human needs of present and future generations;
- ❑ Promoting equitable access to water;
- ❑ Redressing the results of past racial and gender discrimination;
- ❑ Promoting the efficient, sustainable and beneficial use of water in the public interest;
- ❑ Facilitating social and economic development;
- ❑ Providing for growing demand for water use; protecting aquatic and associated ecosystems and their biological diversity;
- ❑ Reducing and preventing pollution and degradation of water resources;
- ❑ Meeting international obligations;
- ❑ Promoting dam safety; and
- ❑ Managing floods and droughts.

The Department of Water and Sanitation (DWS) is the custodian of South Africa's water resources.

Some key definitions from this Act include:

- ❑ "*Pollution*" – the direct or indirect alteration of the physical, chemical or biological properties of a water resource so as to make it (a) less fit for any beneficial purpose for which it may reasonably be expected to be used; or (b) harmful or potentially harmful;
- ❑ "*Waste*" – includes any solid material or material that is suspended, dissolved or transported in water (including sediment) and which is spilled or deposited on land or into a water resource in such volume, composition or manner as to cause, or to be reasonably likely to cause, the water resource to be polluted; and
- ❑ "*Water resource*" – includes a watercourse, surface water, estuary, or aquifer.

The Project entails the following activities that constitute water uses in terms of Section 21 of the NWA:

- Section 21(c) - Impeding or diverting the flow of water in a watercourse; and
- Section 21(i) - Altering the bed, banks, course or characteristics of a watercourse.

The Applicant will seek authorisation from DWS in terms of the NWA for the above water uses associated with the Project.

5.2.5 National Environmental Management: Air Quality Act

The purpose of the National Environmental Management: Air Quality Act (Act No. 39 of 2004) (NEM:AQA) is to reform the law regulating air quality by providing measures for the prevention of pollution and ecological degradation and for securing ecologically sustainable development. This Act aims to promote justifiable economic and social development; to provide for national norms and standards regulating air quality monitoring, management and control by all spheres of government, and for specific air quality measures.

Some key definitions from this Act include:

- "*Air pollution*" – any change in the composition of the air caused by smoke, soot, dust (including fly ash), cinders, solid particles of any kind, gases, fumes, aerosols and odorous substances.
- "*Atmospheric emission*" or "*emission*" – any emission or entrainment process emanating from a point, non-point or mobile source that results in air pollution.
- "*Non-point source*" – a source of atmospheric emissions which cannot be identified as having emanated from a single identifiable source or fixed location, and includes veld, forest and open fires, mining activities, agricultural activities and stockpiles.
- "*Point source*" – single identifiable source and fixed location of atmospheric emission, and includes smoke stacks and residential chimneys.

This Act provides for the listing of activities which result in atmospheric emissions that pose a threat to health or the environment. No person may without an Atmospheric Emission Licence (AEL) conduct any such listed activity. No AEL is required for the Project. Provision is made in the EMPr to manage impacts to air quality as a result of the Project during the construction phase.

5.2.6 National Environmental Management: Biodiversity Act

The purpose of the National Environmental Management: Biodiversity Act (Act No. 10 of 2004) (NEM:BA) is to provide for the management and conservation of SA's biodiversity within the framework of NEMA.

The Act allows for the publication of provincial and national lists of ecosystems that are threatened and in need of protection. The list should include:

- *Critically Endangered Ecosystems*, which are ecosystems that have undergone severe ecological degradation as a result of human activity and are at extremely high risk of irreversible transformation.
- *Endangered Ecosystems*, which are ecosystems that, although they are not critically endangered, have nevertheless undergone ecological degradation as a result of human activity.
- *Vulnerable Ecosystems*, which are ecosystems that have a high risk of undergoing significant ecological degradation.
- *Protected Ecosystems*, which are ecosystems that are of a high conservation value or contain indigenous species at high risk of extinction in the wild in the near future.

Similarly, the Act allows for the listing of endangered species, including critically endangered species, endangered species, vulnerable species and protected species. A person may not carry out a restricted activity (including trade) involving listed threatened or protected species without a permit.

The Regulations on the management of Listed Alien and Invasive Species were promulgated on 1 August 2014. The Listed Invasive Species were also published on this date and were subsequently amended in GN 864 of 29 July 2016.

Some key definitions from this Act include:

- "*Alien species*" –
  - A species that is not an indigenous species; or
  - An indigenous species translocated or intended to be translocated to a place outside its natural distribution range in nature, but not an indigenous species that has extended its natural distribution range by natural means of migration or dispersal without human intervention.
- "*Biological diversity*" or "*biodiversity*" – the variability among living organisms from all sources including, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part and also includes diversity within species, between species, and of ecosystems.
- "*Indigenous* species" – a species that occurs, or has historically occurred, naturally in a free state in nature within the borders of the Republic, but excludes a species that has been introduced in the Republic as a result of human activity.
- "*Invasive species*" – any species whose establishment and spread outside of its natural distribution range -
  - Threaten ecosystems, habitats or other species or have demonstrable potential; and
  - May result in economic or environmental harm or harm to human health.
- "*Species*" – a kind of animal, plant or other organism that does not normally interbreed with individuals of another kind, and includes any sub-species, cultivar, variety, geographic race, strain, hybrid or geographically separate population.

The Regulations on the management of Listed Alien and Invasive Species were promulgated on 1 August 2014. The Listed Invasive Species were also published on this date and were subsequently amended in GN 864 of 29 July 2016.

The implications of NEM:BA for the Project *inter alia* include the requirements for managing invasive and alien species, protecting threatened ecosystems and species, as well as for rehabilitating the areas affected by the Project (outside of the development footprint).

The findings from the Wetland Study, Terrestrial Biodiversity Study and Avifaunal Study that were undertaken for the Project are included in **Section 12.3**, **Section 12.4** and **Section 12.5** below, respectively.

5.2.7 National Heritage Resources Act

The purpose of the National Heritage Resources Act (Act No. 25 of 1999) (NHRA) is to protect and promote good management of SA's heritage resources, and to encourage and enable communities to nurture and conserve their legacy so it is available to future generations.

In terms of Section 38 of the NHRA, certain listed activities require authorisation from provincial agencies, which include the following:

- ❑ The construction of a road, wall, powerline, pipeline, canal or other similar form of linear development or barrier exceeding 300 m in length;
- ❑ The construction of a bridge or similar structure exceeding 50 m in length;
- ❑ Any development or other activity which will change the character of a site -
  - Exceeding 5 000 m^2 in extent; or
  - Involving three or more existing erven or subdivisions thereof; and
- ❑ The re-zoning of a site exceeding 10 000 m^2 in extent.

The findings from the Phase 1 Cultural Heritage Impact Assessment and Palaeontological Desktop Assessment that were undertaken for the Project are included in **Section 12.7** and **Section 12.8** below, respectively.

5.3 Governance of Energy in SA

SA has expressed and entrenched its commitment to promoting the use of renewable energy and implementing Energy Efficiency through the following (amongst others):

- ❑ SA is a signatory to various international treaties and conventions relating to climate change and greenhouse gas (GHG), such as –
  - United Nations Framework Convention on Climate Change;
  - Kyoto Protocol; and
  - Paris Agreement.

- SA has developed the following related policy frameworks –
  - White Paper on Energy Policy (1998);
  - White Paper on Renewable Energy (2003);
  - Integrated Energy Plan (2003);
  - IRP 2010;
  - IRP 2019
  - National Climate Change Response White Paper (2011);
  - Post-2015 National Energy Efficiency Strategy;
  - The National Development Plan (2030);
  - Climate Change Bill (2018); and
  - Carbon Tax Bill (2019).
- SA has developed the following related legal frameworks –
  - Electricity Regulation Act (Act No. 4 of 2006);
  - National Energy Act (Act No. 34 of 2008); and
  - Income Tax Act (1962) - tax incentive provided for Section 12L.
- The former Department of Environmental Affairs (DEA), which is now known as DFFE, developed EIA Guideline for Renewable Energy Projects (2015).
- SA's related voluntary instruments include –
  - South African National Standard (SANS) 941 energy-efficiency of electrical and electronic equipment; and
  - SANS 50001 energy management standard.

5.4 Guidelines

The following guidelines were considered during the preparation of the EIA Report:

- Guideline on Alternatives, EIA Guideline and Information Document Series (DEA&DP, 2010);
- Guideline on Need and Desirability (DEA, 2017);
- Integrated Environmental Management Guideline Series 7: Public Participation in the EIA Process (DEA, 2010);
- EIA Guideline for Renewable Energy Projects (DEA, 2015); and
- Guidelines for Involving Specialists in the EIA Processes Series (Brownlie, 2005).

5.5 National and Regional Plans

The following regional plans were considered during the execution of the EIA Phase (amongst others):

- Fezile Dabi District Municipality Integrated Development Plan (IDP);
- Ngwathe Local Municipality IDP;
- Free State Biodiversity Plan (2015) (Collins, 2016); and

- ❑ Relevant national, provincial and local policies, strategies, plans and programmes.

5.6 Renewable Energy Development Zones

A Strategic Environmental Assessment (SEA) was undertaken by the former DEA, which is now known as DFFE, in order to identify geographical areas most suitable for the rollout of wind and solar PV energy projects and the supporting electricity grid network. These areas are referred to as Renewable Energy Development Zones (REDZs), in which development will be incentivised and streamlined. The proposed Project footprint in relation to the REDZs are shown in **Figure 4** below.

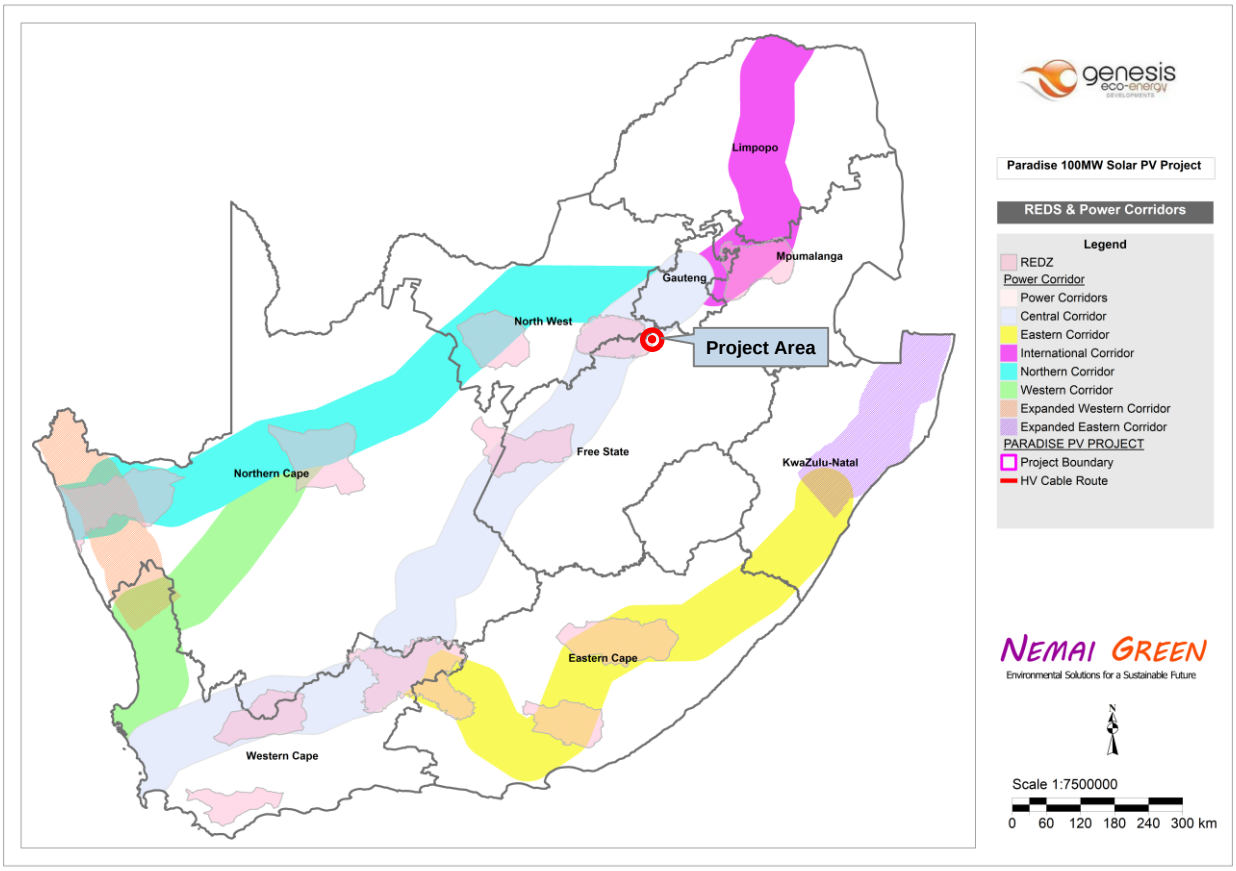


Figure 4: The Project in relation to REDZs

As shown in **Figure 4** above, the Project is not located within any REDZs or Strategic Transmission Corridors. According to GNR 113 of 16 February 2018, where an Application for Environmental Authorisation for large scale wind or solar PV facilities is being made and these facilities fall outside of the REDZs then these applications will be considered in terms of the requirements of the EIA Regulations.

6 SCOPING AND EIA PROCESS

6.1 Environmental Assessment Authorities

In terms of NEMA the lead decision-making authority for the environmental assessment is DFFE, as the competent authority for renewable energy related applications. Due to the geographic location of the Project, DESTEA is regarded as one of the key commenting authorities in terms of NEMA during the execution of the EIA, and all documentation will thus be copied to this Department.

Various other authorities with jurisdiction over elements of the receiving environment or project activities (refer to **Section 5.2** above) will also be consulted during the course of the EIA. Refer to the database of Interested and Affected Parties (I&APs) contained in **Appendix F** for a list of the government departments.

6.2 Environmental Assessment Practitioner

Nemai Green was appointed as the independent Environmental Assessment Practitioner (EAP) to undertake the environmental assessment for the proposed Project. In accordance with Appendix 2, Section 2(1)(a) of the EIA Regulations, this section provides an overview of Nemai Green and the company's experience with EIA's, as well as the details and experience of the EAP's that form part of the Scoping and EIA team.

Nemai Green is an independent, specialist environmental, social development and Occupational Health and Safety (OHS) consultancy. The company is a 100% black female owned company, with a level 1 BBBEE rating. The company is directed by a team of experienced and capable environmental engineers, scientists, ecologists, sociologists, economists and analysts. The company has offices in Randburg (Gauteng) and Durban (KZN).

The core members of Nemai Green that are involved with the S&EIR process for the Project are captured in **Table 8** below, and their respective Curricula Vitae are contained in **Appendix D**. The oath of the EAP is contained in **Appendix I**.

Table 8: Scoping and EIA Core Team Members

Name	Qualifications	Selected Experience - Renewable Energy & Bulk Power Projects
D. Henning (21 years' experience)	MSc (River Ecology)	▪ Matjhabeng 400 MW Solar PV Power Plant with 80 MW (320 MWh) Battery Energy Storage Systems, Free State Province, SA. ▪ Beaufort West 75MW Solar PV Project, Western Cape, SA. ▪ Extraction of Gas and Electric Power Production Plant in the Rubavu District, Rwanda. ▪ Impompomo Hydropower Plant, Mpumalanga, SA. ▪ Hydropower Plant within Hydraulic Network at Rand Water's Zoekfontein Site, Gauteng Province, SA.

Name	Qualifications	Selected Experience - Renewable Energy & Bulk Power Projects
		▪ uMkhomazi Water Project Phase 1 with hydropower facilities, KwaZulu-Natal, SA. ▪ Neptune-Poseidon Transmission Line, including 200km of 400 kV transmission line, Eastern Cape, SA. ▪ Makalu B (Igesi) Substation and Associated Transmission Loop-In Lines, Free State Province, SA. ▪ Anderson Dinaledi Transmission Line, including 80km of 132 kV transmission line with substations, North-West Province, SA.
D. Naidoo (25 years' experience)	BSc Eng (Chem)	▪ Bronkhorstspruit Biogas Plant, Gauteng Province, SA. ▪ Construction of the Xina Solar One Parabolic Trough Technology 100MW Solar Plant, Northern Cape Province, SA. ▪ Construction of the Biotherm Solar Photovoltaic Power Plants, Northern Cape, SA. ▪ Construction of the Roodeplaat Wind Farm, Eastern Cape, SA. ▪ North-South Strengthening Scheme, including 300km of 400 kV transmission line with substations, Mpumalanga, SA. ▪ Mookodi-Mahikeng 400 kV Transmission Line, North-West Province, SA. ▪ Watershed 275/88/132 kV Substation, North-West Province, SA.

6.3 Environmental Screening

According to GN 960 of 5 July 2019, an application for Environmental Authorisation must be accompanied by the report generated by the National Web Based Environmental Screening Tool, as contemplated in Regulation 16(1)(b)(v) of the EIA Regulations.

The aims of the National Web Based Environmental Screening Tool include the following:

- ❑ To screen a proposed site for any environmental sensitivity;
- ❑ To provide site specific EIA process and review information;
- ❑ To identify related exclusions and/or specific requirements including specialist studies applicable to the proposed site and/or development, based on the national sector classification and the environmental sensitivity of the site; and
- ❑ To allow for a Screening Report to be generated.

The Screening Report for the proposed Project is appended under **Appendix C**.

6.4 Environmental Assessment Triggers

The process for seeking authorisation under NEMA is being undertaken in accordance with the EIA Regulations, promulgated in terms of Chapter 5 of NEMA. Based on the types of activities involved the requisite environmental assessment for the project is a S&EIR process. Refer to **Section 5.2.1** and **Section 5.2.2** above for the Project's legal framework and specifically the activities triggered in terms of Listing Notices 1, 2 and 3 of the EIA Regulations.

6.5 S&EIR Process

6.5.1 Formal Process

An outline of the S&EIR process for the proposed Project is provided in **Figure 5** below. The objectives of the EIA process, based on the EIA Regulations, are captured in **Section 1** above.

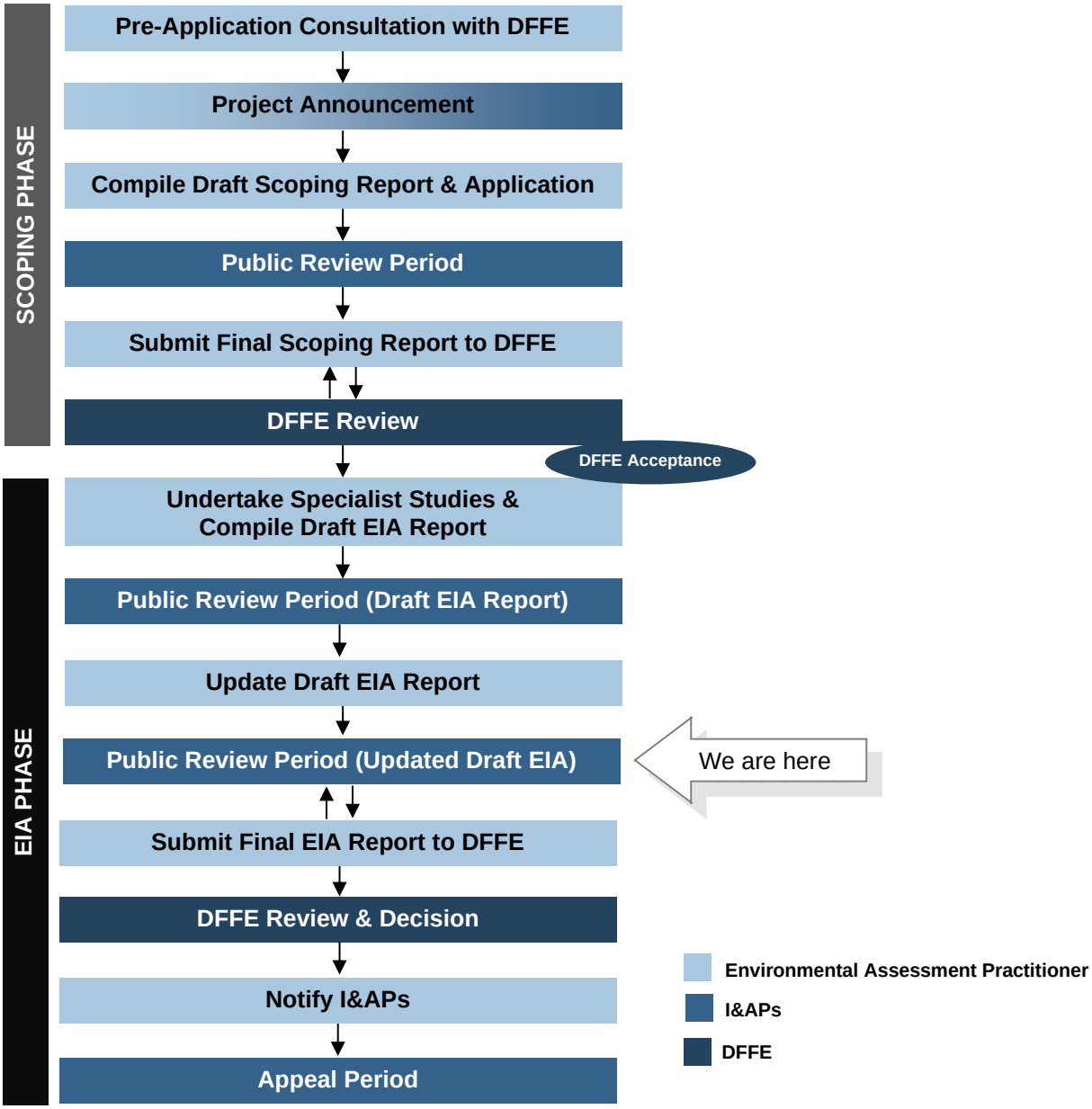


Figure 5: S&EIR process outline

6.5.2 The EIA Process to Date

The following key milestones have been reached to date as part of the EIA process:

1. A Pre-Application Meeting was held with DFFE on 18 November 2021.
2. A draft Scoping Report, which conformed to Appendix 2 of the EIA Regulations, was compiled. This document included the following salient information (amongst others):

a. A Scoping-level impact assessment to identify potentially significant environmental issues for detailed assessment during the EIA phase;
b. Screening and investigation of feasible alternatives to the project for further appraisal during the EIA phase; and
c. A Plan of Study, which explained the approach to be adopted to conduct the EIA for the proposed project.

3. The Application for Environmental Authorisation and draft Scoping Report were submitted to DFFE on 8 September 2022.
4. The draft Scoping Report was lodged for public review from 9 September to 10 October 2022.
5. The final Scoping Report was submitted to DFFE on 20 October 2022.
6. DFFE accepted the Scoping Report and Plan of Study for the EIA on 22 November 2022 (refer to **Appendix B**), which allowed the commencement of the EIA phase
7. The draft EIA Report was lodged for public review from 20 February 2023 to 23 March 2023.
8. The draft EIA Report was updated to incorporate the findings of the TIA that was commissioned for the project.

6.6 Alignment with the Plan of Study

The Plan of Study, which was contained in the Scoping Report and was accepted by DFFE, explained the approach to be adopted to conduct the EIA for the proposed Project. The manner in which the EIA Report addresses the requirements of the Plan of Study is shown in **Table 9** below.

Table 9: Alignment of EIA Report with Plan of Study

No.	Plan of Study Requirement	Reference to Section in EIA Report
1.	Assess potentially significant environmental issues identified during Scoping through: 1. Applying an appropriate impact assessment methodology. 2. Conducting specialist studies. 3. Identifying suitable mitigation measures.	• **Section 12** • **Section 13**
2.	Assessment of feasible alternatives.	• **Section 14**
3.	Specialist studies to be completed in accordance with Terms of Reference.	• **Section 12** • **Appendix E**
4.	Public participation to include the following: • Update the database of I&APs. • Allow for the review of the draft EIA Report. • Convene a public meeting. • Compile and maintain a Comments and Responses Report (CRR). • Notification of DFFE's decision.	**Section 15**
5.	EIA Report to satisfy the minimum requirements stipulated in Appendix 3 of the EIA Regulations.	**Section 2**
6.	Authority Consultation.	**Section 15**

6.7 Addressing DFFE's Requirements

6.7.1 Acceptance of Scoping Report

The manner in which DFFE's specific requirements, as listed in the letter dated 22 November 2022 from this Department for the acceptance of the Scoping Report (refer to **Appendix B**), have been attended to are described in **Table 10** below.

Table 10: DFFE's Specific Requirements - Acceptance of the Scoping Report

DFFE's Requirements	Response/Status
(i) Listed Activities	
(a) It is noted that certain activities may be no longer relevant or necessary after the outcome of specialist studies. Please ensure that only listed activities that are triggered by this development are applied for in the EIAR for the proposed project.	The listed activities triggered are explained in the context of the Project in **Table 6** and **Table 7** above. The findings of the specialist studies were considered in confirming the listed activities triggered.
(b) The EIAR must provide an assessment of the impacts and mitigation measures for each of the listed activities applied for.	Refer to **Section 13** below for the assessment of the listed activities and the identified mitigation measures.
(c) The listed activities represented in the EIAR and the application form must be the same and correct.	The listed activities contained in **Table 6** and **Table 7** above are the same as those contained in the Application Form.
(d) The EIAR must assess the correct sub-listed activity for each listed activity applied for. The onus is on the EAP and applicant to ensure that no other activities are triggered, and the correct activities are applied for.	Refer to **Table 6** and **Table 7** above for the sub-listed activity for each listed activity triggered by the Project.
(ii) Public Participation	
(a) Please ensure that comments from all relevant stakeholders are submitted to the Department with the EIAR. This includes but is not limited to the provincial Department of Agriculture, the local and district Municipality, the Department of Water and Sanitation (DWS), the South African Heritage Resources Agency (SAHRA), BirdLife SA, the Department of Mineral Resources and Energy, the Department of Rural Development and Land Reform, and the Department of Environment, Forestry and Fisheries: Directorate Biodiversity and Conservation and World Heritage Sites.	Copies of the draft EIA Report were provided to the key regulatory and commentary authorities listed in **Section 15** below. Comments received on the draft EIA Report will be appended to the final EIA Report, which will be submitted to DFFE. These comments will also be incorporated into the CRR.
(b) Please ensure that all issues raised and comments received during the circulation of the FSR and draft EIAR from registered I&APs and organs of state which have jurisdiction in respect of the proposed activity are adequately addressed in the final EIAR. Proof of correspondence with the various stakeholders must be included in the final EIAR. Should you be unable to obtain comments, proof should be submitted to the Department of the attempts that were made to obtain comments.	The CRR contained in **Appendix G** includes comments received during the Scoping phase. The CRR will be updated with comments received during the review of the draft EIA Report.
(c) A Comments and Response trail report (C&R) must be submitted with the final EIAR. The C&R report must incorporate all comments for this development. The C&R report must be a separate document from the main report and the format must be in the table format as indicated in Appendix 1 of this comments letter in chronological order. Please refrain from summarising comments made by I&APs. All comments from I&APs must be copied verbatim and responded to clearly. Please note that a response such as "noted" is not regarded as an adequate response to I&AP's comments.	The CRR is contained in **Appendix G**.
(d) Comments from I&APs must not be split and arranged into categories. Comments from each submission must be responded to individually.	The CRR, which is contained in **Appendix G**, does not categorise the comments received.

DFFE's Requirements	Response/Status
(e) The Public Participation Process must be conducted in terms of Regulation 39, 40, 41, 42, 43 & 44 of the EIA Regulations, 2014, as amended	The approach to Public Participation during the EIA phase is explained in **Section 15** below.
(iii) Layout & Sensitivity Maps	
(a) The EIAR must provide the following: ▪ Clear indication of the envisioned area for the solar PV facility, i.e., location of solar PV, Battery Energy Storage System (BESS); powerlines, supporting Infrastructure: main sub-station, operation and maintenance office, weather station, internal roads, parking, offices, staff ablutions and all associated infrastructure should be mapped at an appropriate scale. ▪ Clear description of all associated infrastructure. This description must include, but is not limited to the following: o Power lines; o Internal roads infrastructure; and: o All supporting onsite infrastructure such as laydown area, guard house and control room etc.	Refer to layout shown in **Figure 3** above and **Figures 8** to **11** below. Refer to **Section 4.2** and **Section 9** for a description of the project.
(b) A copy of the final preferred route layout map. All available biodiversity information must be used in the finalisation of the layout map. Existing infrastructure must be used as far as possible e.g., roads. The layout map must indicate the following: ▪ Permanent laydown area footprint; ▪ Internal roads indicating width (construction period width and operation period width) and with numbered sections between the other site elements which they serve (to make commenting on sections possible); ▪ Wetlands, drainage lines, rivers, stream and water crossing of roads and cables indicating the type of bridging structures that will be used; ▪ The location of sensitive environmental features on site e.g., CBAs, heritage sites, wetlands, drainage lines etc. that will be affected by the facility and its associated infrastructure; ▪ Substation(s) and/or transformer(s) sites including their entire footprint; ▪ Location of access and service roads; ▪ All existing infrastructure on the site, especially railway lines and roads; ▪ Buffer areas; ▪ Buildings, including accommodation; and ▪ All "no-go" areas.	Based on the findings of the specialist studies the layout of the PV project was revised to cater for environmental sensitivity (refer to **Section 12** below). The combined sensitivity maps for the project are presented in **Section 16**.
(c) An environmental sensitivity map indicating environmental sensitive areas and features identified during the assessment process.	Sensitivity maps, based on the findings of the specialist studies, are presented in **Section 12** below. The combined sensitivity maps are presented in **Section 16** below.
(d) A map combining the final layout map superimposed (overlain) on the environmental sensitivity map.	
(iv) Specialist assessments	
(a) The EAP must ensure that the terms of reference for all the identified specialist studies must include the following: ▪ A detailed description of the study's methodology; indication of the locations and descriptions of the development footprint, and all other associated infrastructures that they have assessed and are recommending for authorisations. ▪ Provide a detailed description of all limitations to the studies. All specialist studies must be conducted in the right season and providing that as a limitation will not be allowed. ▪ Please note that the Department considers a 'no-go' area, as an area where no development of any infrastructure is allowed; therefore, no development of associated	Provision was made in the terms of reference for the specialist studies to cater for these requirements. Potential cumulative impacts associated with the Project are discussed in **Section 13.28** below. The specialists did not provide contradicting recommendations.

DFFE's Requirements	Response/Status
infrastructure including access roads is allowed in the `no-go' areas. ▪ Should the specialist definition of 'no-go' area differ from the Departments definition; this must be clearly indicated. The specialist must also indicate the 'no-go' area's buffer if applicable. ▪ All specialist studies must be final, and provide detailed/practical mitigation measures for the preferred alternative and recommendations, and must not recommend further studies to be completed post EA. ▪ Should a specialist recommend specific mitigation measures, these must be clearly indicated. ▪ Regarding cumulative impacts: o Clearly defined cumulative impacts and where possible the size of the identified impact must be quantified and indicated, i.e., hectares of cumulatively transformed land. o A detailed process flow to indicate how the specialist's recommendations, mitigation measures and conclusions from the various similar developments in the area were taken into consideration in the assessment of cumulative impacts and when the conclusion and mitigation measures were drafted for this project. o Identified cumulative impacts associated with the proposed development must be rated with the significance rating methodology used in the process. o The significance rating must also inform the need and desirability of the proposed development. o A cumulative impact environmental statement on whether the proposed development must proceed. ▪ Should the appointed specialists specify contradicting recommendations, the EAP must clearly indicate the most reasonable recommendation and substantiate this with defendable reasons; and were necessary, include further expertise advice.	
(b) The following Specialist Assessments will form part of the EIAr: ▪ Terrestrial Ecological Impact Assessment; ▪ Aquatic Impact Assessment & Delineation ▪ Avifaunal Impact Assessment; ▪ Heritage Impact Assessment; ▪ Agricultural Impact Assessment; ▪ Social Impact Assessment; ▪ Visual Impact Assessment; and ▪ Desktop Palaeontological Impact Assessment.	Refer to the findings from these specialist studies contained in **Section 12** and **Section 13** below.
(c) It is further brought to your attention that Procedures for the Assessment and Minimum Criteria for Reporting on identified Environmental Themes in terms of Sections 24(5)(a) and (h) and 44 of the National Environmental Management Act, 1998, when applying for Environmental Authorisation, which were promulgated in Government Notice No. 320 of 20 March 2020 (i.e. "the Protocols"), and in Government Notice No. 1150 of 30 October 2020 (i.e. protocols for terrestrial plant and animal species), have come into effect. Please note that specialist assessments must be conducted in accordance with these protocols.	When specialists are appointed, their terms of reference include that they needed to be compliant with protocols which is how they have undertaken the assessment.
(d) The screening tool output: ▪ The screening tool and the gazetted protocols (GN R320 of 20 March 2020 and GN R 1150 of 30 October 2020) require a site sensitivity verification to be completed to either confirm or dispute the findings and sensitivity ratings of the screening tool. ▪ It is the responsibility of the EAP to confirm the list of specialist assessments and to motivate in the assessment	The verification of site sensitivity, based on the Screening Tool, was undertaken by the relevant specialists. Refer to **Section 12** below for the findings from the specialists in this regard.

DFFE's Requirements	Response/Status
report, the reason for not including any of the identified specialist studies including the provision of photographic evidence of the site situation. The site sensitivity verification for each of the recommended studies, as per the protocols, must be compiled and attached.	
(e) An applicant intending to undertake an activity identified in the scope of this protocol, on a site identified on the screening tool as being of "very high sensitivity" for terrestrial biodiversity, must submit a Terrestrial Biodiversity Specialist Assessment.'' If the findings of the site verification differed from the screening tool and was found to be of a different sensitivity level, then a compliance statement would be accepted.	The findings of the Terrestrial Biodiversity Compliance Statement are provided in **Section 12.4.** below.
(f) Site sensitivity verifications for all the identified specialist studies (according to the screening tool) must be provided.	The verification of site sensitivity, based on the Screening Tool, was undertaken by the relevant specialists. Refer to **Section 12** below for the findings from the specialists in this regard.
(g) Additionally, the protocols specify that an assessment must be prepared by a specialist who is an expert in the field and is SACNASP registered for e.g. an aquatic assessment must be prepared by a specialist registered with SACNASP, with expertise in the field of aquatics sciences.	All assessments have been undertaken by suitably registered SACNASP registered scientists.
(h) Should the appointed specialists specify contradicting recommendations, the EAP must clearly indicate the most reasonable recommendation and substantiate this with defendable reasons; and were necessary, include further expertise advice.	The specialists did not provide contradicting recommendations.
(i) Please include a table that shows the proposed studies and the relevant specialists carrying out the study. In addition, a summary should be included of the specialist's recommendations in terms of the alternatives that are preferred based on the findings of their study.	A table is included for every assessment conducted containing the relevant studies and appointed specialists. Specialist recommendations are contained in **Section 12** and **Section 13**.
General	
(a) The applicant is hereby reminded to comply with the requirements of Regulation 45 of GN R982 of 04 December 2014, as amendment, regarding the time allowed for complying with the requirements of the Regulations.	The requirements were adhered to by the Applicant.
(b) You are hereby reminded of Section 24F of the National Environmental Management Act, Act No. 107 of 1998, as amended, that no activity may commence prior to an environmental authorisation being granted by the Department.	

6.7.2 Comments on Draft EIA Report

The manner in which DFFE's comments on the draft EIA Report have been attended to are described in **Table 11** below.

Table 11: DFFE's Comments on draft EIA Report

DFFE's Requirements	Response/Status
(1) Specific comments	
(a) If the activities applied for in the application form differ from those mentioned in the final EIAR, an amended application form must be submitted with the final EIAR. Ensure to include thresholds of the infrastructure.	The listed activities contained in **Table 6** and **Table 7** above are the same as those contained in the Application Form.
(b) Provide a separate appendix which includes the GPS coordinates, affected properties and SG codes of the preferred alternative. When providing coordinates as part of the information submitted regarding the location of an activity as	A separate appendix will be included in the final EIAR which provide the GPS coordinates, affected properties and SG codes of the preferred alternative.

DFFE's Requirements	Response/Status
part of an application for environmental authorisation, such coordinates must be provided in degrees, minutes and seconds using the Hartebeesthoek WGS84 coordinate system as per regulation 5(6) of the NEMA EIA Regulations, 2014, as amended.	
(2) Undertaking of an Oath	
(a) Please note that the final EIAR must have an undertaking under oath/ affirmation by the EAP.	Refer to **Appendix I** for the Oath of Environmental Assessment Practitioner.
(b) Based on the above, you are therefore required to include an undertaking under oath or affirmation by the EAP (administered by a Commissioner of Oaths) as per Appendix 3 of the NEMA EIA Regulations, 2014, as amended, which states that the EIAR must include: i. An undertaking under oath or affirmation by the EAP in relation to: ii. The correctness of the information provided in the reports; iii. The inclusion of comments and inputs from stakeholders and I&APs; iv. The inclusion of inputs and recommendations from the specialist reports where relevant; and v. Any information provided by the EAP to interested and affected parties and any responses by the EAP to comments or inputs made by interested and affected parties.	Refer to **Appendix I** for the Oath of Environmental Assessment Practitioner.
(3) Environmental Management Programme	
(a) The EMPr must include the following: i. All recommendations and mitigation measures recorded in the final EIAR and the specialist studies conducted. ii. An environmental sensitivity map indicating environmental sensitive areas and features identified during the assessment process. iii. Measures to protect hydrological features such as streams, rivers, pans, wetlands, dams and their catchments, and other environmental sensitive areas from construction impacts including the direct or indirect spillage of pollutants. iv. In addition to the above, the EMPr must comply with Appendix 4 of the EIA Regulations, 2014, as amended.	The following EMPr's were developed for the Project: • Generic EMPr for the development and expansion for overhead electricity transmission and distribution infrastructure; • Generic EMPr for the development and expansion of substation infrastructure for the transmission and distribution of electricity; and • EMPr for the Solar PV plant. The EMPr for the PV Site contains the recommendations and mitigation measures recorded in the final EIA Report and in the specialist studies. The EMPr's (PV Site, Power Line and Substation) include environmental sensitivity maps. The EMPr's (PV Site, Power Line and Substation) include mitigation measures to safeguard watercourses and other environmentally sensitive areas. The document roadmap in Section 2 of the EMPr for the PV Site presents the document's composition in terms of Appendix 4 of the EIA Regulations.
(b) Section 2 of the generic EMPr states: *This section must be submitted to the CA together with the final BAR or EIAR. The information submitted to the CA will be incomplete should a signed copy of Part B: section 2 not be submitted. Once approved, this Section forms part of the EMPr for the development and is legally binding.* Please ensure a signed generic EMPr's (for the powerline and substation) are submitted with the final EIAR	Signed generic EMPrs (for the powerline and substation) will be submitted with the final EIAR.

General	
Please also ensure that the final EIAR includes the period for which the Environmental Authorisation is required and the date on which the activity will be concluded as per Appendix 3 of the NEMA EIA Regulations, 2014, as amended.	Refer to the Implementation Programme in **Section 9.6** below.
You are further reminded to comply with Regulation 23(1)(a) of the NEMA EIA Regulations, 2014, as amended, which states that: "The applicant must within 106 days of the acceptance of the scoping report submit to the competent authority - (a) an environmental impact assessment report inclusive of any specialist reports, an EMPr, a closure plan in the case of a closure activity and where the application is a mining application, the plans, report and calculations contemplated in the Financial Provisioning Regulations, which must have been subjected to a public participation process of at least 30 days and which reflects the incorporation of comments received, including any comments of the competent authority."	A notification in terms of Regulation 23(1)(b) was submitted to the Competent Authority to indicate that the Final EIA Report will be submitted within 156 days of the acceptance of the Scoping Report. The notification was provided to accommodate the inclusion of a TIA for the project in the EIA Report that was requested by the FS DPRT.
Should there be significant changes or new information that has been added to the EIAR or EMPr which changes or information was not contained in the reports or plans consulted on during the initial public participation process, you are required to comply with Regulation 23(1)(b) of the NEMA EIA Regulations, 2014, as amended, which states: "The applicant must within 106 days of the acceptance of the scoping report submit to the competent authority – (b) a notification in writing that the documents contemplated in sub-regulation 1(a) will be submitted within 156 days of acceptance of the scoping report by the competent authority or where regulation 21(2) applies, within 156 days of receipt of the application by the competent authority, as significant changes have been made or significant new information has been added to the documents, which changes or information was not contained in the original documents consulted on during the initial public participation process contemplated in sub-regulation (1)(a), and that the revised documents contemplated in sub-regulation 1(a) will be subjected to another public participation process of at least 30 days"	A notification in terms of Regulation 23(1)(b) was submitted to the Competent Authority to indicate that the Final EIA Report will be submitted within 156 days of the acceptance of the Scoping Report. The notification was provided to accommodate the inclusion of a TIA for the project in the EIA Report that was requested by the FS DPRT.
Should you fail to meet any of the timeframes stipulated in Regulation 23 of the NEMA EIA Regulations, 2014, as amended, your application will lapse.	The regulated timeframes will be adhered to.
You are hereby reminded of Section 24F of the National Environmental Management Act, Act No. 107 of 1998, as amended, that no activity may commence prior to an Environmental Authorisation being granted by the Department.	The Applicant is to comply with this legal requirement.

6.8 Other Applications in Project Area

DFFE has created the SA Renewable Energy EIA Application (REEA) Database, which contains spatial data for renewable energy applications for Environmental Authorisation. It includes spatial and attribute information for both active (in process and with valid authorisations) and non-active (lapsed or replaced by amendments) applications.

According to the REEA Database, no renewable energy applications have been made for properties that are located within a 30km radius of the PV Site (refer to **Figure 6** below). The closest renewable energy applications are located approximately 50km northwest and northeast of the proposed site, which include the following:

1. 20 MW Solar PV facility within Tlokwe Local Municipality (application 12/12/20/2629), (status: Approved); and

2. 75 MW Solar PV facility at the Lethabo Power Station, Free State Province (application 14/12/16/3/3/2/753), (status: Approved).

The cumulative impact of renewable energy applications within 30 km will thus not be considered further in this report.

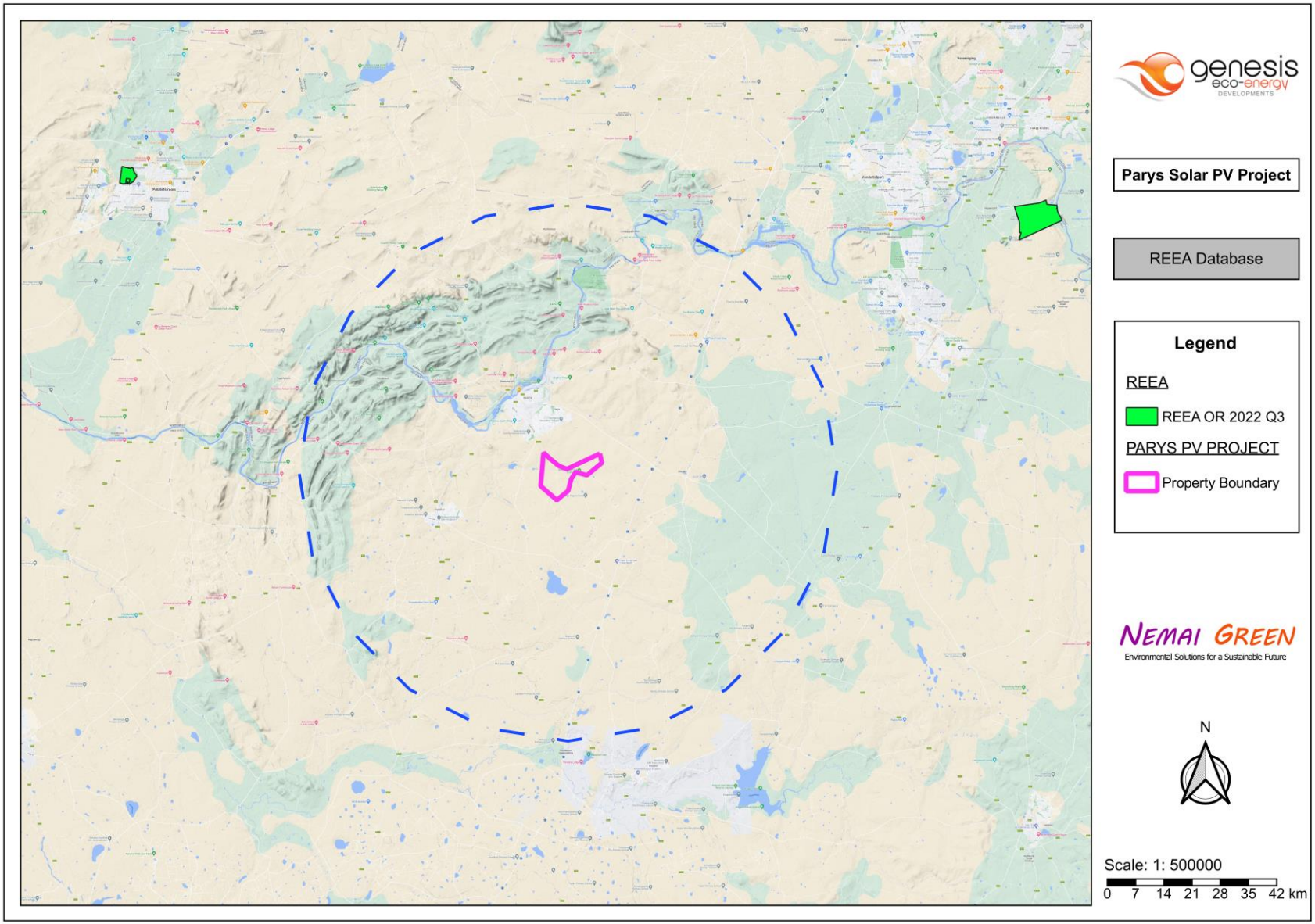


Figure 6: **Renewable energy applications in relation to the project (within a 30km radius)**

7 ASSUMPTIONS AND LIMITATIONS

The following assumptions and limitations accompany the EIA process:

- As the design of the project components is still in feasibility stage, and due to the dynamic nature of the planning environment, the dimensions and layout of the infrastructure may change during the detailed design phase.
- Regardless of the analytical and predictive method employed to determine the potential impacts associated with the Project, the impacts are only predicted on a probability basis. The accuracy of the predictions is largely dependent on the availability of environmental data and the degree of understanding of the environmental features and their related attributes.
- Agricultural Impact Assessment:
  - Land Uses - The impact assessment is done for land that will be included into the development boundary. All the land is used for animal grazing at present.
  - Land Use Potential Classes
    - High potential land is defined in CARA as follows: Land best suited to, and capable of consistently producing acceptable levels of goods and services for a wide range of agricultural enterprises in a sustainable manner, taking into consideration expenditure of energy and economic resources. It includes:
      - Land Capability Classes i, ii and iii;
      - Unique agricultural land;
      - Irrigated land; and
      - Land suitable for irrigation (deep well-drained soils - assuming irrigation water is available). There is no irrigation water available, hence, this does not apply.
- Avifaunal Impact Assessment:
  - Access was only arranged for survey work within the project area; and
  - To date only a single season (late summer) survey has been completed.
- Phase 1 Cultural Heritage Impact Assessment:
  - It is assumed that the description of the proposed project, provided by the client, is accurate;
  - It is assumed that the public consultation process undertaken as part of the Scoping and EIA process is sufficient and that it does not have to be repeated as part of the HIA;
  - It is assumed that the information contained in existing databases, reports and publications is correct;
  - The unpredictability of buried archaeological remains;
  - No subsurface investigation (i.e. excavations or sampling) were undertaken, since a permit from SAHRA is required for such activities; and
  - The vegetation cover encountered during a site visit can have serious limitations on ground visibility, obscuring features (artefacts, structures) that might be an indication of human settlement.

- Palaeontological Desktop Assessment:
  - The focal point of geological maps is the geology of the area, and the sheet explanations were not meant to focus on palaeontological heritage. Many inaccessible regions of South Africa have not been reviewed by palaeontologists and data is generally based on aerial photographs. Locality and geological information of museums and universities databases have not been kept up to date or data collected in the past have not always been accurately documented.
  - Comparable Assemblage Zones in other areas is used to provide information on the existence of fossils in an area which was not yet been documented. When similar Assemblage Zones and geological formations for Desktop studies is used it is generally assumed that exposed fossil heritage is present within the footprint.
- Aquatic Impact Assessment and Delineation:
  - Fieldwork and consequently the results of this assessment were limited to the area for which access was made possible.
  - The GPS used for water resource delineations is accurate to within five meters. Therefore, the wetland delineation plotted digitally may be offset by at least five meters to either side
  - All information provided by the client was taken as both truthful and correct.
- Terrestrial Ecological Impact Assessment:
  - The assessment area was based on the area provided by the client and any alterations to the route and/or missing GIS information pertaining to the assessment area would have affected the area surveyed.
  - The area was only surveyed during a single site visit and therefore, this assessment does not consider temporal trends, however sufficient to derive meaningful baseline.
  - Only a single season survey was conducted for the respective studies, this would constitute a dry season survey. However, owing to the very low to low sensitivity of the terrestrial habitats this is not considered to be a notable limitation, with limit benefit being achieved from a wet season survey in comparison.
  - Flora identification is limited due to the lack of aboveground plant parts used to determine species, especially in regard to bulbous plants, the vegetation was dry, and most plants had already lost the green flush.
  - A separate avifauna assessment has been compiled.
  - The layout of the proposed project was provided after completion of the report and the mitigation measures were updated accordingly.
  - Whilst every effort is made to cover as much of the site as possible, representative sampling is completed and by its nature, it is possible that some plant and animal species that are present on site were not recorded during the field investigations.
- Visual Impact Assessment:
  - The core study area for the visual assessment can be defined as an area with a radius of not more than 10 km from the structures and a total study area with a radius of 15 km from the structures. This is because the visual impact of structures beyond a distance

of 10 km would be so reduced that it can be considered negligible even if there is direct line of sight.

- It is assumed that there are no alternative locations for the structures and that the assessment, therefore, assessed only the proposed site.
- The assessment was undertaken during the planning stage of the project and is based on the information available at that time.
- The heights were assumed for the proposed infrastructure for which heights were not available at the time of the study.
- Only the infrastructure expected to cause the most visual impact was included in the visual analysis.
- Visual perception is by nature a subjective experience, as it is influenced largely by personal values. For instance, what one viewer experiences as an intrusion in the landscape, another may regard as positive. Such differences in perception are greatly influenced by culture, education and socio-economic background. A degree of subjectivity is therefore bound to influence the rating of visual impacts. In order to limit such subjectivity, a combination of quantitative and qualitative assessment methods were used. A high degree of reliance has been placed on GIS-based analysis viewsheds, visibility analyses and on making transparent assumptions and value judgements, where such assumptions or judgements are necessary.
- The results generated in GIS cannot be guaranteed as 100% accurate. Some viewpoints, which are indicated on the viewshed as being inside of the viewshed, can be outside of the viewshed. This is due to the change of the natural environment by surrounding activities as well as natural vegetation that play a significant role and can have a positive or negative influence on the viewshed.
- The modelling of visibility is merely conceptual. Being based on the ALOS DSM and land cover data, it does not fully take into account the real-world effect of buildings, trees etc. that could shield the structures from being visible or could have changed over time. The viewshed analysis therefore signifies a worst-case scenario.
- Only the major infrastructure (in terms of height and area) were included in the visual analysis and not the proposed ancillary infrastructure. The expected visual impact of the ancillary infrastructure is generally less significant than the expected visual impact of the proposed PV Panels, substations and powerlines. However, the ancillary infrastructure may contribute to the cumulative expected visual of the proposed project therefore, the expected visual impacts of the proposed ancillary infrastructure is addressed in the Impact Assessment.
- A Glint and Glare Impact Assessment did not form part of the scope of work.

❑ Socio-Economic Impact Assessment:

- The information obtained during the public participation phase provides a comprehensive account for the community structure and community concerns for the project.
- The study was done with the information and the time frames available to the specialist at the time of executing the study. The specialist took an evidence-based approach in

the compilation of this report and did not intentionally exclude information which is relevant to the assessment.

- No relocation of families will take place for this project.

❑ Traffic Impact Assessment:

- This study is based on the project information provided by the client as available at commencement of the Scoping Phase.
- According to the Eskom Specifications for Power Transformers (Eskom Power Series, Volume 5: Theory, Design, Maintenance and Life Management of Power Transformers), the following dimensional limitations need to be kept when transporting the transformer – total maximum height 5 000 mm, total maximum width 4 300 mm and total maximum length 10 500 mm. It is envisaged that for this project the inverter, transformer, and switchgear will be transported to site in containers on a low bed truck and trailer. The transport of a mobile crane and the transformer are the only abnormal loads envisaged. The crane will be utilised for offloading equipment, such as the transformer.
- Maximum vertical height clearances along the haulage route are 5.2 m for abnormal loads.
- If any elements are manufactured within South Africa, these will be transported from their respective manufacturing centres, which would be either in the greater Cape Town area, Johannesburg, or possibly in Pinetown/Durban.
- All haulage trips will occur on either surfaced national and provincial roads or existing gravel roads.
- Material for the construction of internal access roads will be sourced locally as far as possible.
- The final access points are to be determined during the detailed design stage. Only recommended access points at conceptual level can be given at this stage.
- An 18-months construction period is assumed with some of the construction period dedicated to site prep and civil works.

8 NEED AND DESIRABILITY

This section serves to expand on the motivation for the proposed Project that is provided in **Section 3** above. The format contained in the Guideline on Need and Desirability (DEA, 2017) was used in **Table 12** below.

Table 12: Need for and desirability of the proposed Project

Question No.	Response
1. How will this development (and its separate elements/aspects) impact on the ecological integrity of the area? *1.1. How were the following ecological integrity considerations taken into account?:* *1.1.1. Threatened Ecosystems.* *1.1.2. Sensitive, vulnerable, highly dynamic or stressed ecosystems, such as coastal shores, estuaries, wetlands, and similar systems require specific attention in management and planning procedures, especially where they are subject to significant human resource usage and development pressure.* *1.1.3. Critical Biodiversity Areas ("CBAs") and Ecological Support Areas ("ESAs").* *1.1.4. Conservation targets.* *1.1.5. Ecological drivers of the ecosystem.* *1.1.6. Environmental Management Framework.* *1.1.7. Spatial Development Framework.* *1.1.8. Global and international responsibilities relating to the environment (e.g. RAMSAR sites, Climate Change, etc.).*	The following specialist studies were undertaken to assess the impacts of the Project on the ecological integrity of the area: ▪ Aquatic Assessment; ▪ Terrestrial Ecological Assessment; and ▪ Avifaunal Assessment. The findings of the above studies are presented in the EIA Report. Management objectives are included in the EIA Report and EMPr to safeguard the sensitive ecological features.
1.2. How will this development disturb or enhance ecosystems and/or result in the loss or protection of biological diversity? What measures were explored to firstly avoid these negative impacts, and where these negative impacts could not be avoided altogether, what measures were explored to minimise and remedy (including offsetting) the impacts? What measures were explored to enhance positive impacts?	Potential disturbances to ecosystems may include the following: ▪ Clearance of large areas of indigenous vegetation associated with the construction footprint of the PV and BESS Site and associated infrastructure; ▪ Potential loss of sensitive environmental features; ▪ Pollution of water resources; ▪ Soil destabilisation and subsequent erosion; and ▪ Proliferation of alien and invasive species. The following specialist studies were undertaken to assess the impacts of the Project on the ecological integrity of the area: ▪ Aquatic Assessment; ▪ Terrestrial Ecological Assessment; and ▪ Avifaunal Assessment. The findings of the above studies are presented in the EIA Report. Mitigation measures are included in the EIA Report and EMPr to disturbances to ecosystems, according to the mitigation hierarchy.
1.3. How will this development pollute and/or degrade the biophysical environment? What measures were explored to firstly avoid these impacts, and where impacts could not be avoided altogether, what measures were explored to minimise and remedy	The Project may cause surface water, groundwater, soil, air, noise and light pollution during the construction and operational phases.

Question No.	Response
(including offsetting) the impacts? What measures were explored to enhance positive impacts?	The above impacts were assessed during the EIA Phase. Mitigation measures are included in the EIA Report and EMPr to manage these impacts.
1.4. What waste will be generated by this development? What measures were explored to firstly avoid waste, and where waste could not be avoided altogether, what measures were explored to minimise, reuse and/or recycle the waste? What measures have been explored to safely treat and/or dispose of unavoidable waste?	The waste to be generated by the Project includes the following: ▪ Construction – o Waste generated from site preparations (e.g. plant material), domestic waste, surplus and used building material, and hazardous waste (e.g. chemicals, oils, soil contaminated by spillages, diesel rags). Solid waste generated during the construction phase will be temporarily stored at suitable locations (e.g. at the construction camp) and will be removed at regular intervals and disposed of at approved waste disposal sites. All the waste disposed of will be recorded. o Wastewater will include sewage, water used for washing purposes and drainage over contaminated areas. ▪ Operation – o Refuse (domestic waste) generated during the operational phase will be removed on a weekly basis and will be disposed of at a permitted waste disposal facility. Mitigation measures to manage all waste and wastewater generated during the construction and operational phases are included in the EMPr.
1.5. How will this development disturb or enhance landscapes and/or sites that constitute the nation's cultural heritage? What measures were explored to firstly avoid these impacts, and where impacts could not be avoided altogether, what measures were explored to minimise and remedy (including offsetting) the impacts? What measures were explored to enhance positive impacts?	Potential disturbances to cultural heritage may include the following: ▪ Possible direct impacts to graves, heritage resources and on below-ground archaeological deposits and fossils as a result of ground disturbance. ▪ Possible impacts to the cultural landscape as a result of the introduction of incompatible structures and infrastructure to the rural landscape A Heritage Impact Assessment was undertaken during the EIA Phase and the findings are presented in the EIA Report.
1.6. How will this development use and/or impact on non-renewable natural resources? What measures were explored to ensure responsible and equitable use of the resources? How have the consequences of the depletion of the non-renewable natural resources been considered? What measures were explored to firstly avoid these impacts, and where impacts could not be avoided altogether, what measures were explored to minimise and remedy (including offsetting) the impacts? What measures were explored to enhance positive impacts?	During the construction phase electricity will be obtained from diesel generators and / or temporary supply via cables from the site power grid. No alternative energy sources were considered for the generation of electricity. During the operational phase electricity will be sourced from this renewable energy-generation facility itself and/or from the existing electrical infrastructure on the property.
1.7. How will this development use and/or impact on renewable natural resources and the ecosystem of which they are part? Will the use of the resources and/or impact on the ecosystem jeopardise the integrity of the resource and/or system taking into account carrying capacity restrictions, limits of acceptable change, and thresholds? What measures were explored to firstly avoid the use of resources, or if avoidance is not possible, to minimise the use of resources? What measures were taken to ensure responsible and equitable use of the resources? What measures were explored to enhance positive impacts?	The Solar PV Plant proposes to generate electricity from a renewable source. The total generation capacity of the Project will be 200MW renewable solar energy. Impacts to the receiving environment were assessed during the EIA Phase and are presented in the EIA Report. Opportunity costs are associated with the net benefits forgone for the development alternative. This was assessed further during the EIA Phase.

Question No.	Response
1.7.1. Does the proposed development exacerbate the increased dependency on increased use of resources to maintain economic growth or does it reduce resource dependency (i.e. de-materialised growth)? (note: sustainability requires that settlements reduce their ecological footprint by using less material and energy demands and reduce the amount of waste they generate, without compromising their quest to improve their quality of life). *1.7.2. Does the proposed use of natural resources constitute the best use thereof? Is the use justifiable when considering intra- and intergenerational equity, and are there more important priorities for which the resources should be used (i.e. what are the opportunity costs of using these resources this the proposed development alternative?)* *1.7.3. Do the proposed location, type and scale of development promote a reduced dependency on resources?*	
1.8. How were a risk-averse and cautious approach applied in terms of ecological impacts? *1.8.1. What are the limits of current knowledge (note: the gaps, uncertainties and assumptions must be clearly stated)?* *1.8.2. What is the level of risk associated with the limits of current knowledge?* *1.8.3. Based on the limits of knowledge and the level of risk, how and to what extent was a risk-averse and cautious approach applied to the development?*	The following specialist studies were undertaken to assess the impacts of the Project on the ecological integrity of the area: ▪ Aquatic Assessment; ▪ Terrestrial Ecological Assessment; and ▪ Avifaunal Assessment. The findings of the above studies are presented in the EIA Report.
1.9. How will the ecological impacts resulting from this development impact on people's environmental right in terms following: *1.9.1. Negative impacts: e.g. access to resources, opportunity costs, loss of amenity (e.g. open space), air and water quality impacts, nuisance (noise, odour, etc.), health impacts, visual impacts, etc. What measures were taken to firstly avoid negative impacts, but if avoidance is not possible, to minimise, manage and remedy negative impacts?* *1.9.2. Positive impacts: e.g. improved access to resources, improved amenity, improved air or water quality, etc. What measures were taken to enhance positive impacts?*	Potential impacts to the social environment include the following: ▪ Construction phase – o Influx of people seeking employment and associated impacts (e.g. foreign workforce, cultural conflicts, squatting, demographic changes) o Safety and security o Use of local road network o Nuisance from dust and noise o Consideration of local labourers and suppliers in area – stimulation of local economy (positive impact) o Transfer of skills (positive impact) ▪ Operational phase – o Direct and indirect economic opportunities as a result of the Project. o Threats to human and animal health from electromagnetic field. A Social Impact Assessment was undertaken during the EIA Phase and the findings are presented in the EIA Report. Mitigation measures to manage impacts to the social environment are included in the EMPr.
1.10. Describe the linkages and dependencies between human wellbeing, livelihoods and ecosystem services applicable to the area in question and how the development's ecological impacts will result in socio-economic impacts (e.g. on livelihoods, loss of heritage site, opportunity costs, etc.)?	The areas affected by the proposed Project footprint are rural in nature. The Project is located approximately 6km southeast of the town of Parys. The PV is currently used for agriculture purposes, which was assessed further as part of the Agricultural Impact Assessment.
1.11. Based on all of the above, how will this development positively or negatively impact on	Refer to the response to question no. 1 above.

Question No.	Response
ecological integrity objectives/targets/considerations of the area?	
1.12. Considering the need to secure ecological integrity and a healthy biophysical environment, describe how the alternatives identified (in terms of all the different elements of the development and all the different impacts being proposed), resulted in the selection of the "best practicable environmental option" in terms of ecological considerations?	There were no site alternatives considered. The layout was assessed by the respective specialists during the EIA Phase and was adjusted to avoid sensitive features, as necessary. Options under consideration are presented in **Section 10** below. The BPEO was identified in the EIA Report, taking into consideration of the specialists' findings.
1.13. Describe the positive and negative cumulative ecological/biophysical impacts bearing in mind the size, scale, scope and nature of the project in relation to its location and existing and other planned developments in the area?	No other renewable energy applications have been made within a 30km radius of the PV Site, according to DFFE's REEA Database, are discussed in **Section 6.8** above. Cumulative impacts are discussed in **Section 13.28** below.
2.1. What is the socio-economic context of the area, based on, amongst other considerations, the following considerations?: *2.1.1. The IDP (and its sector plans' vision, objectives, strategies, indicators and targets) and any other strategic plans, frameworks of policies applicable to the area,* *2.1.2. Spatial priorities and desired spatial patterns (e.g. need for integrated of segregated communities, need to upgrade informal settlements, need for densification, etc.),* *2.1.3. Spatial characteristics (e.g. existing land uses, planned land uses, cultural landscapes, etc.), and* *2.1.4. Municipal Economic Development Strategy ("LED Strategy").*	The socio-economic environment is discussed in **Section 11.8** below. One of the opportunities identified for the Local Municipality through the IDP is PV energy generation. The Parys area is largely an agricultural and tourism area. An SDF and LED could not be located for the area.
2.2. Considering the socio-economic context, what will the socio-economic impacts be of the development (and its separate elements/aspects), and specifically also on the socio-economic objectives of the area? *2.2.1. Will the development complement the local socio-economic initiatives (such as local economic development (LED) initiatives), or skills development programs?*	Refer to the response to question no. 1.9 above.
2.3. How will this development address the specific physical, psychological, developmental, cultural and social needs and interests of the relevant communities?	
2.4. Will the development result in equitable (intra- and inter-generational) impact distribution, in the short- and long-term? Will the impact be socially and economically sustainable in the short- and long-term?	
2.5. In terms of location, describe how the placement of the proposed development will: *2.5.1. result in the creation of residential and employment opportunities in close proximity to or integrated with each other,* *2.5.2. reduce the need for transport of people and goods,* *2.5.3. result in access to public transport or enable non-motorised and pedestrian transport (e.g. will the development result in densification and the achievement of thresholds in terms public transport),* *2.5.4. compliment other uses in the area,* *2.5.5. be in line with the planning for the area,* *2.5.6. for urban related development, make use of underutilised land available with the urban edge,*	2.5.1. The Project will result in increased economic activity, as well as increased opportunities for employment and for SMMEs. 2.5.2. Not deemed to be relevant, due to the nature of the development. 2.5.3. Not deemed to be relevant, due to the nature of the development. 2.5.4. Impacts on surrounding land uses were assessed as part of the Agricultural Impact Assessment, Social Impact Assessment and Visual Impact Assessment (amongst others). 2.5.5. Refer to the response to question no. 2.1 regarding planning.

Question No.	Response
2.5.7. optimise the use of existing resources and infrastructure, *2.5.8. opportunity costs in terms of bulk infrastructure expansions in non-priority areas (e.g. not aligned with the bulk infrastructure planning for the settlement that reflects the spatial reconstruction priorities of the settlement),* *2.5.9. discourage "urban sprawl" and contribute to compaction/densification,* *2.5.10. contribute to the correction of the historically distorted spatial patterns of settlements and to the optimum use of existing infrastructure in excess of current needs,* *2.5.11. encourage environmentally sustainable land development practices and processes,* *2.5.12. take into account special locational factors that might favour the specific location (e.g. the location of a strategic mineral resource, access to the port, access to rail, etc.),* *2.5.13. the investment in the settlement or area in question will generate the highest socio-economic returns (i.e. an area with high economic potential),* *2.5.14. impact on the sense of history, sense of place and heritage of the area and the socio-cultural and cultural-historic characteristics and sensitivities of the area, and* *2.5.15. in terms of the nature, scale and location of the development promote or act as a catalyst to create a more integrated settlement?*	2.5.6. The PV Site and power line are located outside of the urban edge and should not impact on future urban expansion. 2.5.7. The resources and services required for construction and operation are discussed in **Section 9.8** below. 2.5.8. The Project does not include the expansion of any bulk infrastructure. 2.5.9. Not deemed to be relevant, due to the nature of the development. 2.5.10. Not deemed to be relevant, due to the nature of the development. 2.5.11. Provision will be made in the EMPr to manage the impacts associated with the Project. 2.5.12. Locational factors that favour the proposed site include the favourable solar irradiation levels, short distance to grid connection point, flat topography, suitable site access and availability of land. 2.5.13. The socio-economic benefits associated with the Project are identified in the EIA Report. 2.5.14. Refer to the response to question no. 1.5 above. 2.5.15. Refer to the response to question no. 2.1 above regarding planning.
2.6. How were a risk-averse and cautious approach applied in terms of socio-economic impacts? *2.6.1. What are the limits of current knowledge (note: the gaps, uncertainties and assumptions must be clearly stated)?* *2.6.2. What is the level of risk (note: related to inequality, social fabric, livelihoods, vulnerable communities, critical resources, economic vulnerability and sustainability) associated with the limits of current knowledge?* *2.6.3. Based on the limits of knowledge and the level of risk, how and to what extent was a risk-averse and cautious approach applied to the development?*	The findings of the Social Impact Assessment are included in the EIA Report.
2.7. How will the socio-economic impacts resulting from this development impact on people's environmental right in terms following: *2.7.1. Negative impacts: e.g. health (e.g. HIV-Aids), safety, social ills, etc. What measures were taken to firstly avoid negative impacts, but if avoidance is not possible, to minimise, manage and remedy negative impacts?* *2.7.2. Positive impacts. What measures were taken to enhance positive impacts?*	Refer to the responses to questions no. 1.9 and 2.1 above. These impacts were assessed as part of the Agricultural Impact Assessment, Social Impact Assessment and Visual Impact Assessment (amongst others).
2.8. Considering the linkages and dependencies between human wellbeing, livelihoods and ecosystem services, describe the linkages and dependencies applicable to the area in question and how the development's socio-economic impacts will result in ecological impacts (e.g. over utilisation of natural resources, etc.)?	Refer to the responses to questions no. 1.7 and 1.10 above.
2.9. What measures were taken to pursue the selection of the "best practicable environmental option" in terms of socio-economic considerations?	The BPEO was identified in the EIA Report, taking into consideration of the specialists' findings.
2.10. What measures were taken to pursue environmental justice so that adverse environmental	

Question No.	Response
impacts shall not be distributed in such a manner as to unfairly discriminate against any person, particularly vulnerable and disadvantaged persons (who are the beneficiaries and is the development located appropriately)? *Considering the need for social equity and justice, do the alternatives identified, allow the "best practicable environmental option" to be selected, or is there a need for other alternatives to be considered?*	
2.11. What measures were taken to pursue equitable access to environmental resources, benefits and services to meet basic human needs and ensure human wellbeing, and what special measures were taken to ensure access thereto by categories of persons disadvantaged by unfair discrimination?	The areas affected by the proposed Project footprint are rural in nature. The PV Site is vacant. Consent has been provided by the landowner for the proposed development.
2.12. What measures were taken to ensure that the responsibility for the environmental health and safety consequences of the development has been addressed throughout the development's life cycle?	The findings of the Social Impact Assessment are included in the EIA Report. Mitigation measures to manage these impacts are included in the EMPr. Also refer to the response to question no. 1.9 above.
2.13. What measures were taken to: *2.13.1. ensure the participation of all interested and affected parties,* *2.13.2. provide all people with an opportunity to develop the understanding, skills and capacity necessary for achieving equitable and effective participation,* *2.13.3. ensure participation by vulnerable and disadvantaged persons,* *2.13.4. promote community wellbeing and empowerment through environmental education, the raising of environmental awareness, the sharing of knowledge and experience and other appropriate means,* *2.13.5. ensure openness and transparency, and access to information in terms of the process,* *2.13.6. ensure that the interests, needs and values of all interested and affected parties were taken into account, and that adequate recognition were given to all forms of knowledge, including traditional and ordinary knowledge, and* *2.13.7. ensure that the vital role of women and youth in environmental management and development were recognised and their full participation therein were be promoted?*	**Section 15** below provides an overview of the public participation process to date, which includes the following: ▪ Public Participation during the Announcement and Scoping Phases; ▪ Maintenance of the database of I&APs; ▪ Period to review the draft EIA Report; ▪ Notification of review of the draft EIA Report; ▪ Means of accessing the draft EIA Report; and ▪ Commenting on the draft EIA Report. The Comments and Responses Report (CRR) will be updated with all comments received from organs of state and I&APs during the review period of the draft EIA Report. The updated CRR will be appended to the final EIA Report that will be submitted to DFFE.
2.14. Considering the interests, needs and values of all the interested and affected parties, describe how the development will allow for opportunities for all the segments of the community (e.g.. a mixture of low-, middle-, and high-income housing opportunities) that is consistent with the priority needs of the local area (or that is proportional to the needs of an area)?	The findings of the Social Impact Assessment are included in the EIA Report. Also refer to the responses to questions no. 1.9 and 2.5 above.
2.15. What measures have been taken to ensure that current and/or future workers will be informed of work that potentially might be harmful to human health or the environment or of dangers associated with the work, and what measures have been taken to ensure that the right of workers to refuse such work will be respected and protected?	Health and safety related risks associated with the Project during the construction and operational phases were assessed in the EIA Report. These risks are addressed through mitigation measures included in the EMPr. Additional management requirements will be included in the Project's Occupational Health and Safety system.
2.16. Describe how the development will impact on job creation in terms of, amongst other aspects: *2.16.1. the number of temporary versus permanent jobs that will be created,*	The Project will have a beneficial impact on local employment during the construction and operational phases.

Question No.	Response
2.16.2. whether the labour available in the area will be able to take up the job opportunities (i.e. do the required skills match the skills available in the area), *2.16.3. the distance from where labourers will have to travel,* *2.16.4. the location of jobs opportunities versus the location of impacts (i.e. equitable distribution of costs and benefits), and* *2.16.5. the opportunity costs in terms of job creation (e.g. a mine might create 100 jobs, but impact on 1000 agricultural jobs, etc.).*	
2.17. What measures were taken to ensure: *2.17.1. that there were intergovernmental coordination and harmonisation of policies, legislation and actions relating to the environment, and* *2.17.2. that actual or potential conflicts of interest between organs of state were resolved through conflict resolution procedures?*	SA's commitment to renewable energy is reflected in its ratification of the Paris Agreement and the country's long-term energy planning iterations. Solar power represents a large component of the needed diversification of SA's electricity system. According to the Department of Energy (2017), energy is by nature an intergovernmental issue, cutting across energy security, economic prosperity, employment and environment, among others. In recognising these benefits, clean energy has been incorporated into the broader policy framework. The White Paper on Renewable Energy of 2003 is one of SA's policy documents that laid the foundation for the promotion of renewable energy technologies such as solar, hydro, biomass and wind (http://www.energy.gov.za/files/renewables_frame.html). Through this policy document, a ten year target of how renewable energy technologies could diversify the country's energy mix and secure cleaner energy was set. The Applicant intends to bid for the current and future REIPPPP bid windows and/or other renewable energy markets within SA.
2.18. What measures were taken to ensure that the environment will be held in public trust for the people, that the beneficial use of environmental resources will serve the public interest, and that the environment will be protected as the people's common heritage?	The Solar PV Plant proposes to generate electricity from a renewable resource. The total generation capacity of the Project will be up to 200MW renewable solar energy. Impacts to the receiving environment were assessed through various specialist studies that are summarised in **Section 12**.
2.19. Are the mitigation measures proposed realistic and what long-term environmental legacy and managed burden will be left?	The mitigation measures that were included in the EIA Report and EMPr are considered to be realistic. The mitigation measures proposed reduce the residual risks to an acceptable level.
2.20. What measures were taken to ensure that the costs of remedying pollution, environmental degradation and consequent adverse health effects and of preventing, controlling or minimising further pollution, environmental damage or adverse health effects will be paid for by those responsible for harming the environment?	The solar PV facility will have an estimated lifespan of 25 years. It is at this time impossible to accurately predict the exact nature of the surrounding environment in 25 years' time or whether the area would have developed to the point where the solar PV facility will be upgraded to continue providing electricity, or decommissioned. Decommissioning of facilities that require environmental authorisation such as the solar PV facility is also a listed activity in terms of NEMA and will thus require the decommissioning and closure to be approved by the relevant authorities at the time, based on the current legislative framework. However, it is also not possible to predict the legal framework in 25 years' time. For the purposes of this EIA, it is assumed that the facility will eventually be decommissioned, and the site rehabilitated.
2.21. Considering the need to secure ecological integrity and a healthy bio-physical environment, describe how the alternatives identified (in terms of all the different elements of the development and all the different impacts being proposed), resulted in the	The BPEO is presented in **Section 14** below, which was identified based on the recommendations of the specialists, technical considerations, feedback from I&APs and the comparison of the impacts.

Question No.	Response
selection of the best practicable environmental option in terms of socio-economic considerations?	
2.22. Describe the positive and negative cumulative socio-economic impacts bearing in mind the size, scale, scope and nature of the project in relation to its location and other planned developments in the area?	No other renewable energy applications have been made within a 30km radius of the PV Site, according to DFFE's REEA Database, are discussed in **Section 6.8** above. Cumulative impacts in relation to the Project were assessed individually in **Section 13.9** to **Section 13.26** below and mitigation measures were developed for each of the impact categories.

With the development of the proposed project, secondary social benefits can be expected in terms of the additional spend in the nearby towns due to the increased demands for goods and services. Furthermore, the following are considered motivation for the need and desirability of the Project:

- Training and upskilling of the local economic sector;
- The project is highly desirable for the development of a PV facility due to its suitable topography (slope and local topography);
- Site Access is sufficient to facilitate the movement of machinery during the construction phase and operations staff in the long term;
- Land availability which is the land that has been secured as part of the Option to Lease Agreement, i.e., the land has been secured and agreed upon with the Landowner for the intention of the development of a solar facility;
- The site extent is large enough to accommodate all infrastructure;
- Infrastructure can be optimised to produce the maximum amount of clean energy available, and the layout can be optimised, as far as possible, to avoid sensitive areas;
- There are very few technical constraints; and
- There is quick and easy access to the national grid.

9 PROJECT DESCRIPTION

9.1 Solar Technology

Solar energy facilities operate by converting solar energy into a useful form (i.e. electricity). The use of solar energy for electricity generation is a non-consumptive use of a natural resource and consumes no fuel for continuing operation. Solar power produces an insignificant quantity of greenhouse gases over its lifecycle as compared to conventional coal-fired power stations. The operational phase of a solar facility does not produce carbon dioxide, sulphur dioxide, mercury, particulates, or any other type of air pollution, as fossil fuel power generation technologies do.

9.2 PV Technology Overview

PV technology produces direct current (DC) which is then converted to alternating current (AC) via power electronic inverters. The main technology categories are crystalline modules (mono or poly), thin film, and concentrated photovoltaics (CPV). **Figure 7** below provides an overview of a typical Solar PV Power Plant.

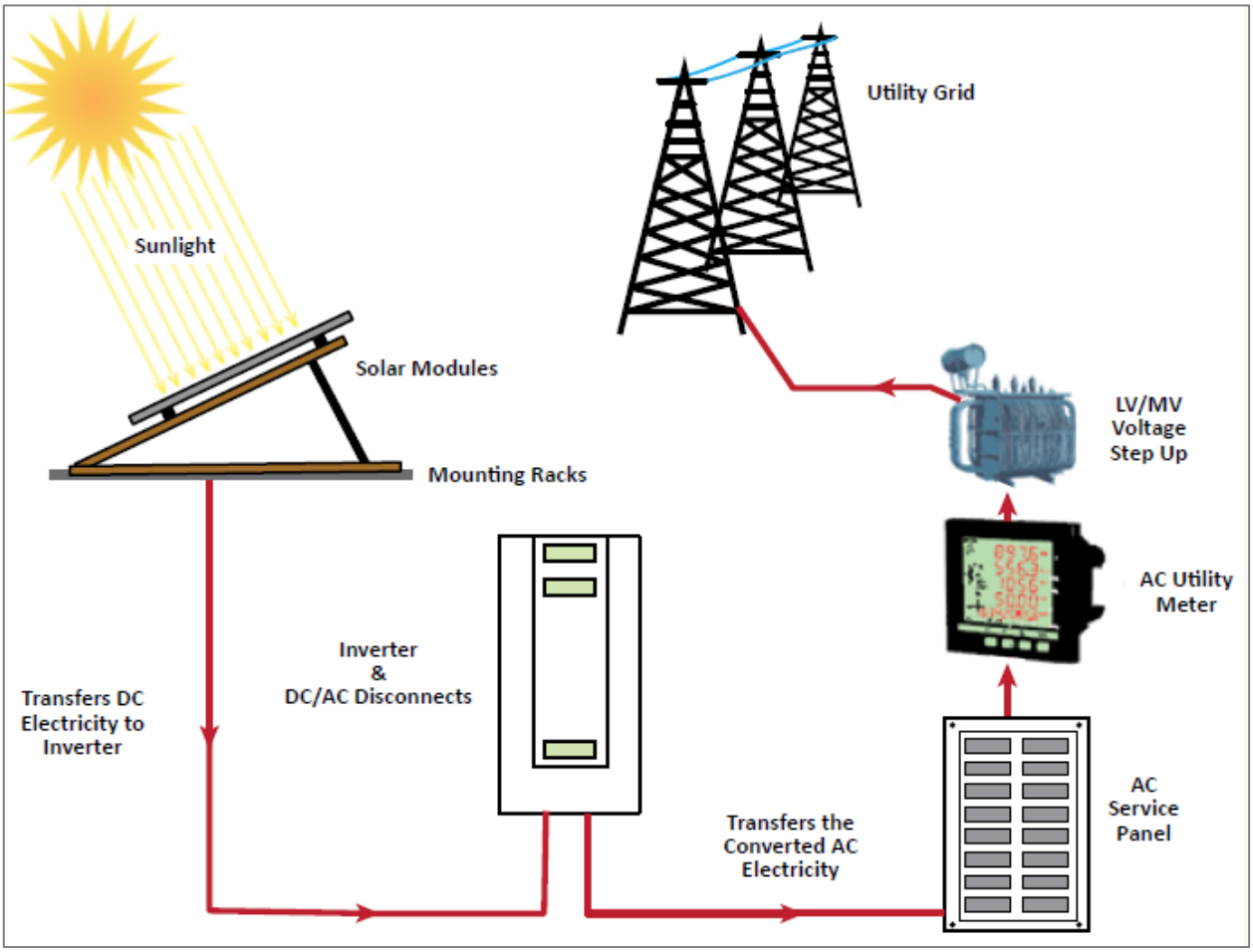


Figure 7: Overview of Solar PV Power Plant (IFC, 2015)

9.3 Project Overview

9.3.1 Overview of Technical Details

The technical details of the proposed Solar PV Plant are captured in **Table 13** below.

Table 13: Technical details of the proposed PV Plant

No.	Component	Description / Dimensions
1.	Height of PV panels	± 2 m
2.	Area of Project (excl. powerline and access roads)	Total area of ± 335 ha total • Western buildable area = ± 76.28 ha • Southern / central buildable area = ± 112.86 ha • Eastern buildable area = ± 145.39 ha
3.	Area of PV Arrays only	Total area of ± 244.56 ha • Western PV array = ± 55.72 ha • Southern / central PV array = ± 9.8 ha & 69.63 ha (79.43 ha) • Eastern PV array = ± 109.41 ha
4.	Number of inverters required	Approximately 25
5.	Area occupied by inverter / transformer stations / substations	▪ Area occupied by inverter stations (25 inverter stations) = 0.13 x 25 = ± 3.25 ha ▪ Area occupied by Operation & Maintenance infrastructure = ± 0.75 ha ▪ Area occupied by facility (step-up/Collector) substation = ± 0.7 ha ▪ Area occupied by the onsite substations = ± 2.8 ha
6.	Capacity of on-site substation	Up to a maximum of 134 MW per PV site, 132 kV/22kV
7.	Area occupied by both permanent and construction laydown areas	▪ Construction areas = 6.51 ha combined ▪ Operation & Maintenance infrastructure = ± 0.75 ha ▪ Total combined = ± 7.26 ha
8.	Area occupied by buildings and BESS	▪ Area occupied by Operation & Maintenance infrastructure = ± 0.75 ha ▪ Area occupied by BESS = ± 2.21 ha
9.	Length of internal roads	± 26.72 km
10.	Width of roads	▪ The internal roads = 12 m reserve and road width of 4 m. ▪ Access roads = 14 m reserve and road width of 8 m.
11.	Proximity to grid connection	Approximately 0.57 km 132 kV transmission line from PV Site to existing Eskom's Parys 132/22 kV Substation
12.	Height of fencing	2.4 m – 3 m
13.	Type of fencing	Type will vary around the site, welded mesh, palisade and electric fencing

9.3.2 Project Layout

The layout of the Solar PV Plant is shown from **Figure 8 to 11** below. The desirability of the earmarked site for the development of the proposed Solar PV Plant is due to the following key characteristics:

- **Solar Irradiation**: The feasibility of a solar facility, especially a Solar Park of this magnitude, is dependent on the direct solar irradiation levels (refer to **Section 4.1** above).
- **Topography**: The suitability of the surface area is an important characteristic for the construction and operation of solar facilities. Most of the site has a low gradient slope and is suitable for this development.

- **Grid connection**: The electricity generated by the Solar PV Plant will be injected into the existing Eskom 132 kV distribution system (refer to **Section 9.5** below). The PV Site is located close to the Eskom grid.
- **Extent of site**: The overall extent of the site is sufficient for the installation of the PV facility.
- **Site access**: The site can be accessed via the R723, which runs through the site.

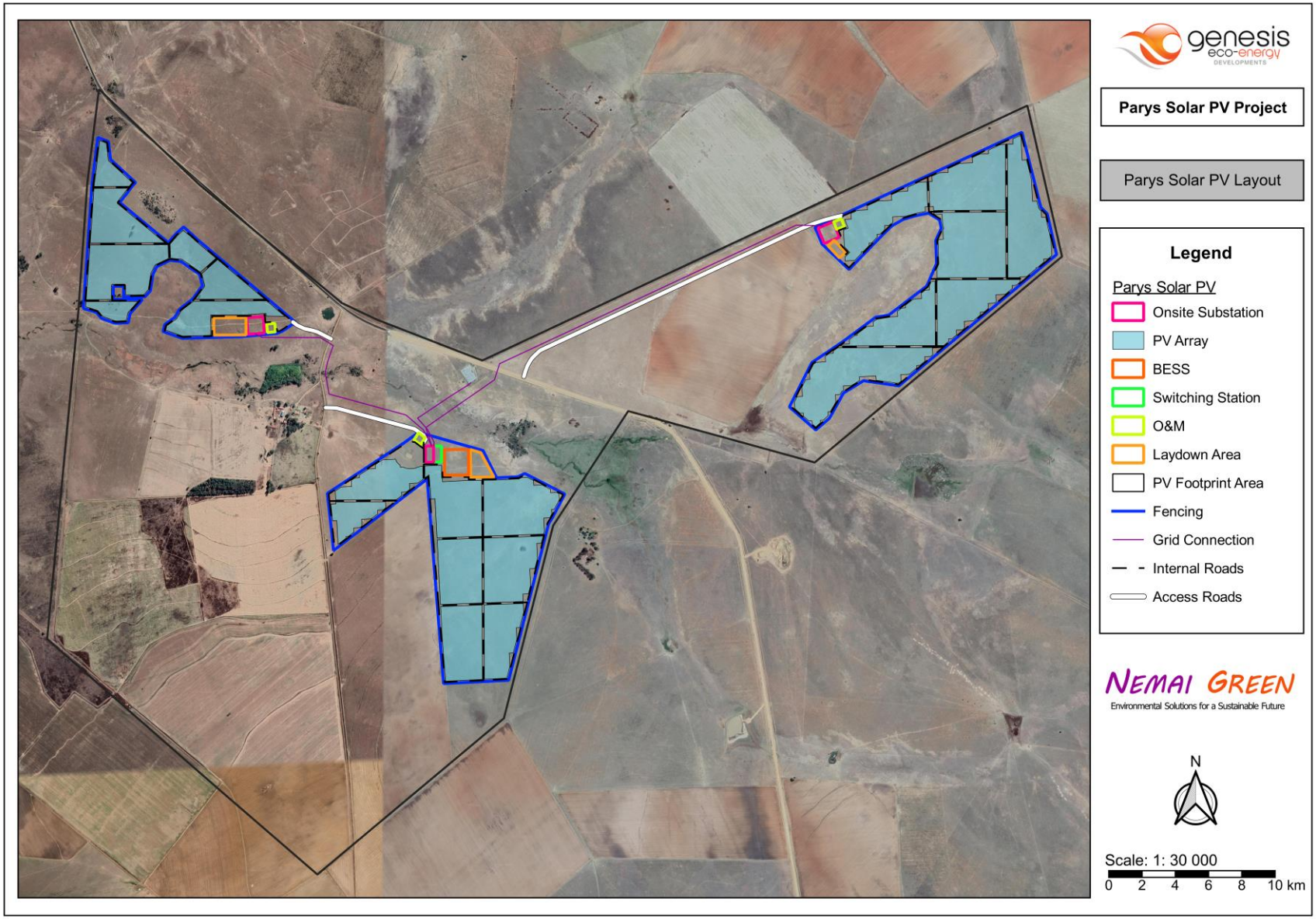


Figure 8: **Proposed Layout of the Solar PV Plant (Orthophotograph)**

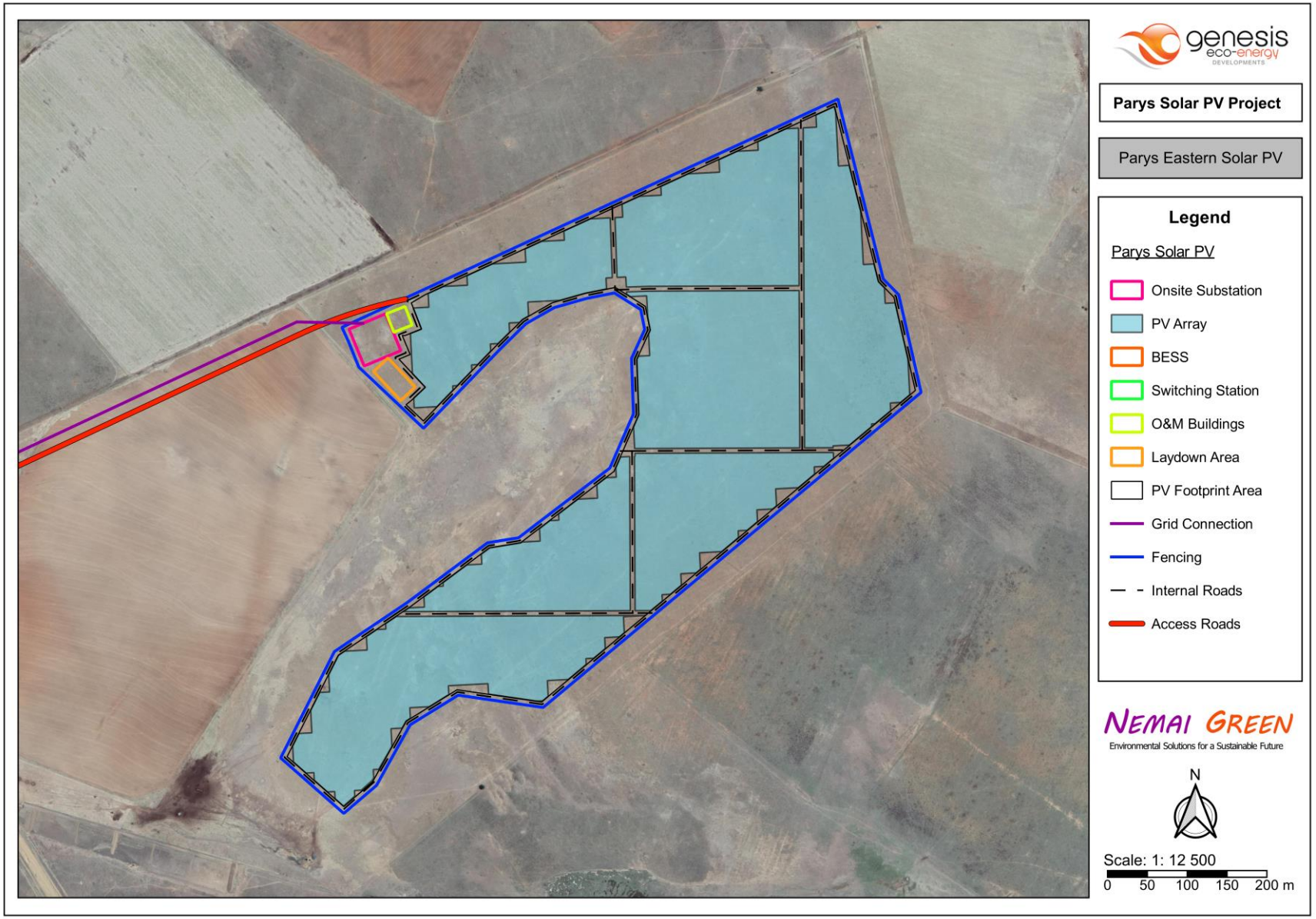


Figure 9: **Proposed Layout of the eastern Solar PV component site (Orthophotograph)**

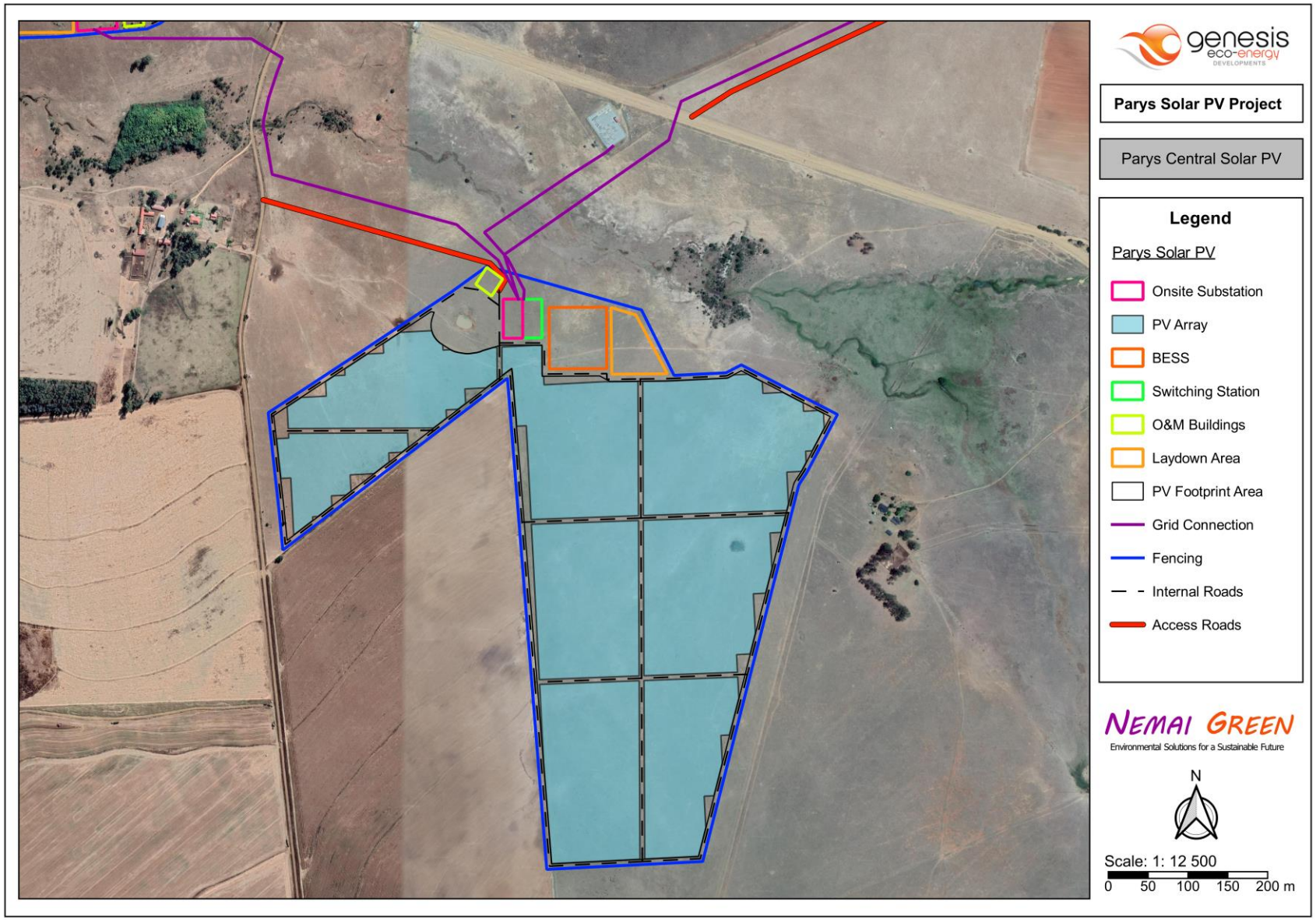


Figure 10: **Proposed Layout of the southern/central Solar PV component site (Orthophotograph)**

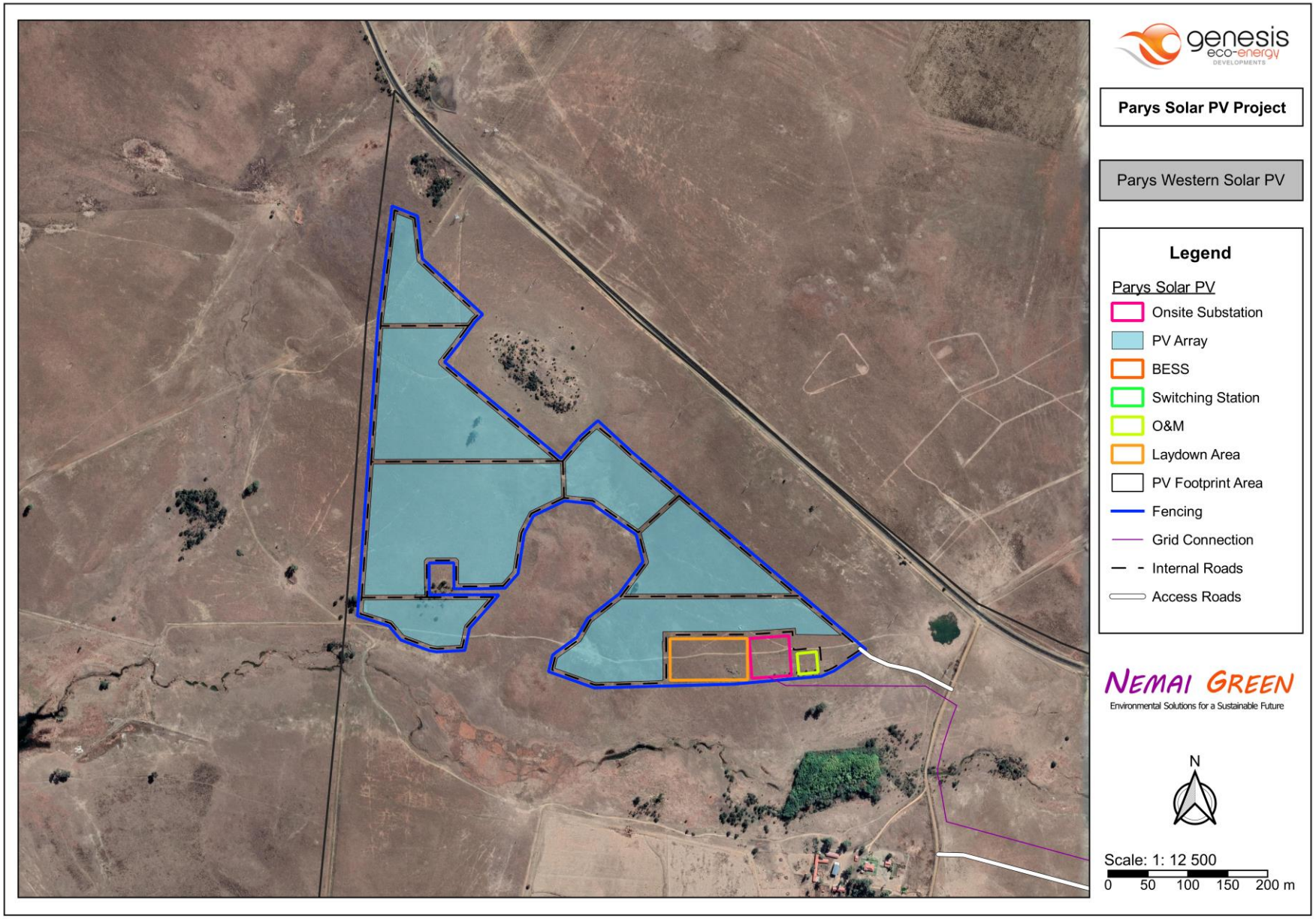


Figure 11: **Proposed Layout of the western Solar PV component site (Orthophotograph)**

The following factors were considered in determining the layouts (amongst others):

- ❑ Requirements of the PV Plant;
- ❑ Understanding of sensitive features on the site (e.g., watercourses); and
- ❑ Existing servitudes and infrastructure.

9.3.3 Components of the Proposed Solar PV Plant

The Project consists of the following systems, sub-systems or components (amongst others):

- ❑ PV panel arrays, which are the subsystems which convert incoming sunlight into electrical energy;
- ❑ Mounting structures to support the PV panels;
- ❑ On-site inverters to convert DC to facilitate AC connection between the solar energy facility and electricity grid;
- ❑ Lithium Ion BESS;
- ❑ New 132 kV power lines between the on-site substation and the grid connection point;
- ❑ Cabling between the Project's components, to be laid underground (where practical);
- ❑ Administration buildings (offices);
- ❑ Workshop areas for maintenance and storage;
- ❑ Temporary laydown areas;
- ❑ Internal access roads and perimeter fencing of the footprint;
- ❑ High Voltage (HV) Transformers; and
- ❑ Security Infrastructure.

The components of the proposed Solar PV Facility are discussed below. Reference Source: Solar Power Plant - Types, Components, Layout and Operation (electricaltechnology.org)

9.3.3.1 Solar PV Panels/Modules

A PV panel is the most important component of a solar power plant. It is made up of small solar cells. This is a device that is used to convert solar photon energy into electrical energy.

Generally, silicon is used as a semiconductor material in solar cells. The typical rating of silicon solar cells is 0.5V and 6Amp. And it is equivalent to 3W power. The number of cells is connected in series or parallel and makes a module. The number of modules forms a solar panel.

According to the capacity of power plants, a number of plates are mounted and a group of panels is also known as a PV array.

9.3.3.2 Single Axis Trackers

The following information was sourced from Solar Basics: Single-Axis Tracking (https://www.powerflex.com/).

A solar tracking system adjusts the position of a solar panel along an axis. This is done to ensure a small angle of incidence or the angle that sunlight hits a solar panel. Since the energy output of a solar system increases as the angle of incidence decreases, keeping this angle as small as possible is ideal. Active trackers rely on powered machineries such as gears and motors to move solar panels, whereas passive trackers achieve motion via compressed fluid that shifts sides when heated by the sun, changing the tilt of the panel along with it. Some trackers keep panels aligned with the sun by moving them in the opposite direction of the earth's rotation, and others determine an optimal panel angle based on latitude and longitude data obtained through GPS.

In addition to varying methods of motion, solar trackers differ in terms of the number of axes on which they move. Single axis tracking systems tilt on one axis, tracking the sun as it moves from east to west during the day.

An example of PV modules mounted on a single axis tracker is shown in **Figure 12** below.

Figure 12: Example of PV Module mounted on Single Axis Tracker
(source: Single-ACES – Atlantic Clean Energy Supply – Official Site [https://atlanticces.com/])

The trackers are mounted on steel posts installed in the ground. Concrete bases are sometimes also used. The site would need to be cleared of all trees to prevent shading of the PV modules. The ground between the trackers is sometimes left grassed.

9.3.3.3 *Inverters*

The following information was sourced from “A Guide to Solar Inverters: how they work and how to choose them” (https://solarmagazine.com/).

A solar inverter is really a converter. Inverters are installed to convert the DC electrical power into AC electrical power, which is used in the grid. The frequency of the AC electricity is synchronised to the grid, which in SA is 50Hz, but varies slightly. The purpose of the inverters is to maximise and control the conversion of power from the DC modules to low voltage AC (i.e., less than 1000V).

String inverters have multiple inputs for connecting the strings from the trackers. String inverters are normally installed on steel structures under the shade of the PV modules.

9.3.3.4 *Low Voltage AC Cabling*

AC cables are installed from the inverters to the distribution box located adjacent to the medium voltage transformers. These cables are installed underground in trenches.

9.3.3.5 *Medium Voltage Step-Up Transformers*

The purpose of medium voltage transformers is to step-up the low voltage to medium voltage. In order to distribute the combined electrical power from a block of tracker rows the voltage is required to be increased. Transformers will typically be in the order of 2.5MVA capacity and similar in appearance to the type as shown in **Figure 13** below.

Figure 13: Example of Medium Voltage Transformer
(source: https://www.ulaginoli.com/)

Transformers will typically be filled with oil for cooling the transformer windings. The cooling oil is circulated through radiator fins mounted on the side of the transformer. The oil remains in the transformer. Oil spills from transformers need to be contained by providing drip trays and special care taken to clean up the spill should it occur.

9.3.3.6 Medium Voltage AC Cabling

Medium voltage AC cabling from the transformers to the high voltage substation is buried in trenches underground. The cables are protected from accidental damage by placing brightly coloured orange danger tape in the trench and sometimes concrete slabs. Cable routes are indicated with concrete cables markers on the ground at bend points, road crossings etc.

9.3.3.7 High Voltage Substations

The medium voltage cables are connected to a medium voltage switchgear room located in a substation yard. High voltage transformers step the medium voltage up to high voltage.

Figure 14: Example of High Voltage Substation
(source: https://www.protogenenergy.com/)

A typical HV Substation will look like the substation shown in **Figure 14** above, with large ground mounted transformers and outdoor high voltage switchgear with overhead conductors and steel lattice structures. The yard is fenced off and only authorised personnel are allowed inside the high voltage yard (see example shown in **Figure 15** below).

Figure 15: Example of High Voltage Transformers
(source: https://www.electricityforum.com/)

9.3.3.8 Guardhouses, Operation, Maintenance and Visitor Centre Buildings

Guardhouses, Operation, Maintenance and Visitor Centre Buildings are required for the facility. Buildings will be single story.

The purpose of the buildings is to provide space for staff working on site for the operation and maintenance of the facilities, including storage space for spare parts, tools, etc. Computers will be installed for monitoring the electricity generation and reporting on the condition of the plant. Toilets, kitchens, water, wastewater, and electricity will be required for staff and visitors.

Sustainable building principals will be used including use of rainwater harvesting, energy efficient lighting, insulation, etc.

9.3.3.9 Roads

Existing roads are located near the site, which will serve as the entrance roads for the 3 planned access roads to the PV sites. The 3 access roads will have 14 m reserves and

widths of 8 m. The internal roads will have a reserve of 12 m and a 4 m width and will be gravel, except for paving close to the buildings for parking and access into the buildings

The basic layout consists of rows of single axis trackers, similar to that shown in **Figure 16** below.

Figure 16: Example of Roads Between Trackers and Medium Voltage Substations
(source: https://ecoinventos.com/)

9.3.3.10 Fencing, Security and Lighting

Fencing is required to secure the site. Due to the voltage of the DC wiring (up to 1500V) and high value of the plant the site must be secured. Details of the fencing is still to be finalised and may include electric fencing.

CCTV cameras and security lighting may be installed as part of the security for the plant.

9.3.3.11 Stormwater Infrastructure

The topography of the site is relatively flat, which simplifies the management of stormwater runoff as high velocities in surface drainage channels and pipes underground drainage systems need not be dealt with. Furthermore, surface stormwater drainage channels can be employed to advantage (easier to maintain than an underground pipe system).

9.4 Battery Energy Storage System

9.4.1 Types of Electrical Energy Storage Systems

Electrical Energy storage systems consist of Mechanical, Chemical, Electrical, Thermal and Electrochemical systems. **Figure 17** below summarizes the various Electrical Energy Storage systems. The Electrochemical/battery storage system was selected as the preferred solution to meet the requirements of the Project.

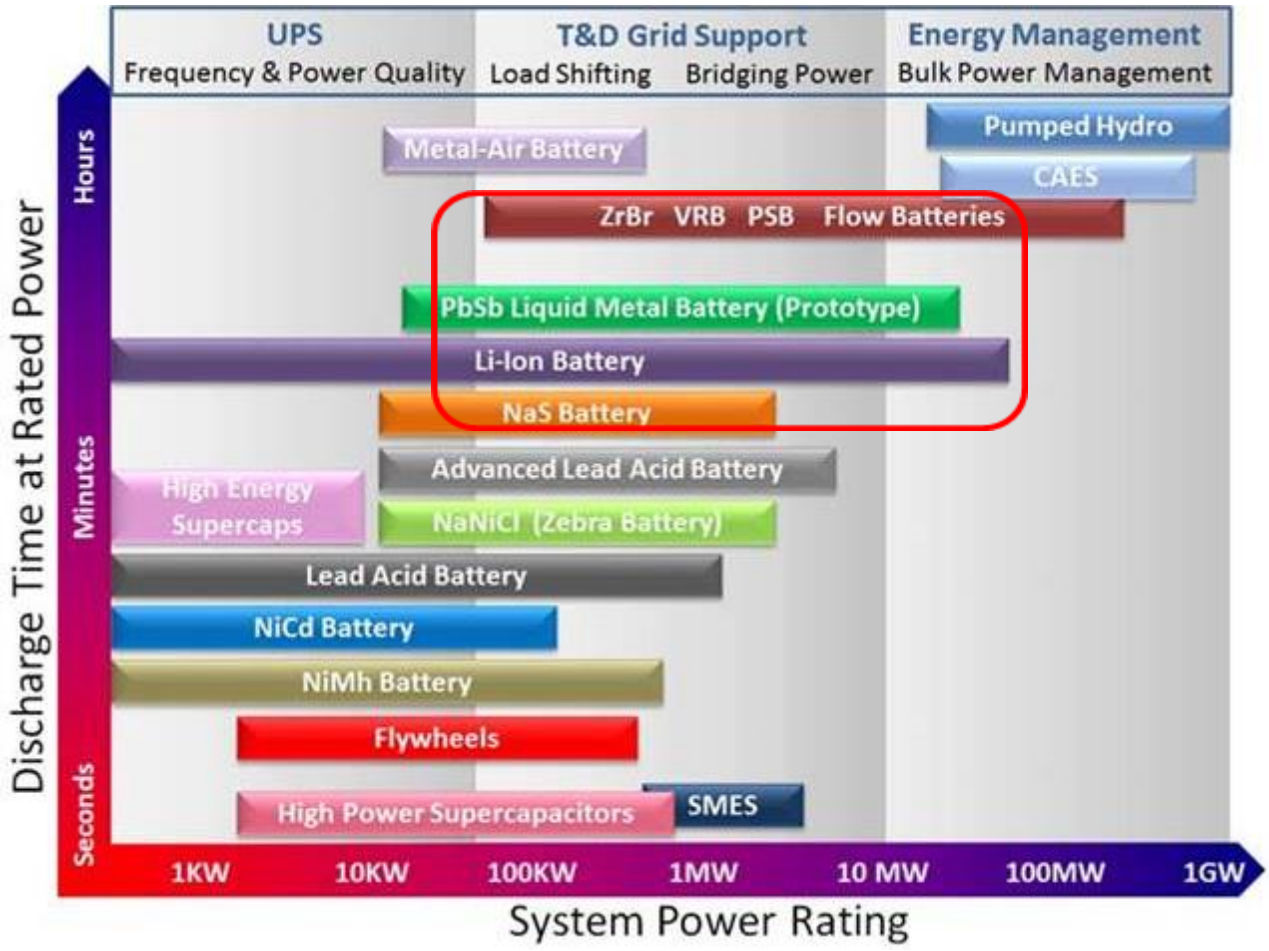


Figure 17: Grid Energy Storage Technologies and Applications
(Adapted from Climate Policy Initiative for the Energy Transitions Committee)

As per https://www.smart-energy.com/, "*Batteries, the oldest, most common and widely accessible form of storage, are an electrochemical technology comprised of one or more cells with a positive terminal named a cathode and negative terminal or anode. Batteries encompass a range of chemistries. The best known and in widespread use in portable electronic devices and vehicles are lithium-ion and lead acid. Others solid battery types are nickel-cadmium and sodium-sulphur, while zinc-air is emerging. Another category is flow batteries with liquid electrolyte solutions, including vanadium redox and iron-chromium and zinc-bromine chemistries*".

9.4.2 The Project's BESS Infrastructure

The total capacity of the BESS is up to a maximum of 45 MW (180 MWh) of BESS. The technology will be the commercially proven solid state battery systems comprising of the Lithium Ion technology.

As per https://www.smart-energy.com/, "This type of technology is widely used in mobile phones and electric vehicles. It is also predominantly used in large utility scale projects". The batteries will be contained in shipping containers which will be delivered pre-assembled to site.

There will be up to a maximum of 45 shipping containers, each with a battery storage capacity of 1MW. The approximate dimensions of the containers will be up to a maximum of 20m long, 3m wide and 3m high. Level and fenced off platforms would be created for the battery storage areas of approximately 2.21 ha. The location of the battery energy storage facility will be adjacent to the solar power plant's on-site substation.

An example of similar utility scale BESS is shown in **Figure 18** below.

Figure 18: Example of BESS installation
(https://biiworld.com/)

The containers are environmentally friendly during their life-cycle. However, the Lithium in the technology is considered hazardous / dangerous goods. Used batteries will be removed by the suppliers. Batteries containing chemistries that when charged are a fire risk and at the end of their life need to be recycled. With regard to the fire risk, the battery storage area will have a non-flammable buffer area to prevent the spread of fire. The BESS will have electrical and fire protection measures in the form of battery temperature monitoring, circuit breakers, fire detection and fire suppression as per fire and electrical regulations.

9.5 Grid Connection

The electricity generated by the proposed Solar PV Plant will be transferred to the national Eskom grid. One power line route is under consideration and included in the project scope (see **Figure 21** below) and connects to the existing Eskom Parys 132/22 kV Substation located to the north of the site through a 0.57 km single circuit twin conductor 132 kV line. The voltage of the electricity generated by the Project will be transformed on site via a step-up transformer in the on-site substation that will be constructed by the Applicant. The Project's proposed overhead power line will be aligned alongside property boundaries and existing power lines as far as possible.

Examples of a 132 kV transmission line as well as a high voltage transmission line connecting to a substation are shown in **Figure 19** and **Figure 20** below, respectively.

Figure 19: Example of a 132 kV transmission line

Figure 20: Example of High Voltage Transmission Line Connecting to Substation

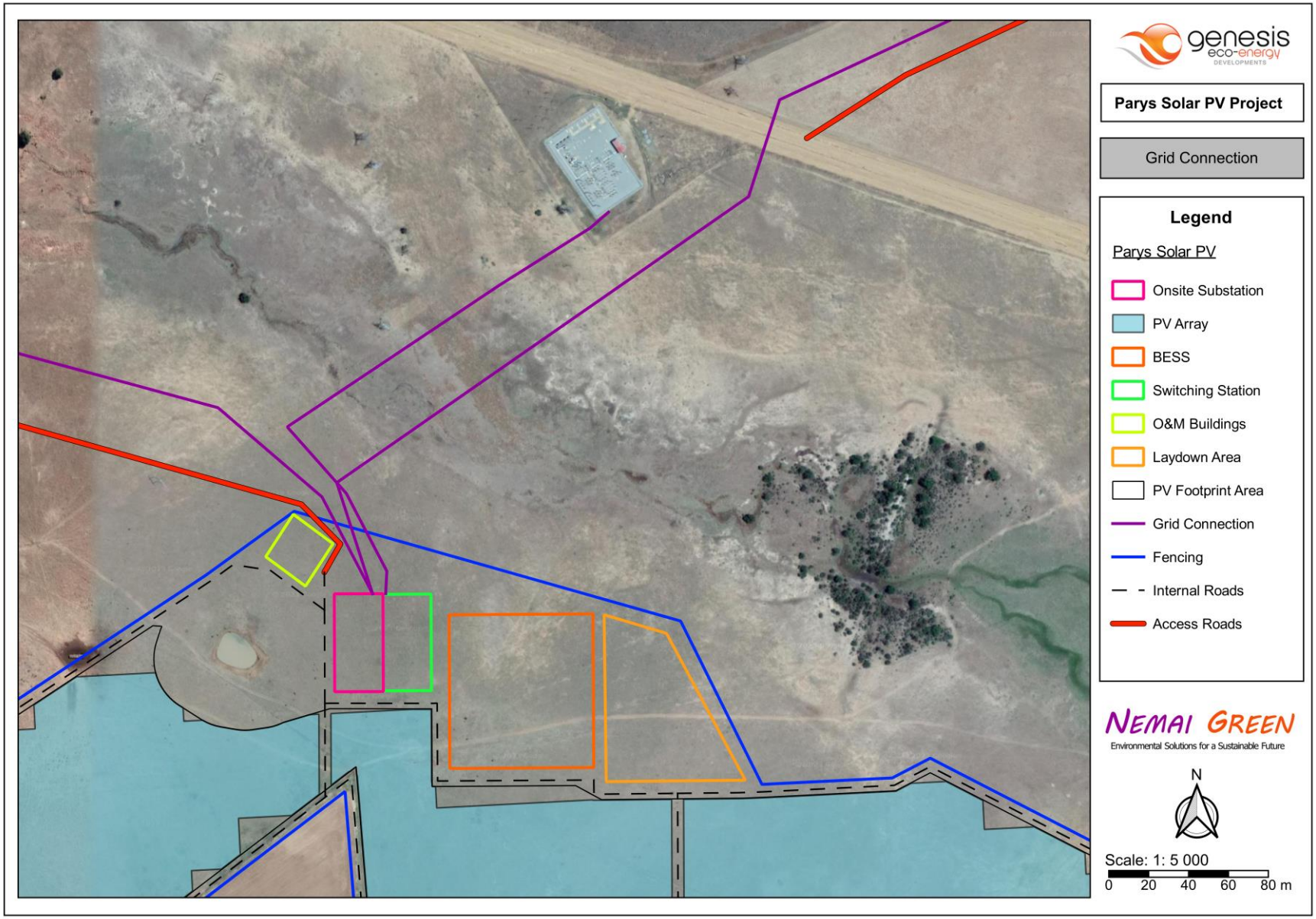


Figure 21: **Proposed Power Line Route Options (Orthophotograph)**

9.6 Implementation Programme

Key milestones during the Project's implementation programme include the following:

- ❑ Preferred Bidder Status: April 2023
- ❑ Financial Close: October 2023.
- ❑ Notice to proceed (commencement of construction): November 2023.
- ❑ Commercial Operation Date (COD): November 2024.

9.7 Project Life-Cycle

The project life-cycle for a typical Solar PV Plant includes the following primary activities (high level outline only):

- ❑ Feasibility phase - This phase includes confirming the feasibility of the Project by evaluating and addressing the following (amongst others) –
  - Solar resource assessment;
  - Site selection;
  - Project land allocation;
  - Project yield assessment;
  - Permitting and licensing;
  - Legal agreements;
  - Socio economic development;
  - Industrialisation and localisation;
  - Project cost determination;
  - Project financing; and
  - Risk analysis.
- ❑ Design phase - This phase includes the following (amongst others) –
  - Confirming key design features such as the type of PV module to be used, tilting angle, mounting and tracking systems, inverters, and module arrangement;
  - Confirming specifications for the components of the Solar PV Plant and BESS;
  - Preparing detailed designs (layout, civil, electrical);
  - Preparing construction plans;
  - Preparing the Project schedule; and
  - Preparing the commissioning plans.
- ❑ Construction phase – During the implementation of the Project, the following construction activities will be undertaken –
  - Pegging the footprint of the development;
  - Establishing access roads;
  - Preparing the site (fencing, clearing, levelling and grading, etc.);
  - Establishing the site office;
  - Establishing laydown areas and storage facilities;

- Transporting equipment to site;
- Undertaking civil, mechanical and electrical work; and
- Reinstating and rehabilitating working areas outside of permanent development footprint.

❑ Operational phase - Once the solar park is up and running the facility will be largely self-sufficient. Operational activities associated with the maintenance and control of the Solar PV Plant will include the following (amongst others) –

- Testing and commissioning the facility's components;
- Cleaning of PV modules;
- Controlling vegetation;
- Managing stormwater and waste;
- Conducting preventative and corrective maintenance; and
- Monitoring of the facility's performance.

❑ Decommissioning –

PV panels are guaranteed to produce at least 80% of their rated power for 20 to 30 years. In practice, PV panels will perform satisfactorily well beyond this timeframe. At the end of the 20-30 year lifespan, two scenarios exist for the PV panels:

- The old, redundant panels can be disposed of (at a registered disposal facility designated for this purpose); or
- The panels can be recycled, by either using their components to fix or make new panels, or be donated for use elsewhere (e.g., for the electrification of rural schools and clinics).

It is unlikely that the PV Park will be decommissioned after 30 years. Instead, the facility will be reconditioned as the PV panels are recycled and replaced with more advanced technology, as it becomes available.

In the event that the facility must be decommissioned, the decommissioning phase will include measures for complying with the prevailing regulatory requirements, rehabilitation and managing environmental impacts in order to render the affected area suitable for a future desirable use.

9.8 Resources and Services required for Construction and Operation

This section briefly outlines the resources that will be required to execute the Project. Note that provision is made in the EMPr to manage impacts associated with aspects listed below, as relevant.

9.8.1 Raw Materials

Construction

Material required for construction purposes, including fencing and construction material (e.g., cement, sand, aggregate, etc.), will be sourced from suitable suppliers. The PV modules and other components of the facility will also be sourced from accredited suppliers.

Operation

During the operational phase, few raw materials will be required. Material such as consumable spares will be used for the operation of the facility.

9.8.2 Water

Construction

During construction, the Contractor will require water for potable use by construction workers and water will also be used in the construction of the foundations and other components of the Project. The necessary negotiations will be undertaken with the Municipality or landowners to obtain water from approved sources.

Operation

Water use requirements for a Solar PV Plant during the operational phase depend on the technology and climate conditions at the site. In general, solar power technologies use relatively low volumes of water for cleaning solar collection and reflection surfaces like PV panels, as well as for domestic consumption by the staff.

9.8.3 Sanitation

Construction

Sanitation services will be required for construction workers in the form of chemical toilets, which will be serviced at regular intervals by the supplier.

Operation

Sewage from the buildings and toilets across the site will be discharged into various septic tank systems. The soakaway systems will be designed with sufficient spare capacity to accommodate the possibility of excessive usage above the anticipated average. This option is the most cost-effective system for this Project. It is to be considered that a well-constructed and maintained septic tank should be odourless and problem free.

Should the receiving environment be regarded as sensitive, then the use of honey sucker services from an independent contractor will be considered.

9.8.4 Waste

Construction

Solid waste generated during the construction phase will be temporarily stored at suitable locations (e.g., at the construction camp) and will be removed at regular intervals and disposed of at licenced waste disposal sites.

Wastewater, which refers to any water adversely affected in quality through construction-related activities and human influence, will include the following:

- Sewage;
- Water used for washing purposes (e.g., equipment, staff); and
- Drainage over contaminated areas (e.g., workshop, equipment storage areas).

Suitable measures will be implemented to manage all wastewater generated during the construction period.

Operation

Refuse generated during the operational phase will be removed on a weekly basis and will be disposed of at licenced waste disposal sites.

9.8.5 Roads

Construction

There will be no temporary access roads during construction.

Operation

The Project site is accessible by the R723 which runs through the site.

9.8.6 Stormwater

Construction

Best environmental practices will be implemented during construction to manage stormwater. These measures are included in the EMPr.

Operation

The stormwater run-off along the main access road will be controlled by side swales and dispersed in a controlled manner at regular intervals. Stormwater run-off from the buildings will be disposed of through soakaways. A formal piped stormwater system is not envisaged for the wider site. Water will be managed on the surface and dispersed into natural drainage routes.

9.8.7 Electricity

Construction

The EPC Contractor will be responsible for the supply of electricity during construction. The electricity supply will be obtained from diesel generators and / or temporary supply via cables from the site power grid.

Operation

The electricity will be supplied by the plant during daylight hours (off-peak times – 07:00 to 17:00). The BESS will supply electricity during night hours (peak times – 05:00 to 07:00 and 17:00 to 19:00). During other times, electricity will be supplied from the power grid.

9.8.8 Laydown Areas

Construction

A laydown area for each PV footprint will be required during the construction phase and is demarcated in the layout drawing giving a total number of laydown areas of 3 (refer to **Figures 8, 9, 10** and **11** above).

9.8.9 Construction Workers

Construction

The appointed Contractor will mostly make use of skilled labour for the construction of the facility and its associated infrastructure. In those instances where casual labour is required, the Applicant will request that such persons are sourced from local communities, as far as possible.

10 ALTERNATIVES

10.1 Introduction

Alternatives are the different ways in which the Project can be executed to ultimately achieve its objectives. Examples could include carrying out a different type of action, choosing an alternative location or adopting a different technology or design for a project.

The sub-sections to follow discuss the project alternatives considered during the EIA process. A comparative analysis of feasible alternatives from environmental (including specialist input) and technical perspectives is provided in **Section 14** below.

10.2 Site Alternatives

No site alternatives are proposed for this Project. Favourable location factors for the PV Site include suitable solar irradiation levels, short distance to grid connection point, flat topography, suitable site access and availability of land.

10.3 Layout / Design Alternatives

It is anticipated that the space available at the PV Site will be adequate to position the facility and its associated infrastructure to avoid areas of sensitive environmental features, which have been determined in the current EIA Phase through the specialist studies. The extent of the site allows for the identification of layout/design alternatives to manage impacts to environmental sensitivity.

An initial layout was proposed by the Applicant (**Figure 22**), however, through the environmental screening process and with input from various specialists, the layout was later refined to take sensitive environmental features into consideration. Therefore, currently one layout alternative is presented for inclusion in the study (**Figure 23**).

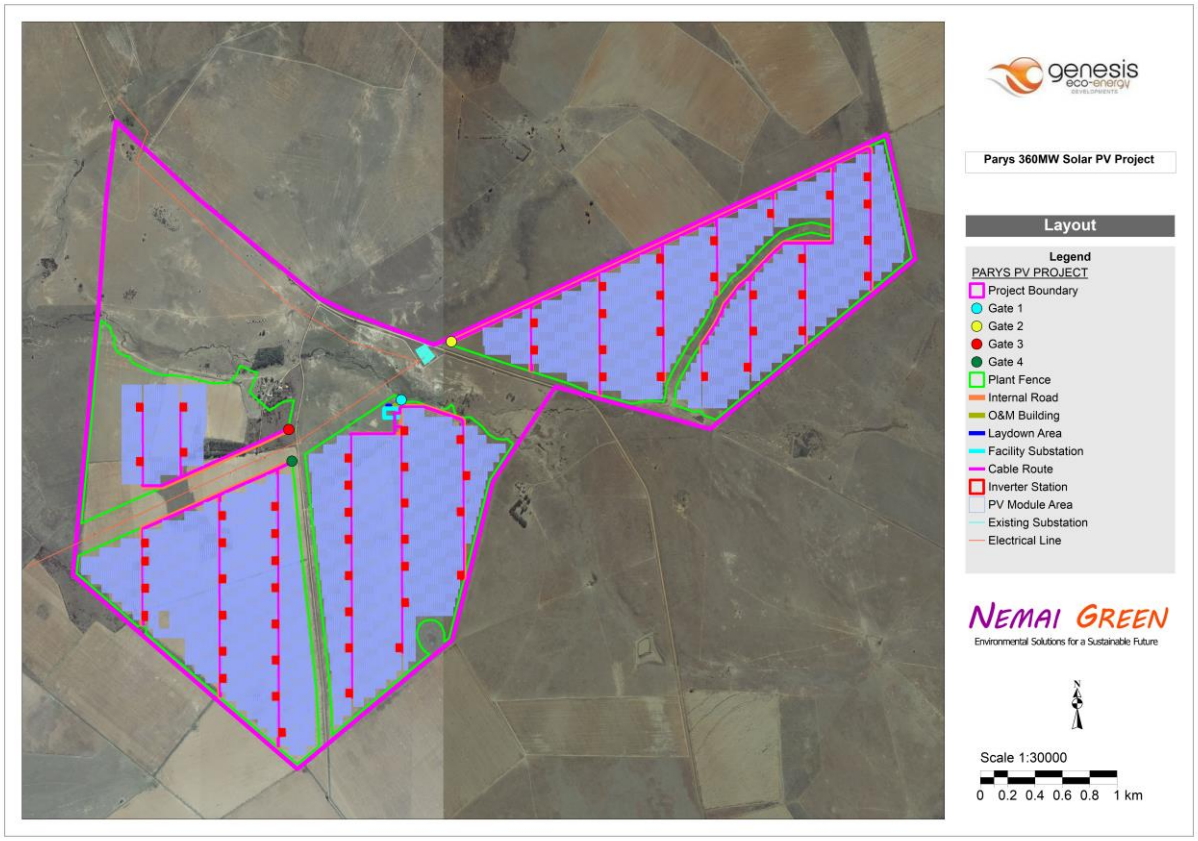


Figure 22: Initial Proposed Layout (Orthophotograph)

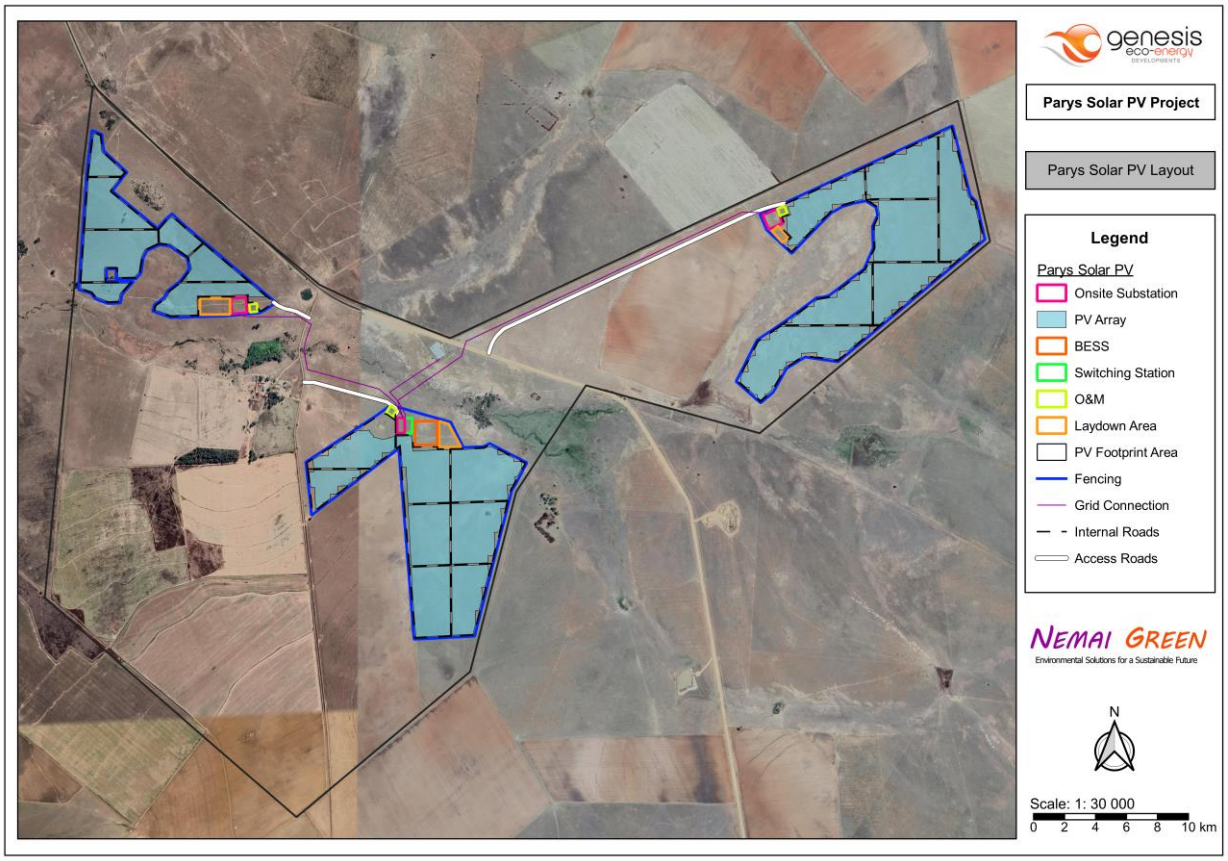


Figure 23: Current Proposed Layout (Orthophotograph)

10.4 Technology Alternatives

10.4.1 PV Technology

Solar PV technology consists of either monofacial or bifacial solar panels used on either a fixed mounting system or tracking mounting system. The following is noted in this regard:

- Single axis tracker system – this is preferred as it optimises the yield output and is the standard for utility scale solar PV installation. Some additional benefits associated with this technology include its robustness, long lifetime, the equipment prices have drastically decreased the past 10 years, it is easy to maintain, it does not cause any emissions and no waste is generated. The selected tracker type is the single axis E-W tracker system which specifically has its collector move from east to west tracking the suns movement throughout the day. A side view of proposed tracker mounting structure is provided in **Figure 24** below.
- Fixed mounted system – This is not preferred in utility scale solar PV plants as it is not able to generate as much energy as a solar PV system using a tracker system. This option will not be considered further.

A bifacial solar panel receives irradiation on both sides of the panel, which increases the yield. This is preferred over monofacial solar panels that only receive power on one of its sides (see **Figure 24** below).

Figure 24: Monofacial (top) and bifacial (bottom) solar panels
(https://www.bluestemenergysolutions.com/bifacial-versus-monofacial-solar-panels-an-analysis/

10.4.2 BESS Technology

The BESS can be broken into solid state and flow battery systems (refer to **Section 9.4** above). The preferred alternative is solid state lithium-ion technology. This EIA Report will evaluate the advantages and disadvantages associated with the types of BESS.

10.5 No-Go Option

As standard practice and to satisfy regulatory requirements, the option of not proceeding with the Project is included in the assessment of the alternatives.

The no-go alternative can be regarded as the baseline scenario against which the impacts of the Project are evaluated. This implies that the current status and conditions associated with the proposed Project footprint will be used as the benchmark against which to assess the possible changes (impacts) associated with the Project.

In contrast, should the proposed Project not go ahead, any potentially significant environmental issues would be irrelevant, and the status quo of the local receiving environment would not be affected by the project-related activities. The objectives of the Project, including the benefits (such as the exploitation of SA's renewable energy resources, potential economic development and related job creation, and increased security of electricity supply), will not materialise.

The "no-go option" is evaluated in **Section 13.27** below to understand the implications of the project not proceeding, taking into consideration the findings of the specialist studies and the outcomes of public participation (amongst others).

11 PROFILE OF THE RECEIVING ENVIRONMENT

11.1 Introduction

This section provides a general description of the status quo of the receiving environment in the Project Area. This serves to provide the context within which the EIA was conducted. The study area includes the entire footprint of the Project, including the proposed Solar PV Plant and the power line.

Where necessary, the regional context of the environmental features is also explained, with an ensuing focus on the local surrounding environment. The reader is referred to **Section 12** below for more elaborate explanations of the specialist studies and their findings for specific environmental features.

This section allows for an appreciation of sensitive environmental features and possible receptors of the effects of the proposed Project. The potential impacts to the receiving environment are discussed in **Section 13** below.

11.2 Land Use and Land Cover

The surrounding landcover of the area can be seen in **Figure 25**. The landcover type within 15 km of the proposed project is dominated by cultivated land and natural grassland, with patches of fallow land and old fields. Formal residential areas are also located towards the north and west of the project area. The Project is located approximately 8km to the south of the town of Parys' business district (CBD) and falls within Ward 15 of the Ngwathe Local Municipality (NLM), in the Free State Province. The R723 runs through the site. The Project's PV Site is vacant and was historically used for agricultural purposes.

Agriculture is the dominant land use in the Project area. The following land uses are encountered around the Project's PV Site:

- The SAJWV Olienhout Shooting Range along the R723.
- Eskom Parys Rural 132/11 kV substation south of the R723;
- Farming activities on the property and surrounding properties.

Views of the Project's PV Site are provided in **Figure 26** and **Figure 27** below.

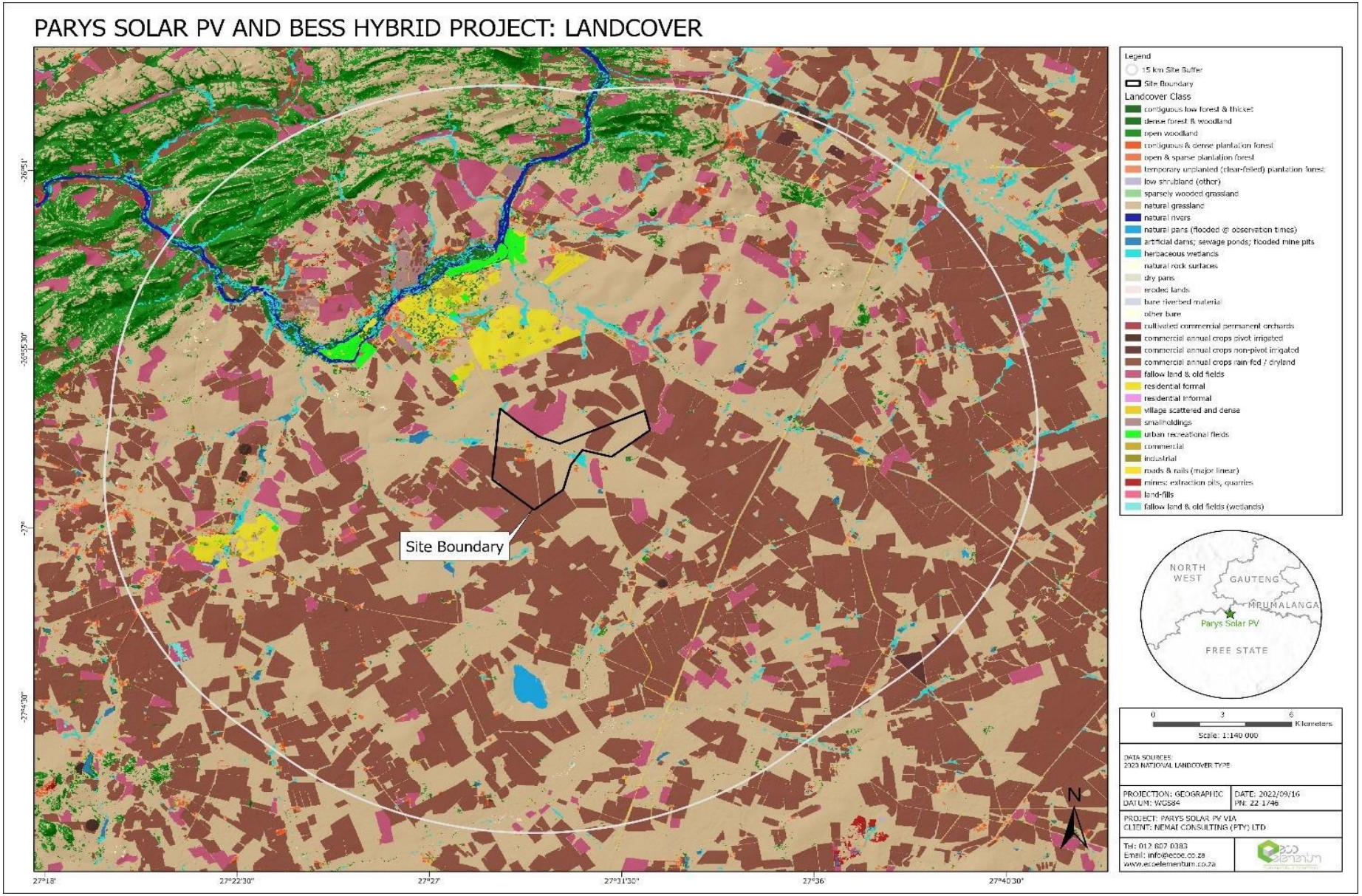


Figure 25: Land Cover

Figure 26: **Existing Eskom substation as viewed from the R723 looking south.**

Figure 27: **View looking south at farm lands on the property, including farm house to the right of the image.**

11.3 Climate

Parys's climate is classified as warm and temperate. When compared with winter, the summers have much more rainfall. According to Köppen and Geiger, this climate is classified as Cwb (https://en.climate-data.org/africa/south-africa/free-state/parys-12809/).

The mean minimum and maximum temperatures for Parys over the year are shown in **Figure 28** below. The average annual temperature is 26°C. The warmest month, on average, is January with

an average temperature of 22°C. The coolest month on average is June, with an average temperature of 9°C.

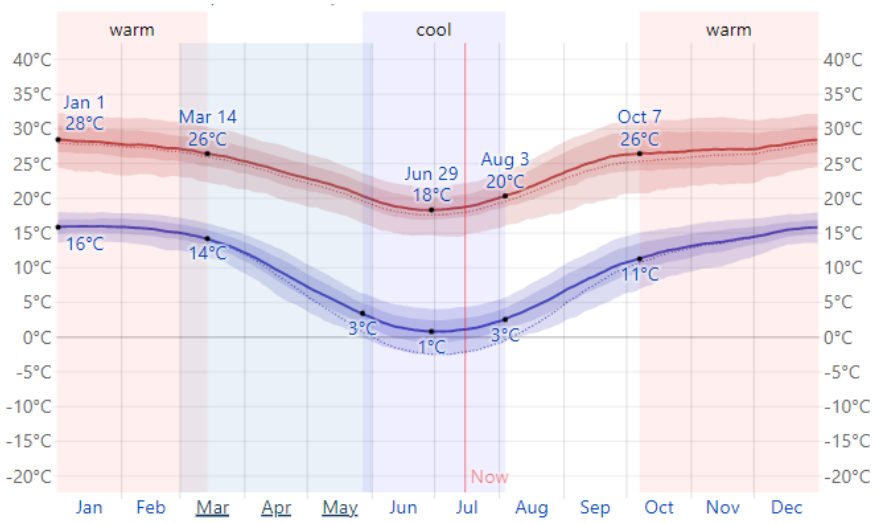


Figure 28: Average minimum and maximum temperatures in Parys
(Copyright © 2022 https://weatherspark.com/y/94201/Average-Weather-in-Parys-South-Africa-Year-Round)

The mean monthly precipitation over the year is shown in **Figure 29** below. The average annual precipitation 727 mm.

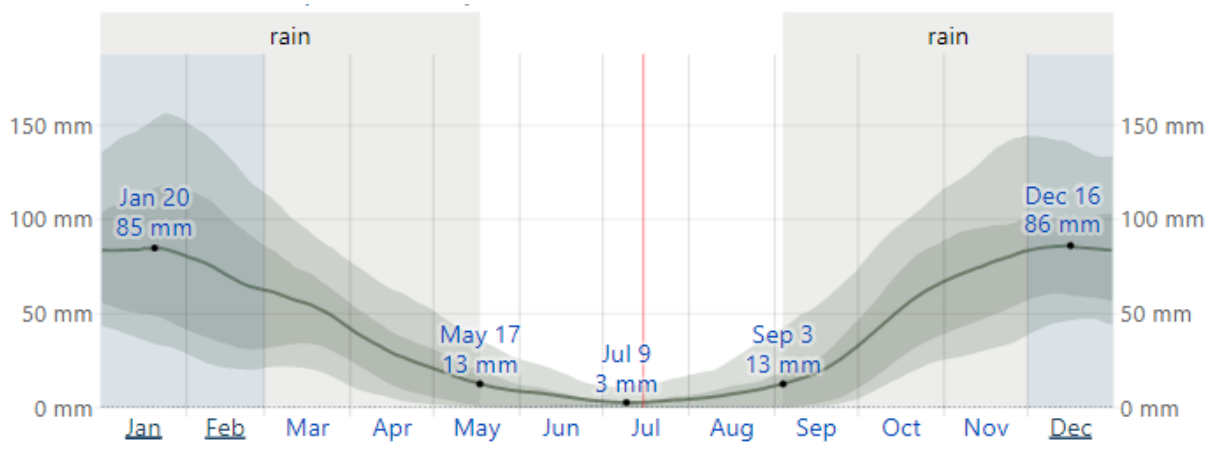


Figure 29: Average monthly precipitation in Parys
(Copyright © 2022 https://weatherspark.com/y/94201/Average-Weather-in-Parys-South-Africa-Year-Round)

11.4 Geology and Soil

The Project Area falls within the core area of the Vredefort Dome, a unique geological feature formed approximately 2 million years ago and is the oldest and largest meteorite impact structure on earth and is underlain by the Karoo Supergroup.

As shown in **Figure 30** below, the PV Site geology is dominated by Meinhardskraal Granite and Sand River Gneiss.

Soil types are characterised by imperfectly drained soils, often shallow and often with a plinthic horizon, which may be seasonally wet over the majority of the southern parts of the site. The northern areas of the site are characterised by structureless and textural contrast soils, which may have favourable physical properties, somewhat high natural fertility; relative wetness favourable in dry areas. The limitation associated with these soils are restricted depth, imperfect drainage, high erodibility; slow water infiltration; and seasonal wetness.

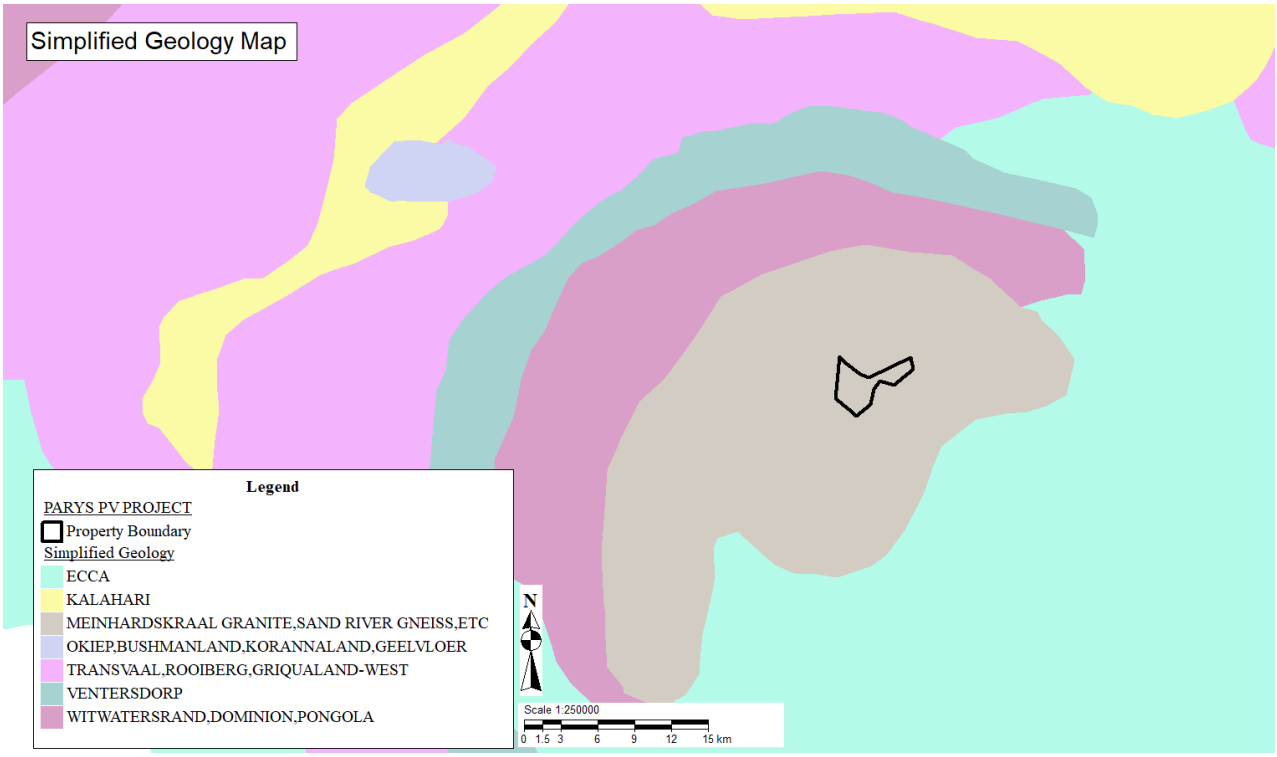


Figure 30: Geology description

11.5 Topography

The general topography of the study area (see **Figure 31** below) can be described as a relatively flat terrain with hills, which form part of the Vredefort Dome, running along the northern perimeter of the 15 km site buffer. Overall, the surface elevation varies between 1 326 meters above mean sea level (mamsl) and 1 647 mamsl within 15 km of the proposed project area. In terms of the SOTER database (see **Figure 32** below), the landform encountered over most of the PV Site is characterised as a plain at a medium level.

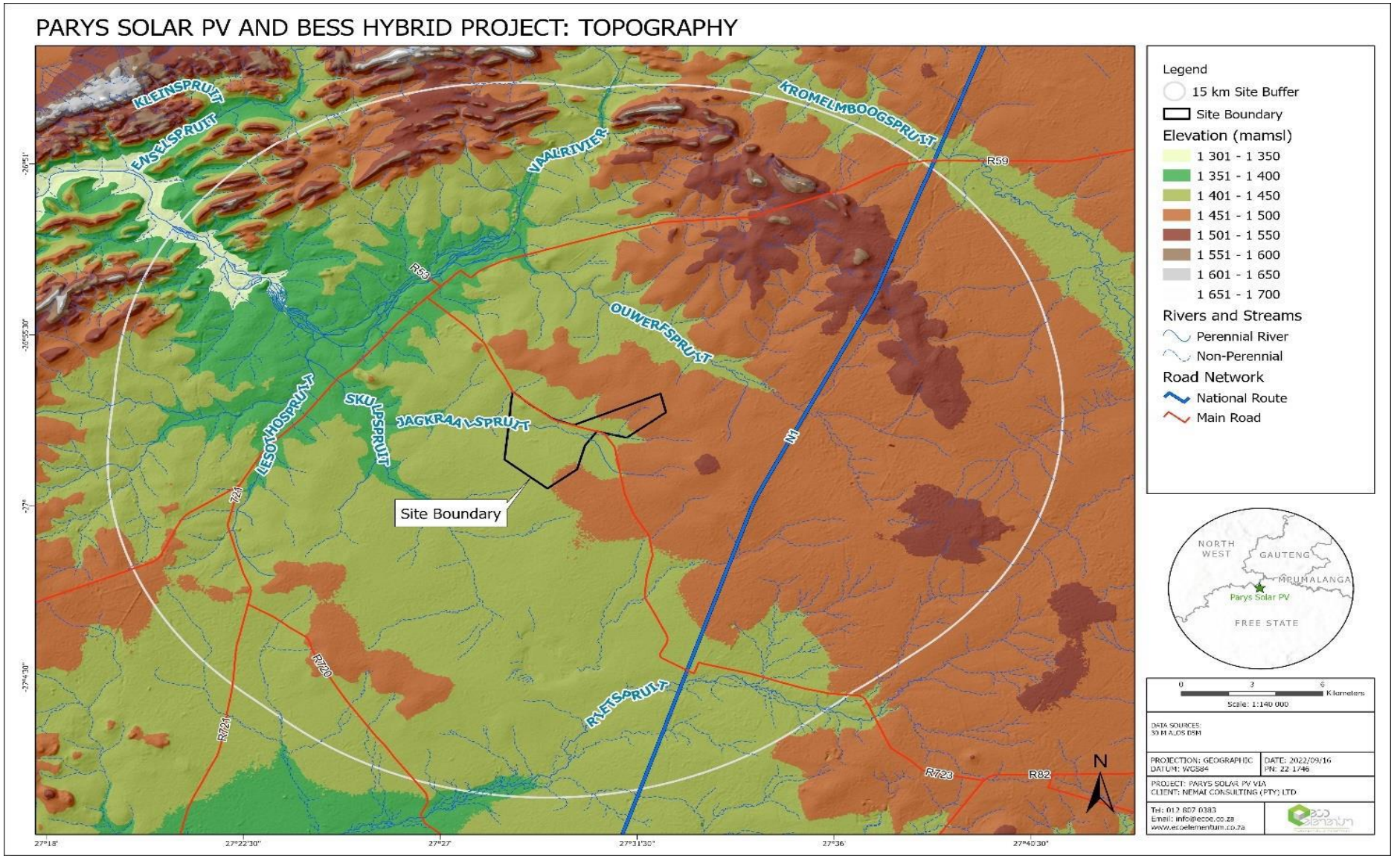


Figure 31: Topography

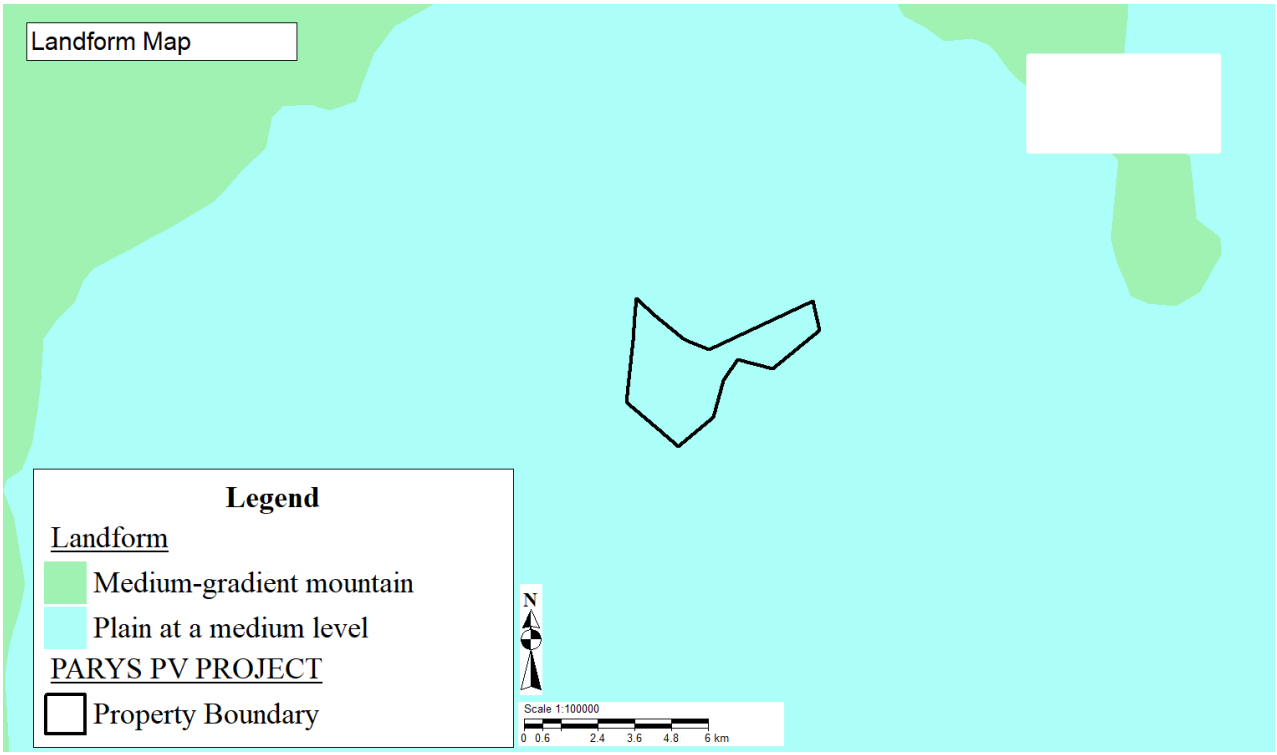


Figure 32: SOTER Landforms

The elevation profiles of the PV Site are as follows (see **Figure 33** below):

- From west to east the elevation rises from 1433m to 1477m above sea level over a distance of approximately 6.6km; and
- From north to south the elevation rises from 1433m to 1457m above sea level over a distance of approximately 2.3km.

The main topographical feature on the site is a watercourse, the Jagkraalspruit, that flows east to west across the property. This watercourse was delineated as part of the Wetland Delineation and Risk Assessment that is included in **Section 12.3.**

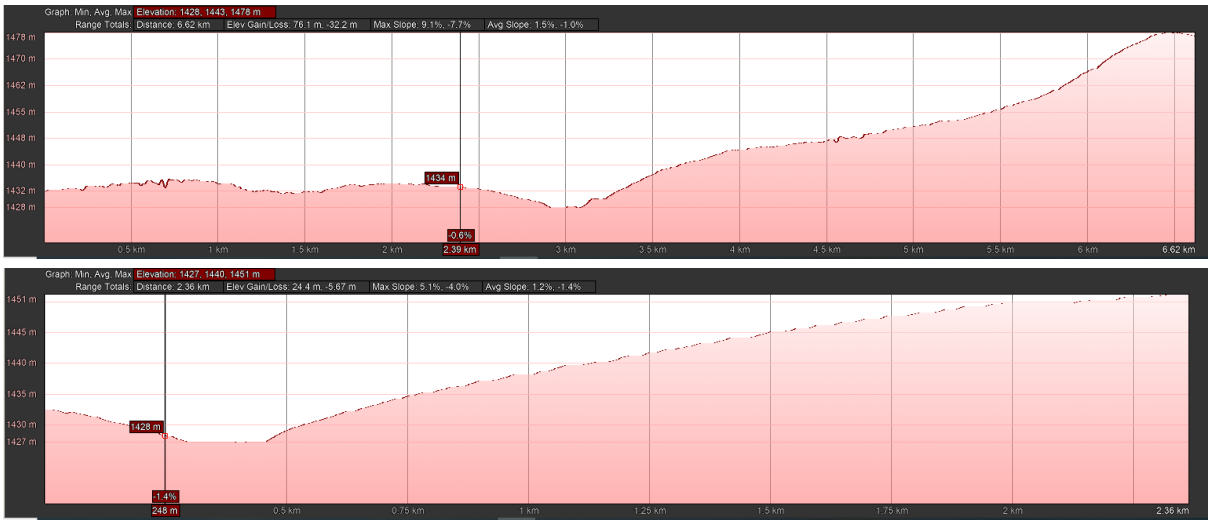


Figure 33: Map of site profiles – Top: west to east; and Bottom: north to south

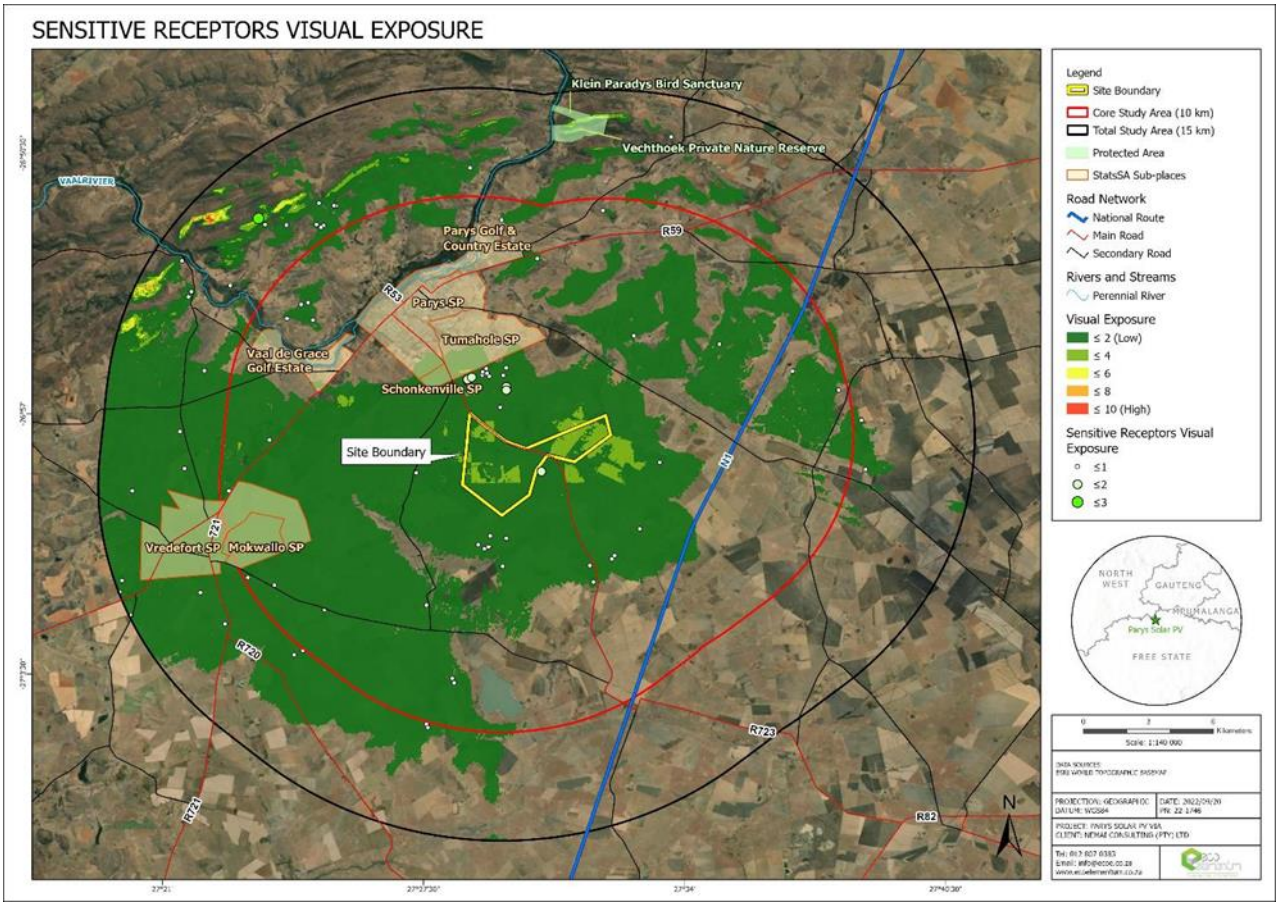


Figure 34: **Visual exposure and sensitive receptors – showing the level of visual exposure potentially experienced by identified sensitive receptors**

Figure 34 above shows that the identified homesteads/schools/recreational facilities/accommodation are expected to experience low levels of visual exposure. The figure also indicates that the identified subplaces are expected to experience low to no levels of visual exposure. Furthermore, the Klein Paradys Bird Sanctuary is not expected to experience any level of visual exposure however, the northern boundary of the Vechthoek Private Nature Reserve is expected to experience medium levels of visual exposure. Lastly, the identified road network is expected to experience low to no levels of visual exposure. Overall, the proposed project is expected to have a low visual impact on the identified sensitive receptors.

11.6 Surface Water

The information contained in the sub-sections to follow was extracted from the Wetland Delineation and Risk Assessment (Clark, 2022a). The specialist report is contained in **Appendix E1**.

11.6.1 Quaternary Catchments and Water Management Areas

The Project Area is situated in the C23C Quaternary Catchment, which falls within the Vaal Water Management Area (WMA). The Project Area drains into the perennial Jagkraalspruit, which flows westward through the site. The Jagkraalspruit joins the Skulpspruit and Lesothospruit before

flowing into the Vaal River. Watercourses in the Project Area are shown in **Figure 35** and **Figure 36** below.

According to the findings from the National Web Based Environmental Screening Tool, an area of very high sensitivity in terms of aquatic biodiversity occurs in the PV Site, which is associated with wetlands. The remainder of the site shows low sensitivity (see **Figure 37** below). The layout was amended to attempt to avoid the high sensitivity areas as far as possible.

11.6.2 National Freshwater Ecosystem Priority Area Status

To better conserve aquatic ecosystems, South Africa has categorised its river and wetland systems according to set ecological criteria to identify Freshwater Ecosystem Priority Areas (FEPAs) (Driver *et al.,* 2011). The FEPAs are intended to be conservation support tools and envisioned to guide the effective implementation of measures to achieve the National Environment Management Biodiversity Act (NEM:BA) biodiversity goals (Nel *et al.,* 2011). **Figure 38** shows the location of the project area in relation to wetland FEPAs. Based on this information, the project area does not overlap with any class 1 FEPA Rivers but does overlap one small FEPA wetland, a small depression in the south-east of the project area.

11.6.3 National Wetland Map 5

The National Wetland Map 5 spatial data was published in October 2019 (Deventer et al. 2019) in collaboration with SANBI with the specific aim of spatially representing the location, type and extent of wetlands in South Africa. The data represents a synthesis of a wide number of official watercourse data including rivers, inland wetlands and estuaries. This database recognises the presence of the small pan in the south-eastern corner of the project area and classifies it as a Least Concern Dry Highveld Grasslands Depression (**Figure 39**).

11.6.4 Free State Biodiversity Dry Highveld Grasslands Conservation Plan

The Free State Conservation Plan classified areas within the province on the basis of its contribution to reach the conservation targets within the province. These areas are classified as Critical Biodiversity Areas (CBAs) and Ecological Support Areas (ESAs) to ensure sustainability in the long term. The CBAs are classified as either ‘Irreplaceable’ (must be conserved), or ‘Important’. Critical Biodiversity Areas (CBAs) are terrestrial and aquatic areas of the landscape that need to be maintained in a natural or near-natural state to ensure the continued existence and functioning of species and ecosystems and the delivery of ecosystem services. Thus, if these areas are not maintained in a natural or near natural state then biodiversity targets cannot be met. According to this spatial dataset, part of the valley-bottom wetland and surrounding grasslands near the access gate is classified as CBA2. Most non-cultivated areas are classified as Other Natural Areas or ONAs while all croplands are classified as Degraded (**Figure 40**).

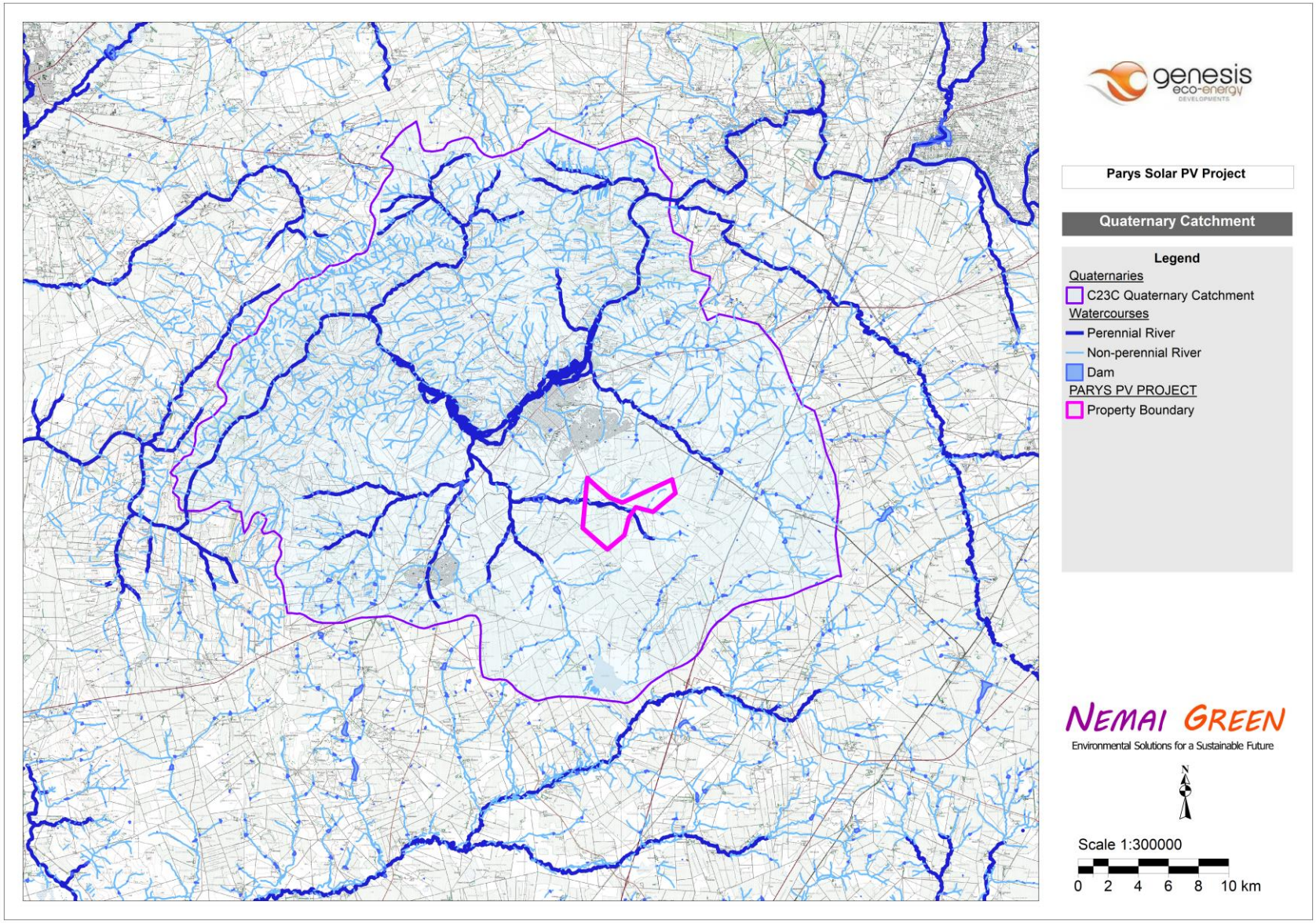


Figure 35: **Quaternary catchment and watercourses – regional map**

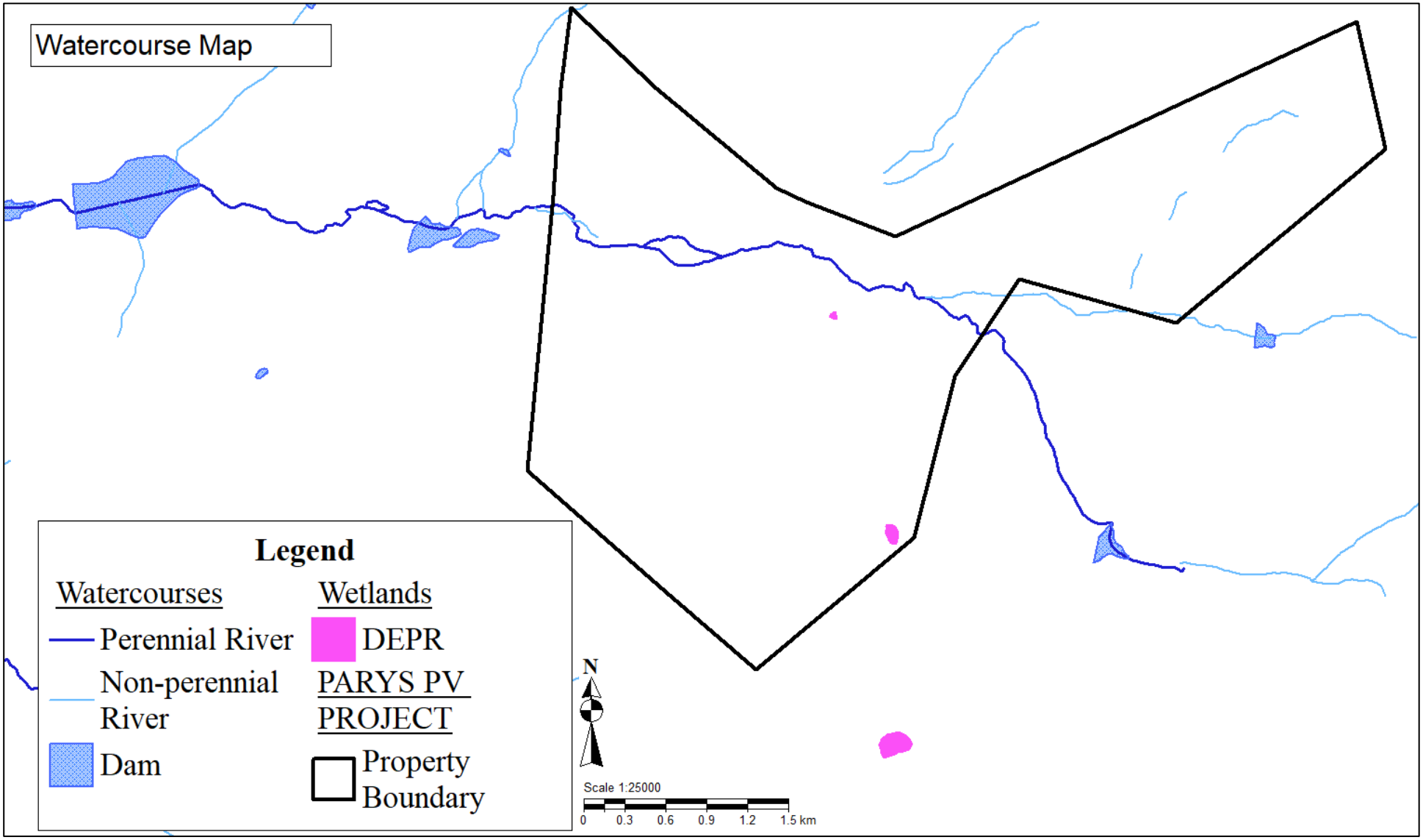


Figure 36: Watercourses in Project Area

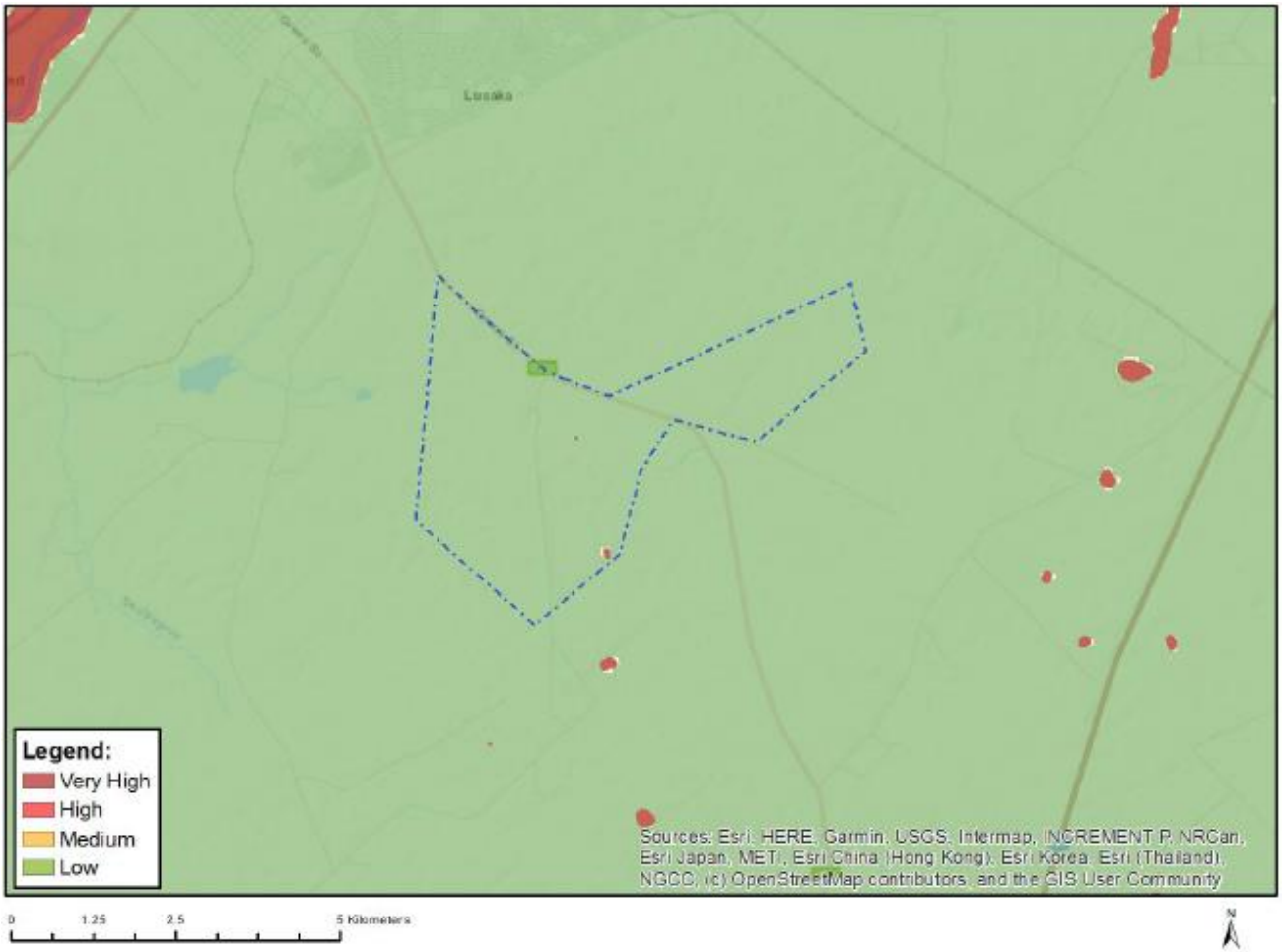


Figure 37: Map of Relative Aquatic Biodiversity Theme Sensitivity

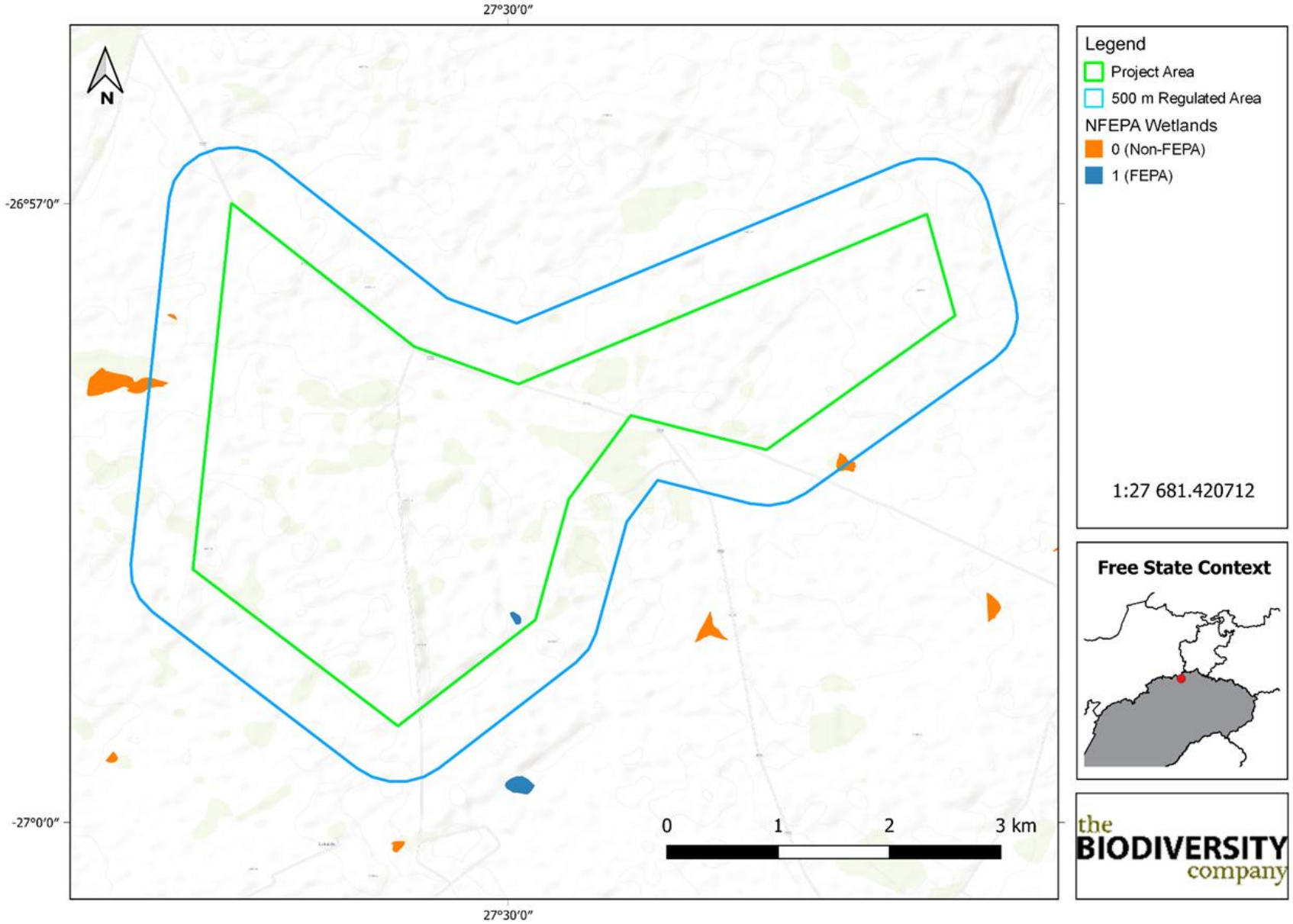


Figure 38: **NFEPA Rivers and Wetlands (no NFEPA listed Rivers occur within the 500m regulated area)**

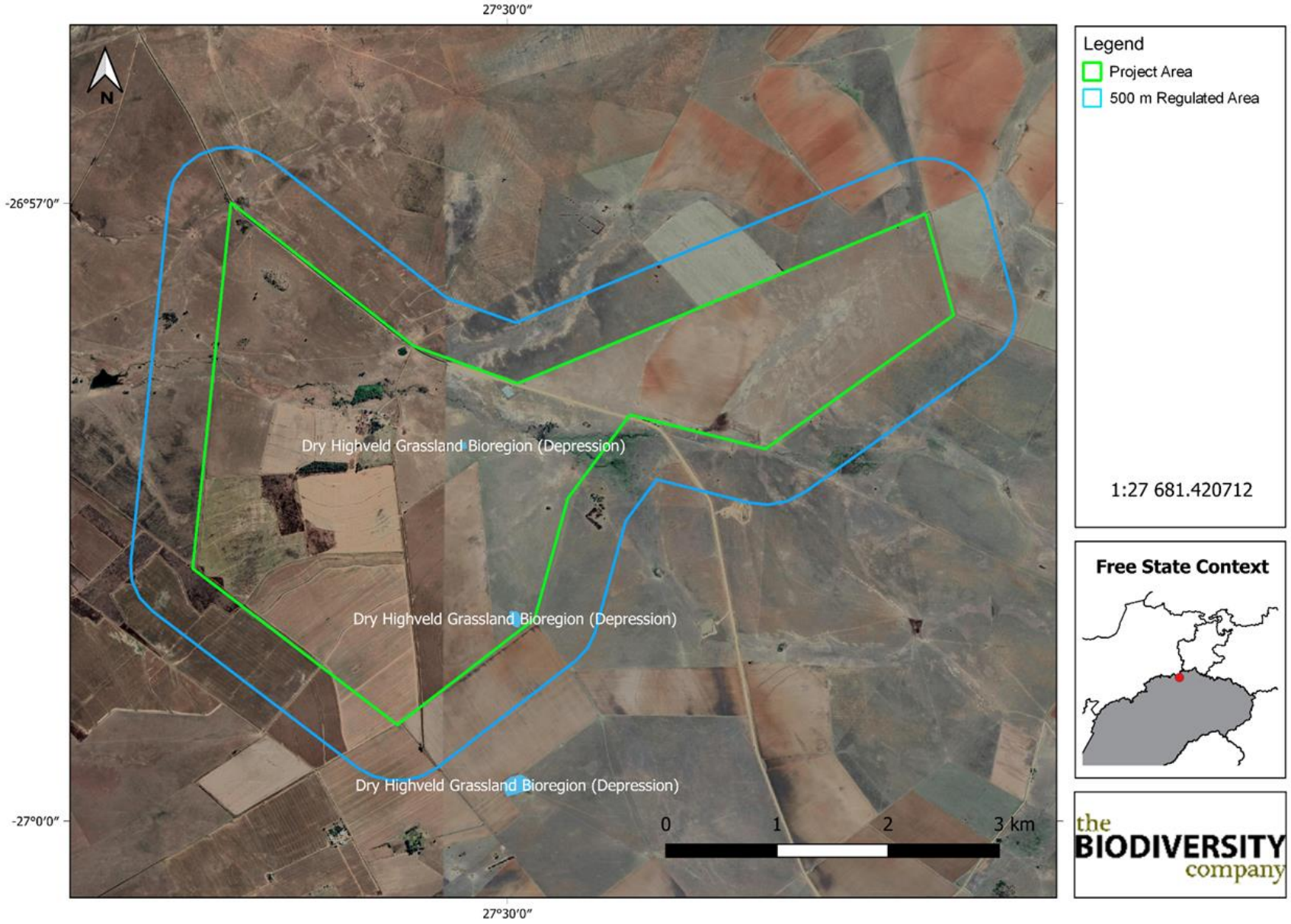


Figure 39: **National Wetland Map 5**

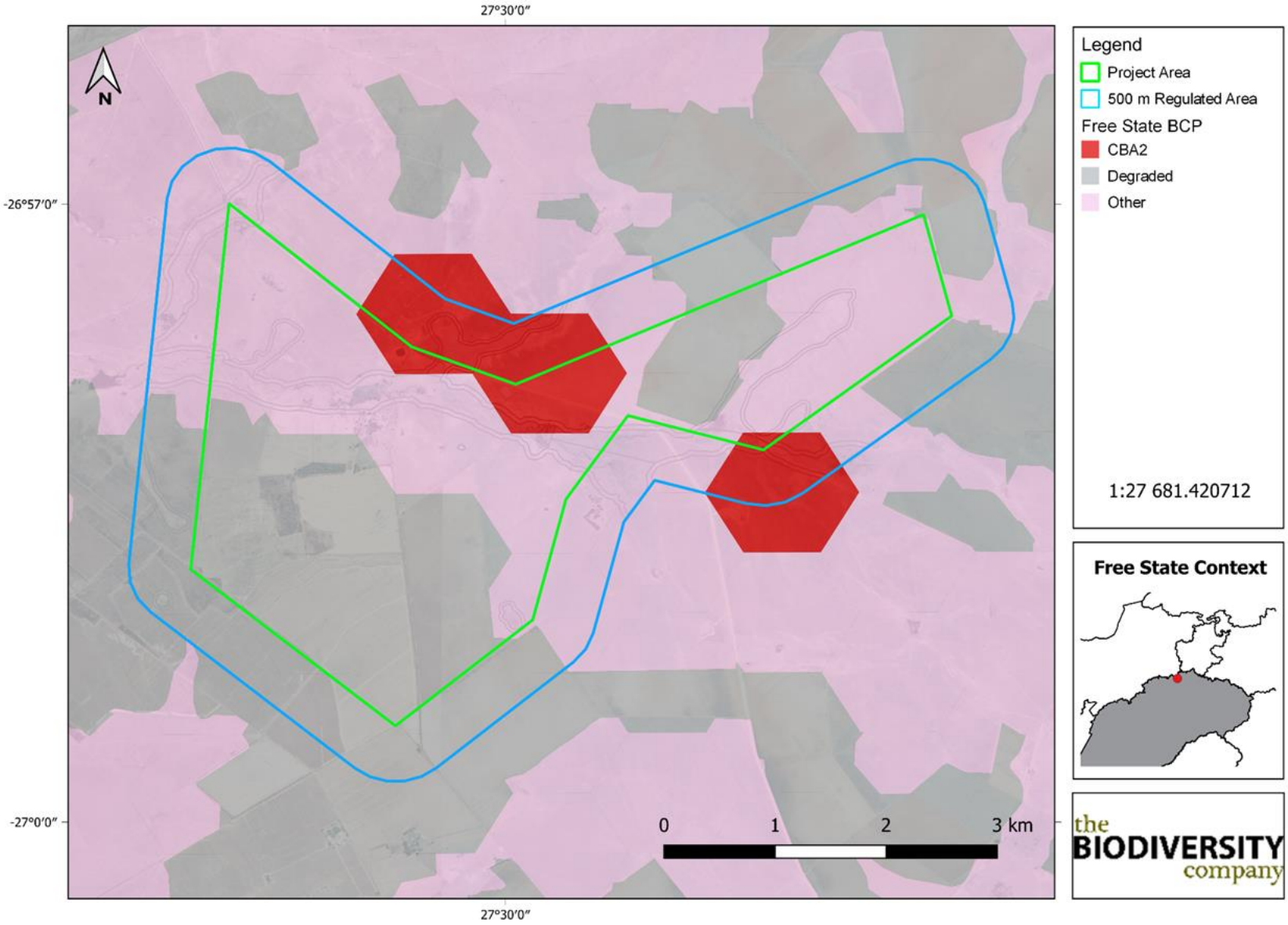


Figure 40: **Free State Biodiversity Conservation Plan**

11.7 Flora & Fauna

11.7.1 Biomes and Vegetation Types

The proposed PV Site falls in the Grassland Biome and the vegetation type found in the Project Area is the Vredefort Dome Granite Grassland (Gh 11) (Mucina and Rutherford, 2006) (see **Figure 41** below). The Vredefort Dome Granite Grassland listed as a Vulnerable (VU) vegetation type.

According to the findings from the National Web Based Environmental Screening Tool, the Project Area has low sensitivity in terms of the relative plant species theme. The site has been affected by historical agricultural activities, which will be evaluated further as part of the Terrestrial Ecological Impact Assessment during the EIA Phase (Refer to **Appendix C** for the Screening Tool Report).

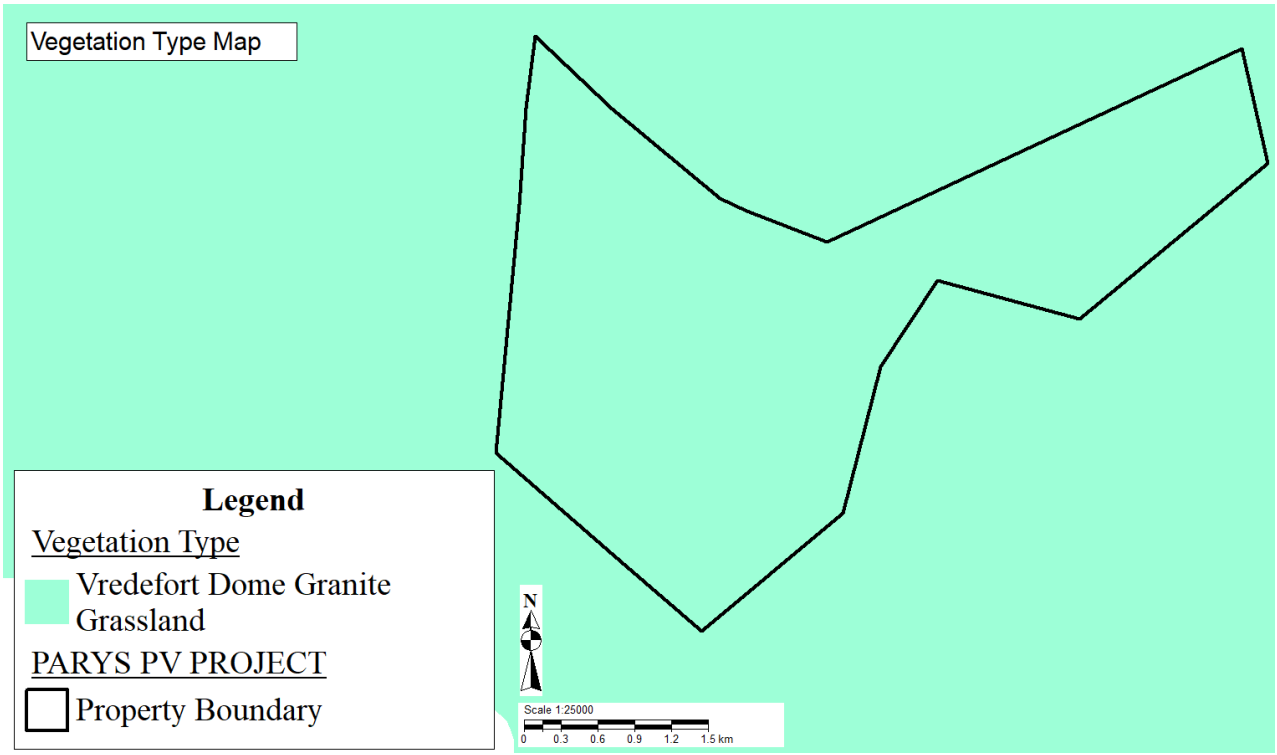


Figure 41: Vegetation types in relation to the Project Area

11.7.2 Threatened Terrestrial Ecosystems

In terms of Section 52(1)(a) of NEM:BA, a national list of ecosystems that are threatened and in need of protection was gazetted on 9 December 2011. The list classified all threatened or protected ecosystems in South Africa in terms of four categories; Critically Endangered (CR), Endangered (EN), Vulnerable (VU), or Protected. The purpose of categorising these ecosystems is to prioritise conservation areas in order to reduce the rates of ecosystem and species extinction, as well as preventing further degradation and loss of structure, function, and composition of these ecosystems. According to the South African National Biodiversity Institute (SANBI) (2011), the Project Area falls within a threatened ecosystem, which is the Vredefort Dome Granite Grassland that is listed as a VU.

'Ecosystem protection level' is an indicator of how adequately an ecosystem is protected or not. Ecosystems can be classified as not protected, poorly protected, moderately protected or well protected depending on the proportion of each ecosystem that is under conservation management within a protected area, as recognized in the National Environmental Management: Protected Areas Act (Act No. 57 of 2003) (NEM:PAA). These protected areas include state or privately-owned protected areas as well a land under biodiversity stewardship agreements. According to the National Biodiversity Assessment (2018), the project area falls within the area listed as **Not Protected** on a national scale.

According to the findings from the National Web Based Environmental Screening Tool (**Figure 42**), the relative terrestrial biodiversity theme sensitivity for the PV Site is very high due to the footprint within a vulnerable ecosystem and a CBA2. The relative Plant Species theme showed a low sensitivity for the entire site, and the Animal Species theme showed both low and medium sensitivities. The medium sensitivity was attributed to the potential presence of *Hydrictis maculicollis* (spotted-necked otter) and *Ourebia ourebi* (oribi) (Refer to **Appendix C** for the Screening Tool Report).

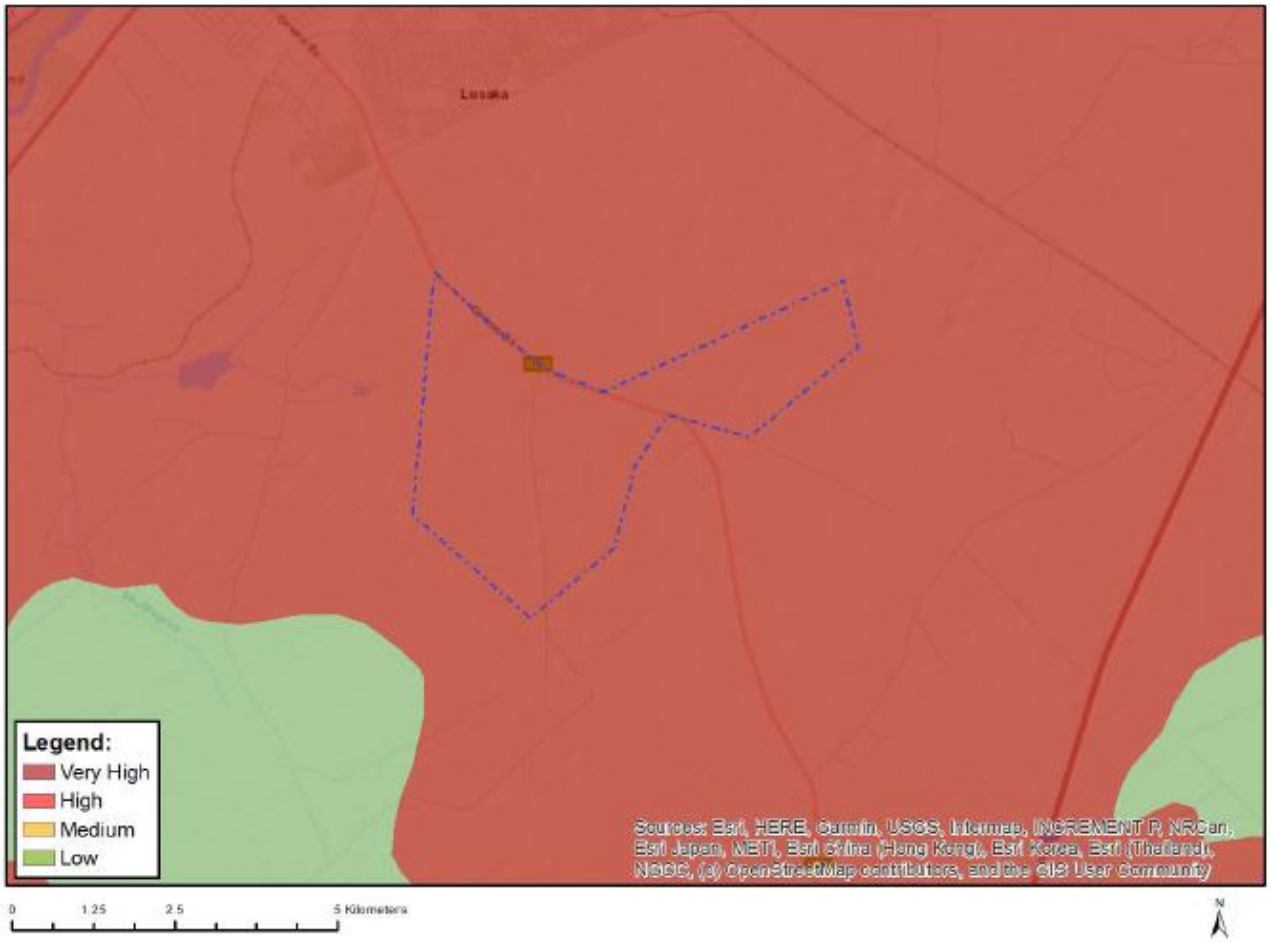


Figure 42: Map of Relative Terrestrial Biodiversity Theme Sensitivity

11.7.3 Ecosystem Threat Status

The Ecosystem Threat Status is an indicator of an ecosystem's wellbeing, based on the level of change in structure, function or composition. Ecosystem types are categorised as Critically Endangered (CR), Endangered (EN), Vulnerable (VU), Near Threatened (NT) or Least Concern (LC), based on the proportion of the original extent of each ecosystem type that remains in good ecological condition. According to the spatial dataset, the proposed project area overlaps with a VU ecosystem (**Figure 43**).

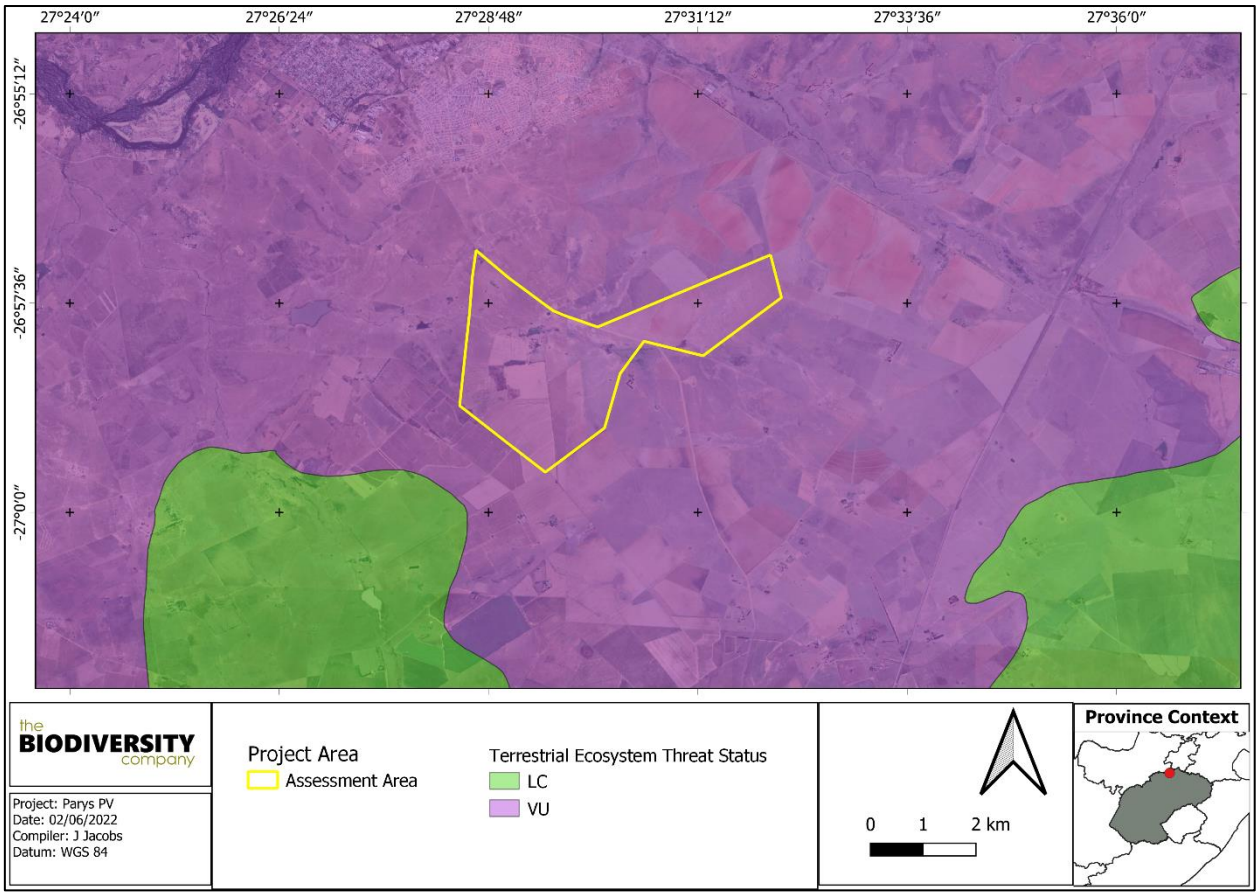


Figure 43: Map illustrating the ecosystem threat status associated with the project area.

11.7.4 Ecosystem Protection Level

This is an indicator of the extent to which ecosystems are adequately protected or under-protected. Ecosystem types are categorised as Well Protected (WP), Moderately Protected (MP), Poorly Protected (PP), or Not Protected (NP), based on the proportion of the biodiversity target for each ecosystem type that is included within one or more protected areas. NP, PP or MP ecosystem types are collectively referred to as under-protected ecosystems. The proposed project overlaps with a Not Protected ecosystem (**Figure 44Error! Reference source not found.**).

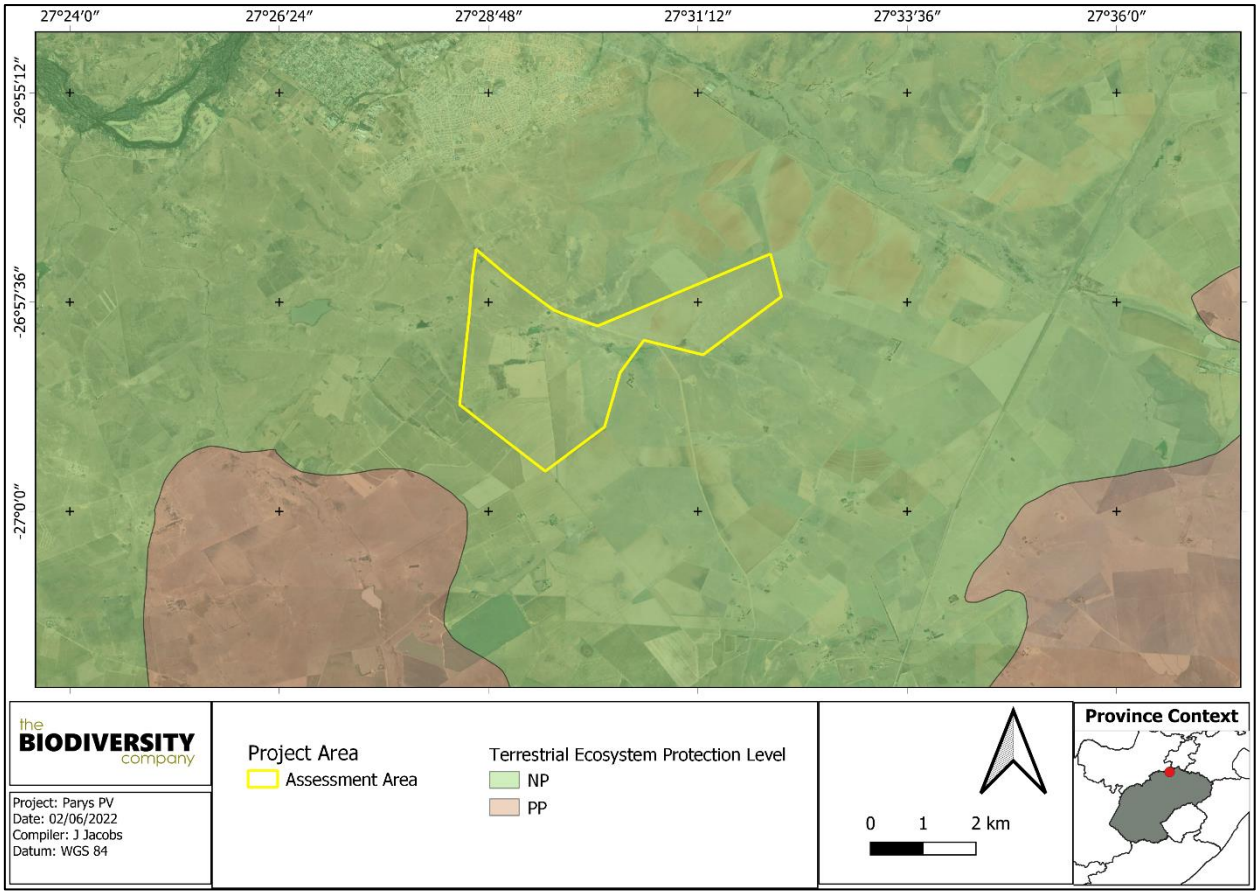


Figure 44: Map illustrating the ecosystem protection level associated with the project area

11.7.5 Protected Areas

The aim of NEM:PAA is to provide for the protection and conservation of ecologically viable areas representative of SA's biological diversity and natural seascapes.

According to the South Africa Protected Areas Database (SAPAD_OR_2021_Q4), the nearest formally protected areas to the Project Area include the following (refer to **Figure 45** below):

- Chazen Game Lodge (± 19 km to the west);
- Nooitgedacht Private Nature Reserve (± 24 km to the west);
- Venterskroon Private Nature Reserve (± 22 km to the northwest);
- Vechthoek Private Nature Reserve (± 13 km to the north);
- Cloudy Creek Bird Sanctuary and Nature Reserve (± 22 km to the northeast); and
- Leeuwspruit Private Nature Reserve (± 29 km to the northeast).

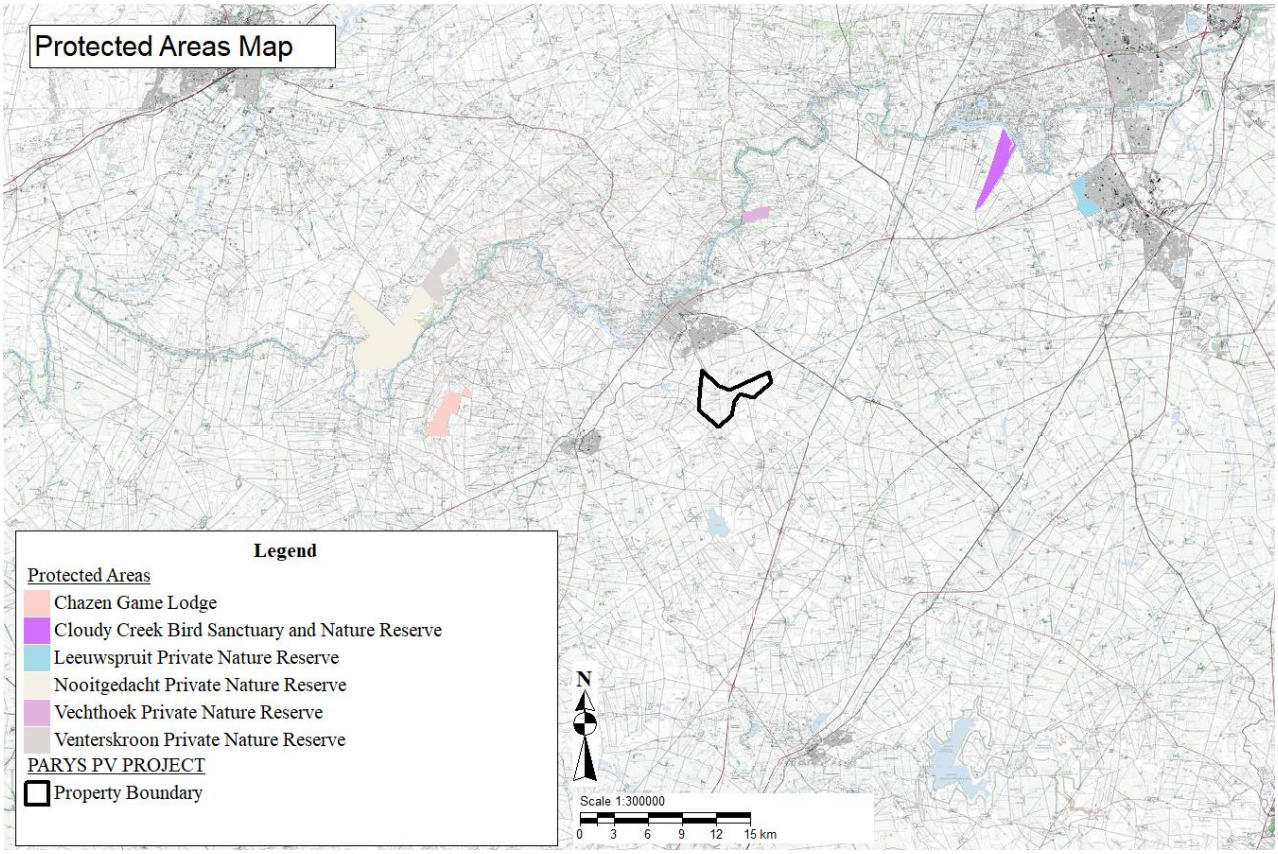


Figure 45: Protected areas in relation to the Project Area

11.7.6 Free State Biodiversity Plan

The Free State Biodiversity Plan (2015) (Collins, 2016) shows Critical Biodiversity Areas (CBAs) and Ecological Support Areas (ESAs). CBAs are important for conserving biodiversity while ESAs are important to ensure the long-term persistence of species or functioning of other important ecosystems. Degradation of CBAs or ESAs could potentially result in the loss of important biodiversity features and/or their supporting ecosystems.

The project location in relation to CBA's are shown in **Figure 46**. The project falls predominately over an area designated as 'other' and 'degraded', with a small section within a CBA2. Ground truthing of these areas, in terms of their actual status, were undertaken as part of the Terrestrial Ecological Impact Assessment in the EIA Phase.

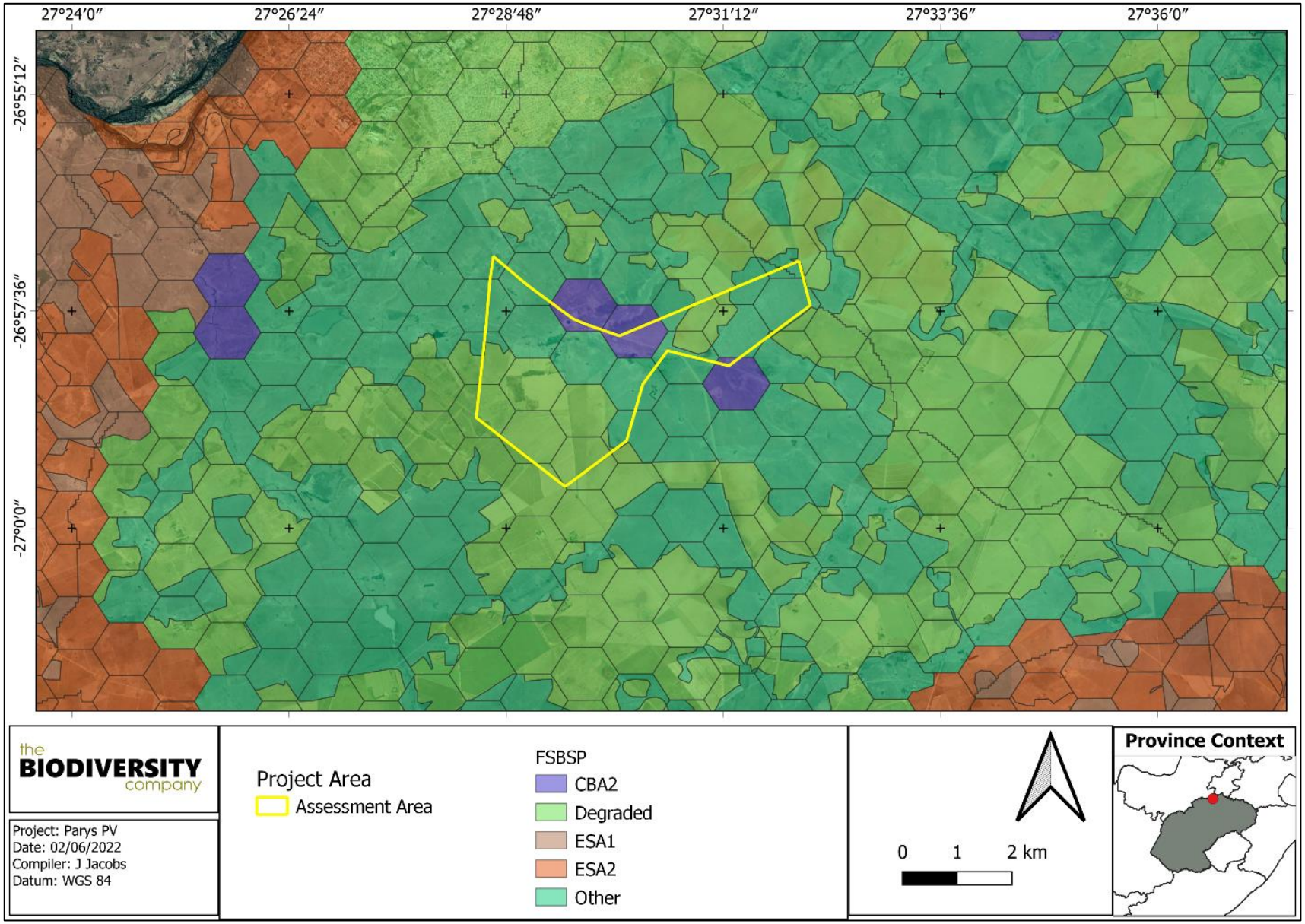


Figure 46: Map illustrating the locations of CBAs in the project area

11.7.7 Important Bird & Biodiversity Area

The Important Bird & Biodiversity Area (IBA) programme of southern Africa (Barnes, 1998) identifies 124 IBAs in South Africa. IBAs are places of international significance for the conservation of birds and other biodiversity and are sites that together form part of a wider, integrated approach to the conservation and sustainable use of the natural environment. There are no IBA's within a 20km radius of the Project Area. The closest IBA is the Suikerbosrand Nature Reserve, which is 77km northeast from the site.

According to the findings from the National Web Based Environmental Screening Tool, the PV Site has a high sensitivity in terms of the relative avian theme (**Figure 47**) due to a known Cape Vulture restaurant site within 20 km of the proposed Project. This was assessed as part of the Avifaunal Impact Assessment during the EIA Phase.

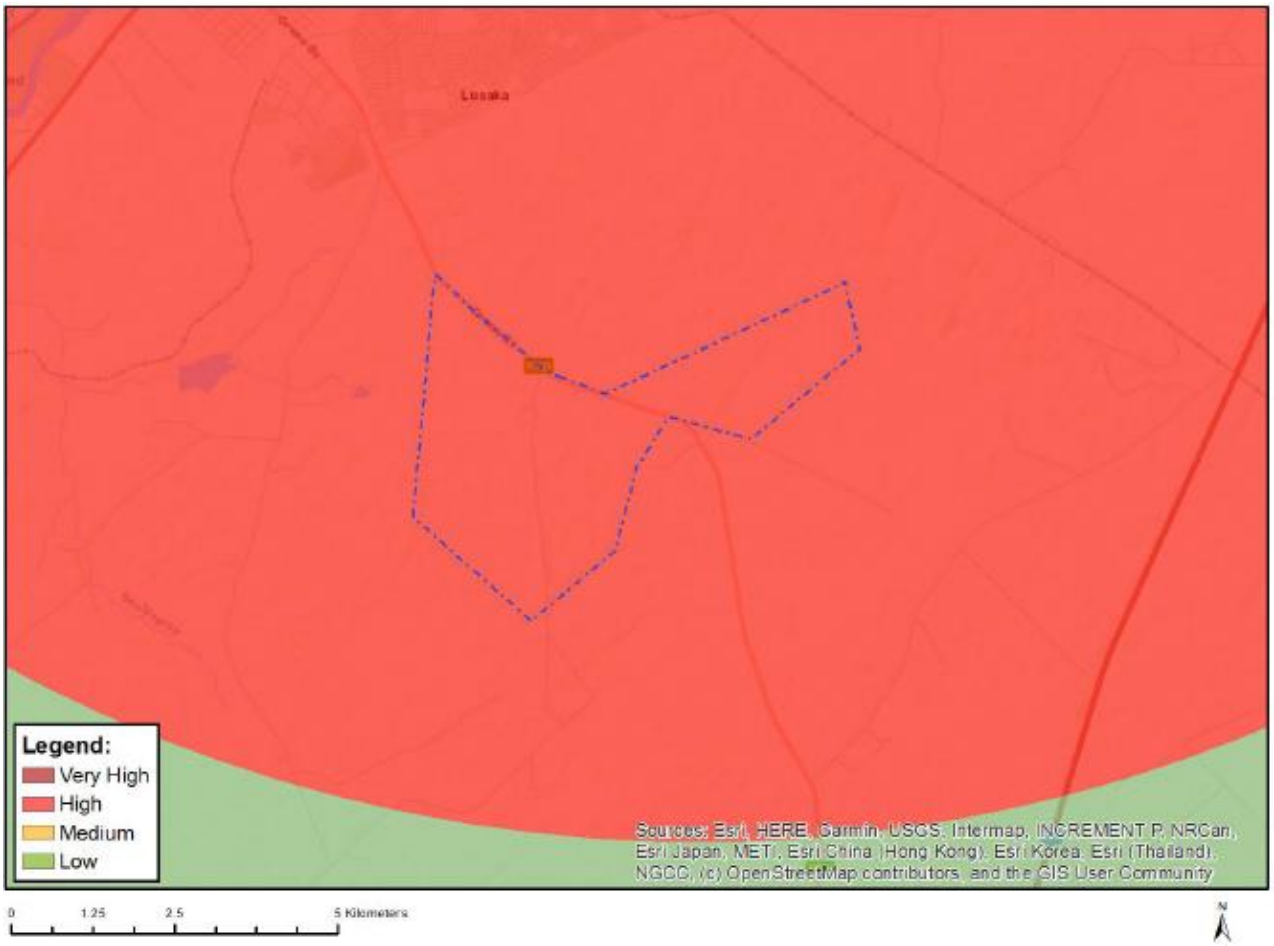


Figure 47: Map of Relative Avian Theme Sensitivity

11.8 Socio-Economic Environment

The following information was sourced from the Fezile Dabi DM and Ngwathe LM IDPs.

- **Demographic Profile –**
  - Ngwathe LM experienced a negative growth from 1996 to 2001, with an increase in growth rate from 2001 to 2011. Overall, the population has stayed relatively constant over the past 20 years.
  - According to 2016 statistics, the majority of the municipality consists of a black African population (104507 people) and white population (11299) with only small numbers representing coloured and Indian/Asian populations (3039 and 61 respectively).
  - Gender was recorded as relatively equal between male and female.
  - The NLM consists of a relatively young population, with the most numerous age group between 10 – 19 years old according to the 2011 census data.
  - The number of people who have completed grade 12, as well as those who havehas increased from 1996 to 2011, and the number of people who have no schooling has decreased over the same period.
  - The average number of households has increased from 2001 to 2011, but the average household size has decreased.
- **Economic and Employment Profile –**
  - According to the NLM IDP, the unemployment rate in the municipality was high in 2011 at 35%. Although high in 2011, there was an improvement as unemployment had decreased from the highest unemployment rate experienced in 2001.
  - The number of households using electricity for cooking, heating and lighting has increased dramatically from 1996 (approximately 30%) to 2011 (approximately 88%). The percentage of households connected to electricity infrastructure in 2016 increased to 95%.
  - The proportion of households with access to piped water improved from 1996 to 2011 with 94% of households having piped water access in 2016.
  - Due to the dominant regional role Parys and Heilbron play in terms of regional service providers and industrial and commercial development, the focus of urbanisation will probably be on these centres.
  - Parys with its strong service character and prominent commercial and industrial components, will remain the main town and growth point of the region and will continue to render various services to the surrounding smaller towns and rural areas.
  - Ngwathe has a significant weekend related tourism potential that could, in future, contribute to the GGP of the district and should be further exploited.
  - The agricultural sector of certain areas in the district is extremely prominent and contributes largely to the GGP of the Fezile Dabi District, which emphasize the agricultural significance of this district. The latter results to industrial development that is agricultural orientated.
  - According to the Ngwathe LM IDP (2022), a key opportunity identified within the municipality is PV power generation.

11.9 Agriculture

The Project's PV Site is used currently for livestock farming and dryland cultivation (**Figure 48**); and was historically used for agricultural purposes.

According to the findings from the National Web Based Environmental Screening Tool, areas of high and medium sensitivity in terms of the relative agriculture theme occur in the Project Area (see **Figure 49** below). The PV layout was adjusted to avoid high sensitive areas as far as possible. The agricultural sensitivity and impacts were assessed through the Agriculture Impact Assessment in the EIA Phase.

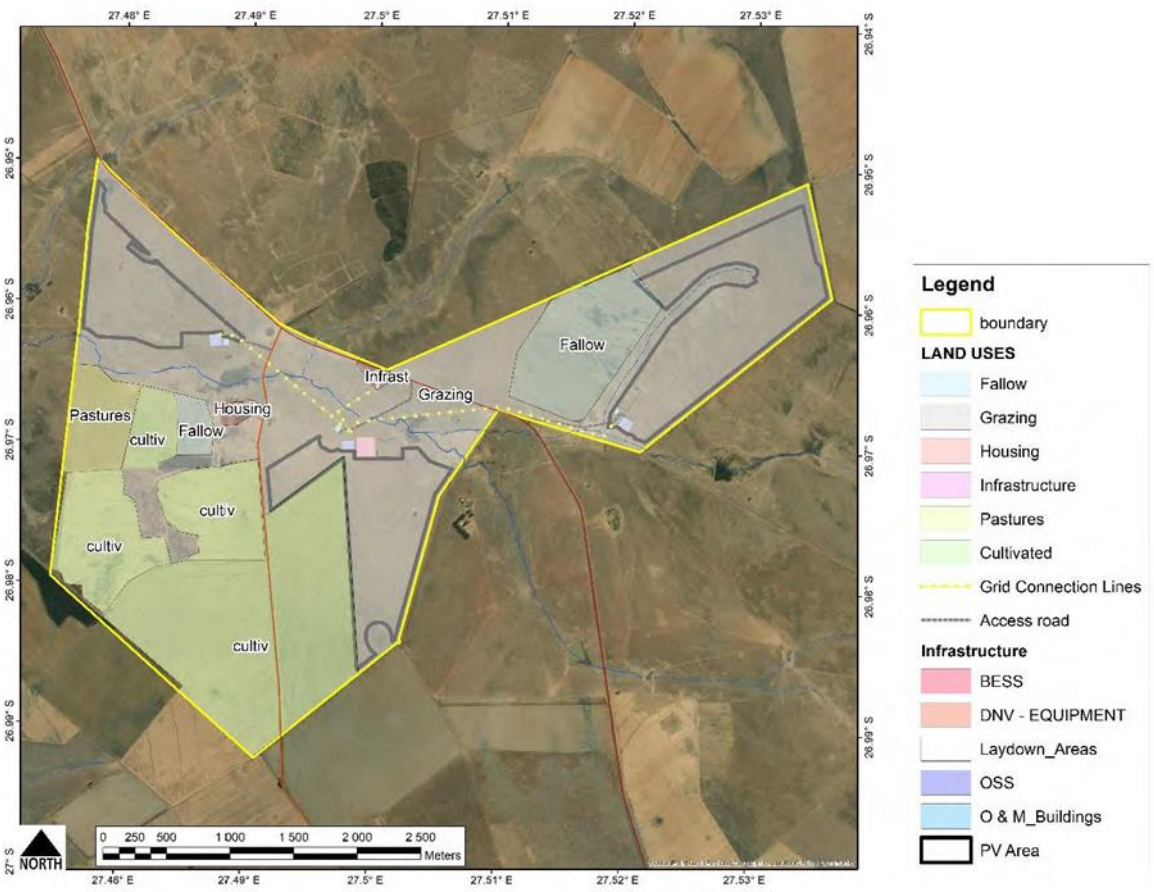


Figure 48: Present land uses of the total site

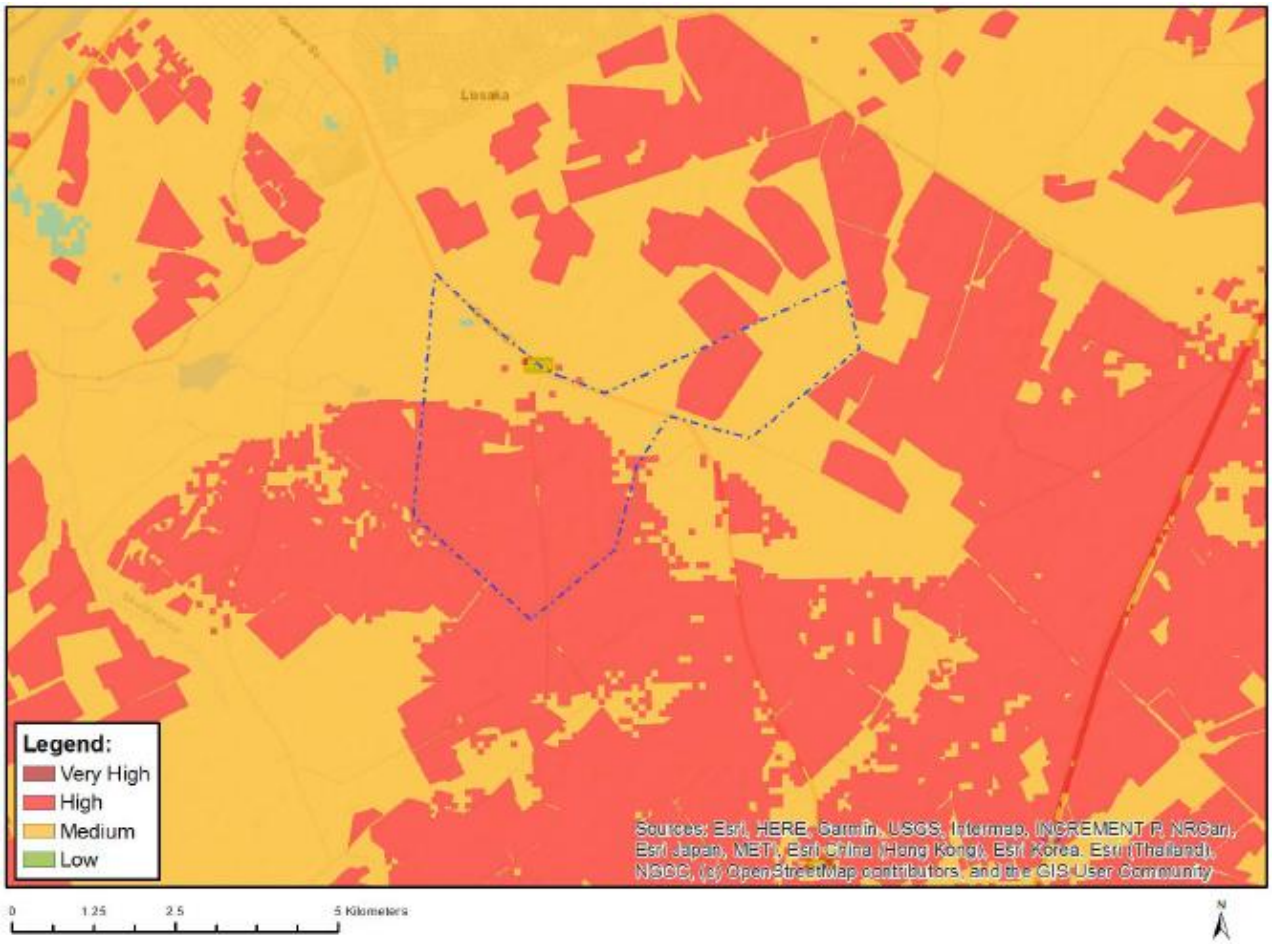


Figure 49: Map of Relative Agriculture Theme Sensitivity

The findings from the Agricultural Impact Assessment that was undertaken for the Project are contained in **Section 12** below.

11.10 Air quality

Potential sources of air pollution in the region include the following:

- Fugitive dust emissions from agricultural activities and vehicles travelling on unpaved roads;
- Vehicle exhaust emissions from vehicles travelling on paved and unpaved roads, including on the R723 other surrounding roads such as N1 and in the town of Parys;
- Biomass burning (veld fires);
- Domestic fuel burning;
- Waste treatment and disposal; and
- Other fugitive dust sources such as wind erosion from exposed areas.

11.11 Noise

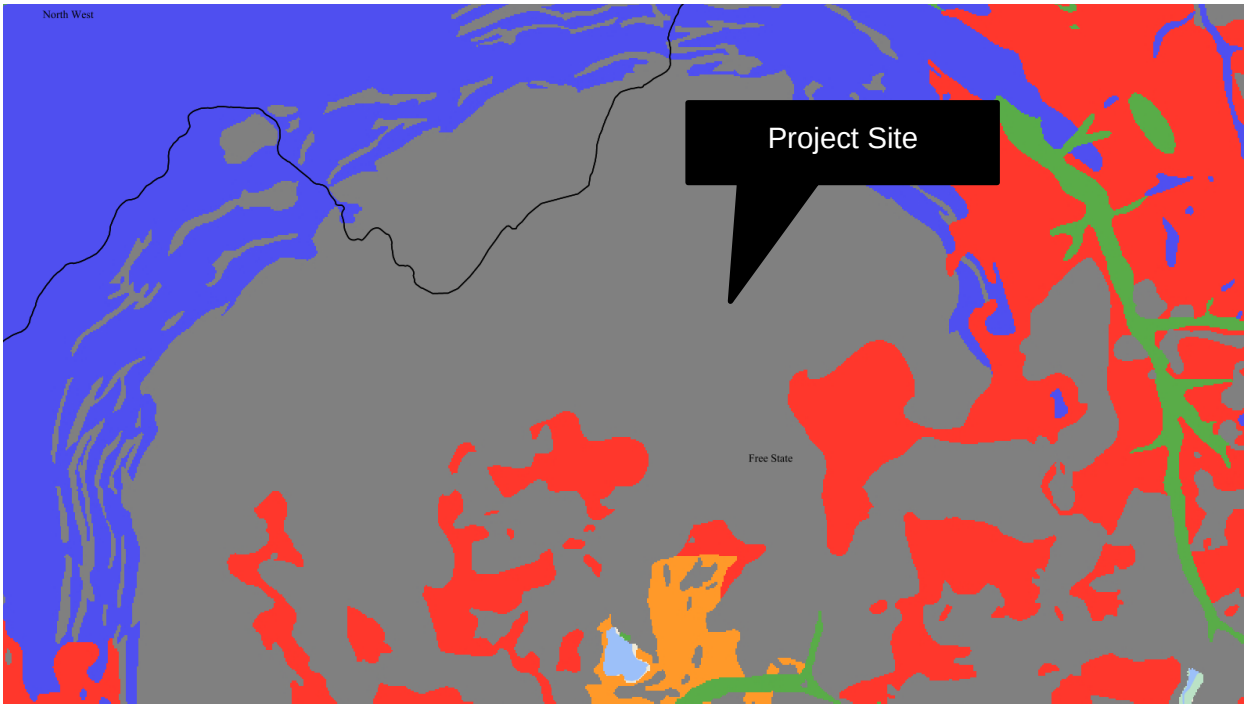
In terms of the local acoustical environment, the background noise levels are expected to be typical of a rural area. Noise in the greater area emanates primarily from farming operations (e.g., use of farming equipment) and vehicles on the surrounding road network.

11.12 Historical and Cultural Features

As seen in the 1985 aerial view of the PV Site in **Figure 50** below, the land was historically used for agricultural purposes. According to the Screening Tool relative archaeological and cultural heritage theme, the site has a low sensitivity. The presence of any heritage resources was confirmed as part of the Heritage Impact Assessment in the EIA Phase. The site falls within 10 km of the Vredefort Dome World Heritage Site.

Figure 50: Aerial view of the PV Site dating to 1985

According to the PalaeoMap of the South African Heritage Resources Information System (SAHRIS), the Palaeontological Sensitivity is insignificant or zero, and no palaeontological studies are required (see **Figure 51** below). According to the Screening Tool relative palaeontology theme, the site has a medium and high sensitivity (see **Figure 52** below). A desktop Palaeontological Impact Assessment was undertaken, however, in order to confirm desktop results (Refer to **Appendix C** for the Screening Tool Report).



Colour	Sensitivity	Required Action
RED	VERY HIGH	field assessment and protocol for finds is required
ORANGE/YELLOW	HIGH	desktop study is required and based on the outcome of the desktop study, a field assessment is likely
GREEN	MODERATE	desktop study is required
BLUE	LOW	no palaeontological studies are required however a protocol for finds is required
GREY	INSIGNIFICANT/ZERO	no palaeontological studies are required
WHITE/CLEAR	UNKNOWN	these areas will require a minimum of a desktop study. As more information comes to light, SAHRA will continue to populate the map.

Figure 51: SAHRIS PalaeoSensitivity Map

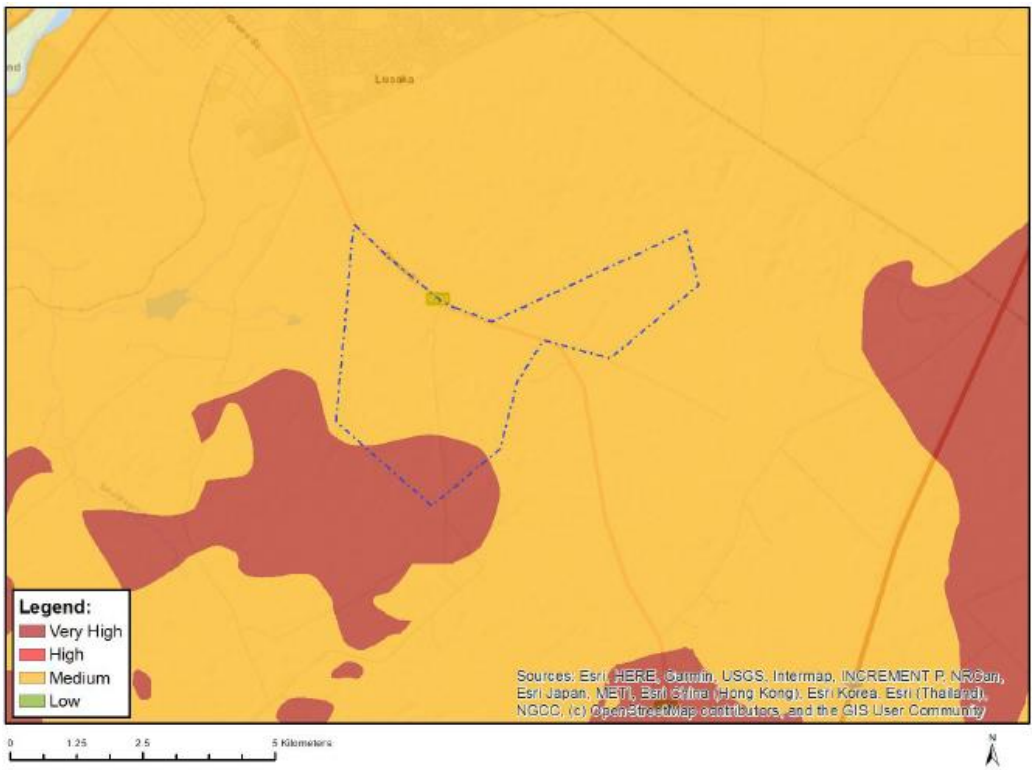


Figure 52: Map of Relative Palaeontology Theme Sensitivity

11.13 Planning

The following is noted from a planning perspective:

- The proposed power lines follow existing infrastructure as far as possible.
- The proposed PV Site and power line are located outside of the urban edge and should not impact on future urban expansion.
- In the event that the Solar PV Plant must be decommissioned, the decommissioning phase will include measures for complying with the prevailing regulatory requirements, rehabilitation and managing environmental impacts in order to render the affected area suitable for a future desirable use.
- No other renewable energy applications have been made within a 30km radius of the PV Site, according to DFFE's REEA Database (refer to **Section 6.8** above).
- According to the Ngwathe LM IDP (2022), a key opportunity identified within the municipality is PV power generation.
- The proposed PV Site is located approximately 8km to the south of a civil aviation aerodrome. According to the findings from the National Web Based Environmental Screening Tool, the PV Site has low sensitivity in terms of the relative civil aviation theme with only small portions of the northern section of the site falling within medium sensitivity.

11.14 Health

All health care services are located within the municipal urban nodes of the surrounding areas, most predominantly in Parys. The nearest hospital is the Parys District Hospital to the northwest of the Project Area. The site is largely un-serviced, and provision would need to be made for sanitation and water supply.

11.15 Existing Structures and Infrastructure

An existing overhead power line traverses the PV Site (see **Figure 53** below) in a southwest – northeast direction to the existing Eskom Parys Rural Substation, and further lines run between the substation and Parys (see **Figure 54** below). The setbacks / conditions required by the custodians of infrastructure on the PV Site and along the power line route will need to be adhered to.

Figure 53: North-eastern view of the PV Site showing existing power line

Figure 54: Western view along the R723 (PV Site on left-hand side)

11.16 Transportation

The Project area is rural in nature. The transportation network in the Project Area is shown in **Figure 55** below. The R723 runs through the Site. The Site falls midway between the N1 (approx. 5.5km to the east) and the R59 (approx. 5.5km to the west). A railway line runs to the west and north of the site. All other roads in the immediate area are unsurfaced farm roads.

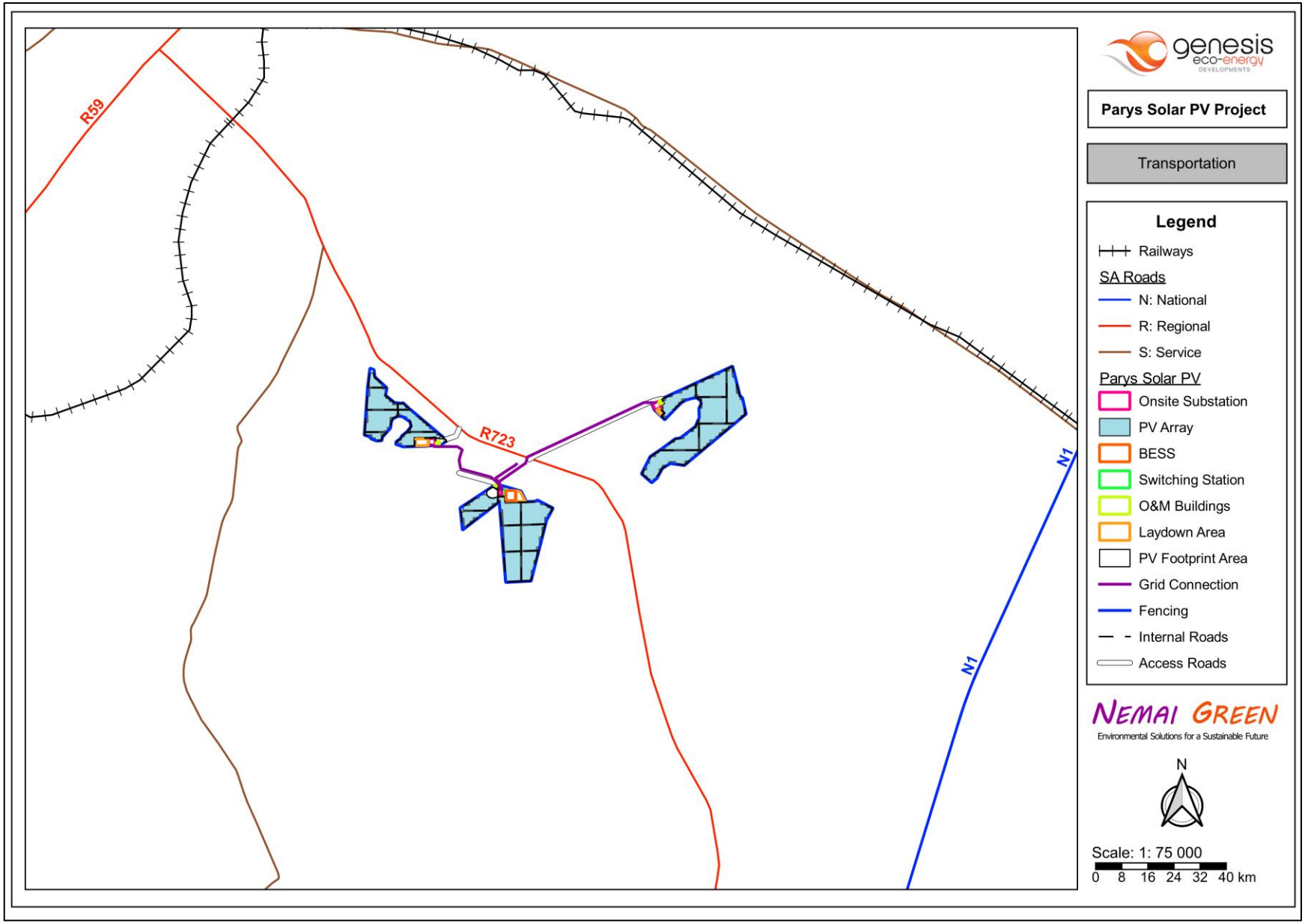


Figure 55: Transportation network

12 SUMMARY OF SPECIALIST STUDIES

12.1 Specialist Studies undertaken as part of the EIA

A crucial element of the Plan of Study for the EIA prepared during the Scoping phase was to provide the Terms of Reference for the requisite specialist studies triggered during Scoping. According to Münster (2005), a 'trigger' is "*a particular characteristic of either the receiving environment or the proposed project which indicates that there is likely to be an issue and/or potentially significant impact associated with that proposed development that may require specialist input*".

The requisite specialist studies 'triggered' by the findings of the Scoping process, aimed at addressing the key issues and compliance with legal obligations, include the following:

1. Wetland Delineation and Risk Assessment;
2. Terrestrial Biodiversity Compliance Statement;
3. Avifaunal Baseline and Impact Assessment;
4. Agricultural Impact Assessment;
5. Phase 1 Cultural Heritage Impact Assessment;
6. Paleontological Desktop Assessment;
7. Visual Impact Assessment; and
8. Social Impact Assessment.

Apart from the above listed specialist studies, a Traffic Impact Assessment (TIA) was undertaken for the project following the circulation of the draft EIA Report based on comments received from the Free State Department of Police, Roads and Transport (FS DPRT).

12.2 Incorporating the Findings from Specialist Studies

The *Guideline for the review of specialist input in EIA processes* (Keatimilwe & Ashton, 2005) was used for including the findings of the specialist studies into the EIA Report. Key considerations included the following:

- ❑ Ensuring that the specialists have adequately addressed I&APs' issues and specific requirements prescribed by environmental authorities;
- ❑ Ensuring that the specialists' input is relevant, appropriate and unambiguous; and
- ❑ Verifying that information regarding the receiving ecological, social and economic environment has been accurately reflected and considered.

The information obtained from the respective specialist studies was incorporated into the EIA Report in the following manner:

- ❑ The assumptions and limitations identified in each study were included in **Section 7** above;
- ❑ The information was used to complete the description of the receiving environment (**Section 11**) in a more detailed and site-specific manner;

- A summary of each specialist study is contained in the sub-sections to follow (**Sections 12.3 – 12.10** below), focusing on the approach to each study, key findings and conclusions drawn;
- The specialists' impacts assessment, and the identified mitigation measures, were included in the overall project impact assessment contained in **Section 13** below;
- The evaluations performed by the specialists on the alternatives were included in **Section 14** below to identify the most favourable option;
- Specialist input was obtained to address comments made by I&APs that related to specific environmental features pertaining to each specialist discipline; and
- Salient recommendations made by the specialists were taken forward to the draft EIA Conclusions in **Section 16** below.

12.3 Wetland Delineation and Risk Assessment

A summary of the Wetland Delineation and Risk Assessment (Clark, 2022a) follows. The specialist report is contained in **Appendix E1**.

12.3.1 Details of the Specialist

The details of the specialists that undertook the Wetland Delineation and Risk Assessment follow.

Organisation:	The Biodiversity Company
Name:	T. Clark
Qualifications:	MSC Zoology
Affiliation (if applicable):	SACNASP Professional Natural Scientist (Registration No.: 121338)

12.3.2 Objectives of the Study

The objectives of this study included the following:

- To identify, delineate and classify wetlands within the Project Area;
- To assess the Present Ecological State (PES) of the identified wetlands;
- To assess the Wetland Ecosystem Services provided by the identified wetlands;
- To assess the Ecological Importance and Sensitivity (EIS) of the identified wetlands;
- To undertake a risk assessment for the proposed development; and
- To provide mitigation measures and recommendations for the identified risks.

12.3.3 Methodology

The assessment included the following tasks (amongst others):

- Identifying and mapping of wetlands. The National Wetland Classification Systems (NWCS) developed by SANBI was considered for this study.
- Delineating wetland areas in accordance with the guideline: A practical field procedure for identification and delineation of wetlands and riparian areas (DWAF, 2005).

- ❑ Determining the PES;
- ❑ Determining the EIS;
- ❑ Determining buffer requirements; and
- ❑ Undertaking a risk-based impact assessment.

12.3.4 Key Findings of the Study

A description of the surface water features in the Project Area is contained in **Section 11.6** above.

Key findings from the study follow.

12.3.4.1 Wetland Classification

In total six wetland hydrogeomorphic (HGM) units belonging to four HGM types (channelled valley-bottom, unchanneled valley-bottom, hillslope seeps and depressions) were identified both within the 500 m regulated area and the project area. Although all six wetland HGMs within the 500 m regulated area were identified and mapped only HGMs 1-3 have the potential to be adversely impacted by the solar PV development and as such they are assessed in detail in this report.

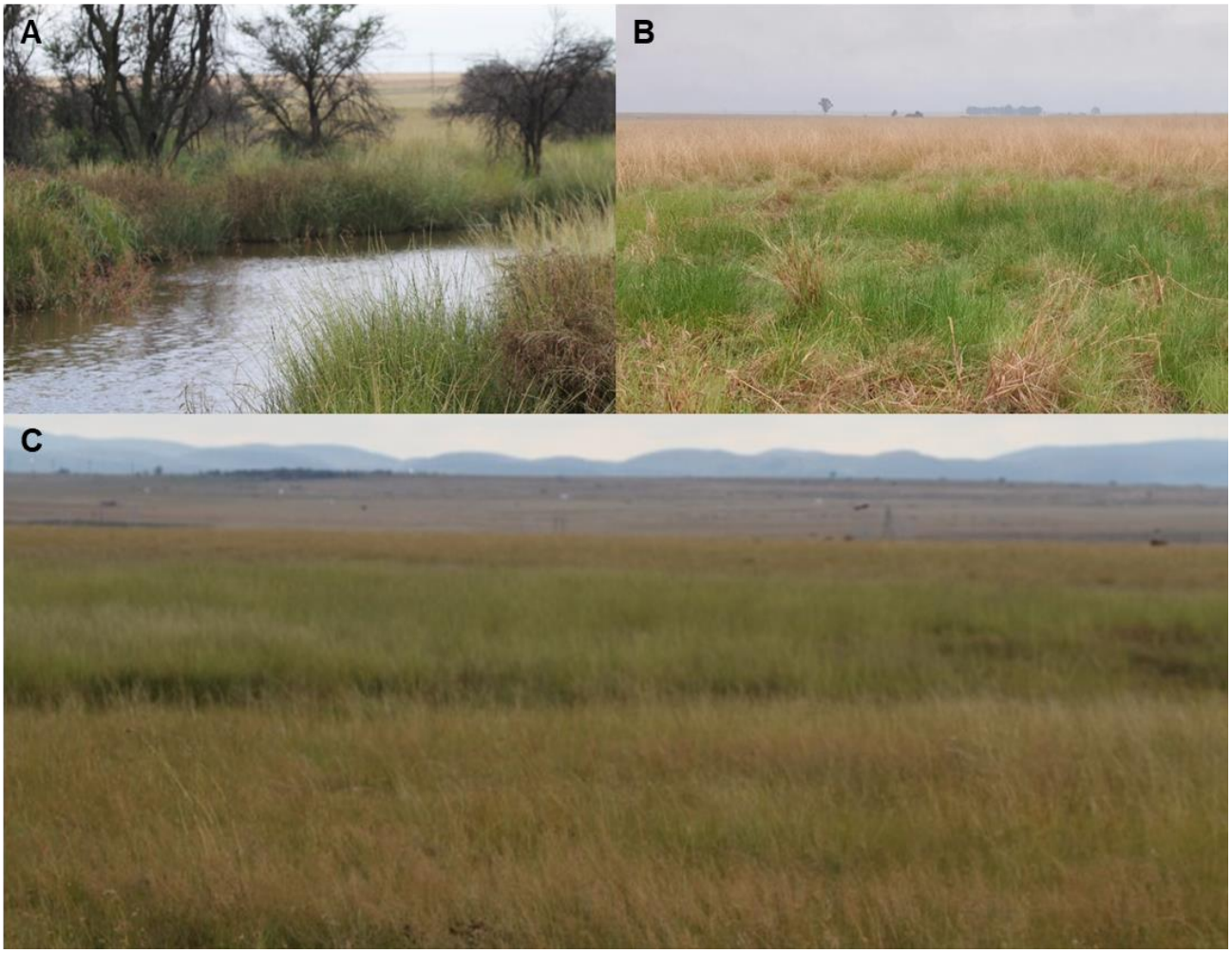


Figure 56: Wetland HGMs in the project area: A) HGM1, B) HGM2 and C) HGM3 (Clark, 2022a)

The most prominent wetland feature is the relatively wide channelled valley-bottom that flows east to west across the central portion of the project area. The wetland is a tributary of the Skulpspruit. This wetland is an upper catchment system and exhibits a very weekly defined and discontinuous channel, and in many respects functions more like an unchanneled valley-bottom. The level 1-4 classification for these HGM units as per the national wetland classification system (Ollis et al., 2013) is presented in **Table 14** below. A map showing the extent of these wetlands is shown in **Figure 57**.

Table 14: Wetland classification as per SANBI guideline (Clark, 2022a)

Wetland System	Level 1	Level 2		Level 3	Level 4		
	System	DWS Ecoregion/s	NFEPA Wet Veg Group/s	Landscape Unit	4A (HGM)	4B	4C
HGM 1	Inland	Highveld	Dry Highveld Grasslands Group 4	Valley Floor	Channelled valley-bottom	NA	N/A
HGM 2	Inland	Highveld	Dry Highveld Grasslands Group 4	Slope	Seep	Without Channelled Outflow	N/A
HGM 3	Inland	Highveld	Dry Highveld Grasslands Group 4	Bench	Depression	Endorheic	Without channelled inflow
HGM 4	Inland	Highveld	Dry Highveld Grasslands Group 4	Valley Floor	Unchannelled valley-bottom	NA	N/A
HGM 5	Inland	Highveld	Dry Highveld Grasslands Group 4	Slope	Seep	Without Channelled Outflow	N/A
HGM 6	Inland	Highveld	Dry Highveld Grasslands Group 4	Bench	Depression	Endorheic	Without channelled inflow

A summary of the extent (ha) of each wetland HGM unit as well as the extent of the buffers and terrestrial (non-wetland) habitat is given in **Table 15** for both the project area (site) as well as the broader 500 m regulated area surrounding it. From this table it is immediately apparent that wetlands occupy 123.44 ha within the project area, which represent a relatively small proportion (10.09%) of the available land within the project area. When including the prescribed wetland buffers this increases to 172.44 ha or 14.10%. The excavations do accumulate water periodically but are dry for most of the year, are largely devoid of hydromorphic vegetation and have limited to no wetland functionality and could be considered as terrestrial habitats. Given the size and spatial arrangement of wetlands, complete avoidance should be possible and any development within wetland areas is discouraged.

Table 15: A summary of the extent (ha) of each wetland and non-wetland resources (Clark, 2022a)

Feature	HGM type	Area (ha) 500 m	Area (ha) Site	Proportion of Site (%)
HGM1	Channelled valley-bottom	131.32	73.804	6.03
HGM2	Seep	62.377	46.36	3.79
HGM3	Depression	2.134	2.134	0.17
HGM4	Unchannelled valley-bottom	25.648	1.137	0.09
HGM5	Seep	6.089	0	0.00
HGM6	Depression	0.971	0	0.00
Wetland Buffer	-	99	49	4.01
Excavations		0.967	0.967	0.08
Terrestrial	-	1938.273	1049.921	85.83
Total		**2266.779**	**1223.269**	
Summary				
Terrestrial and Excavations		**1939.24**	**1050.888**	**85.91**
All Wetlands		**228.539**	**123.435**	**10.09**
All Wetlands & Buffers		**327.539**	**172.435**	**14.10**

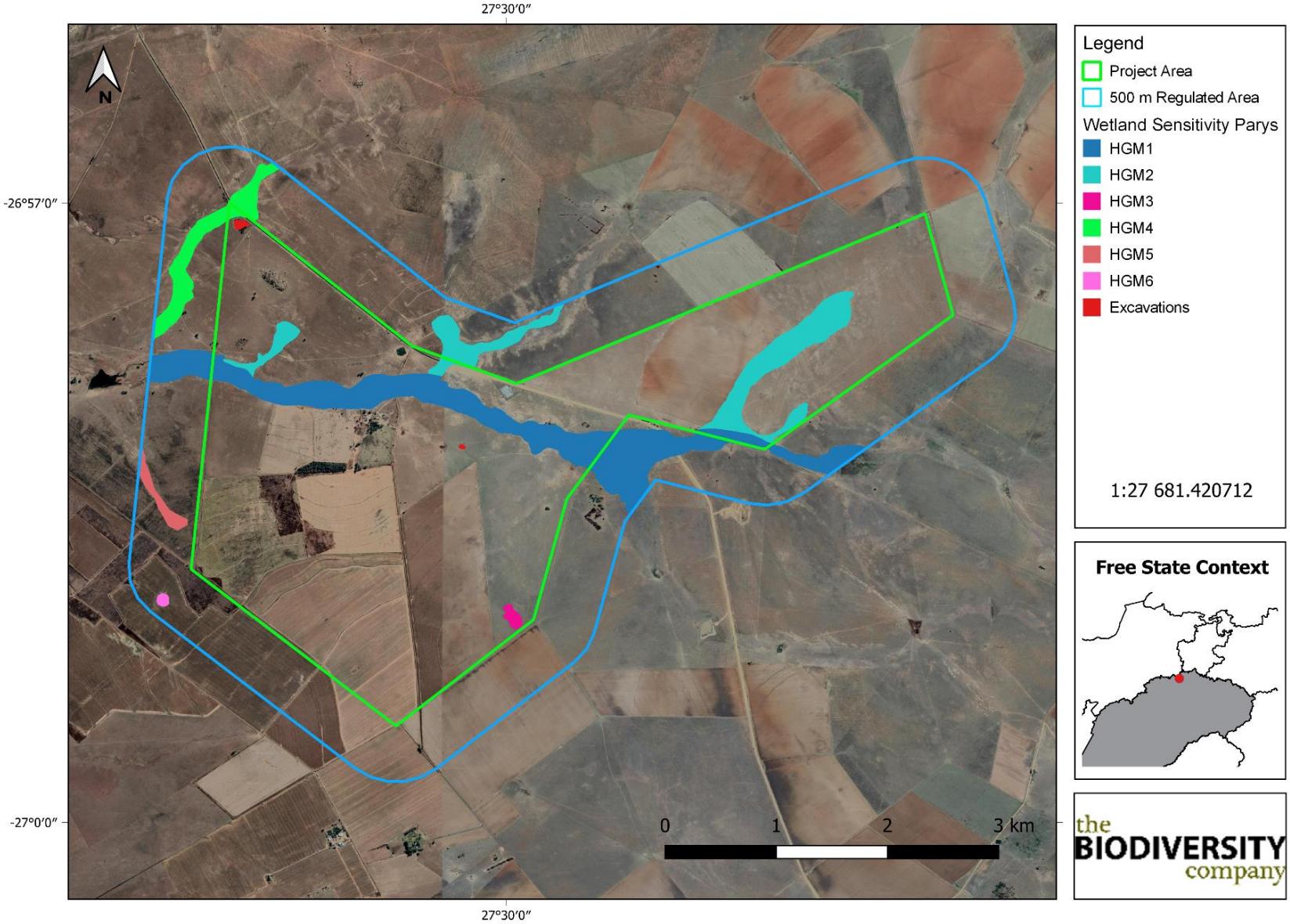


Figure 57: **Wetlands delineated within 500m of the Project Area (Clark, 2022a)**

12.3.4.2 Wetland Ecosystem Services

The ecosystem services provided by each wetland HGM unit identified within the project area were assessed and rated using the latest WET-EcoServices Version 2 system and associated spreadsheets (Kotze et al. 2021). The summarised results of this assessment are shown in **Table 16** below. Overall, the wetlands provide mainly provisional (water, and food for livestock) and regulating services (sediment trapping and water quality enhancement) but provide little in the way of cultural benefits (other than providing fair-good reference sites for research and medicinal plants).

Table 15 highlights the significance of the main channelled valley-bottom wetland (HGM 1) in providing a wide diversity of highly important ecosystem services. The shallow longitudinal gradient, broad cross-sectional profile, presence of small dams and high channel sinuosity of this wetland makes it very effective in trapping sediments received from croplands in the catchment. This together with a dense covering of hydromorphic vegetation across a broad permanent-seasonal zone makes the wetland very effective at water quality enhancement through trapping and assimilating organic nutrients (e.g. nitrates and phosphates) and toxicants. Given the largely undeveloped nature of the catchment, the water purification benefits, periodicity of supply and dependency of people on this water for agricultural purposes this wetland is considered highly important in terms of water provision for human use. Although the wetland is not likely to support viable populations of any Threatened species, it is considered very important from a general biodiversity maintenance perspective. This is based on the ecological connectivity with other wetlands and aquatic habitats, the general intactness of the vegetation (barring one alien bush clump) and its strategic importance in terms of meeting national and regional conservation plan targets (Endangered threat status with a portion zoned as CBA2)

In contrast, the seeps (HGM 2) are much drier and more sparsely vegetated. As such, the magnitude of their ecosystem service provision is lower. However, these wetlands are still considered important from a biodiversity maintenance (Critically Endangered) and livestock grazing perspective (mostly grassed).

Lastly the depression (pan) in the south-western corner of the project area (HGM 3) is too small and hydrologically isolated to provide any appreciable levels of ecosystem services other biodiversity maintenance (as it remains in a largely natural state).

Table 16: Summary of the ecosystem services scores (Clark, 2022a)

Ecosystem Service		Importance Score		
		HGM1	HGM2	HGM3
REGULATING AND SUPPORTING SERVICES	Flood attenuation	0.3	0.0	0.0
	Stream flow regulation	1.3	1.2	0.0
	Sediment trapping	3.3	1.4	0.3

Ecosystem Service		Importance Score		
		HGM1	HGM2	HGM3
	Erosion control	1.5	0.7	0.7
	Phosphate assimilation	3.3	1.9	0.2
	Nitrate assimilation	3.2	1.8	0.3
	Toxicant assimilation	2.3	0.9	0.0
	Carbon storage	2.4	1.3	1.6
	Biodiversity maintenance	3.4	2.5	3.0
PROVISIONING SERVICES	Water for human use	3.2	0.3	0.0
	Harvestable resources	1.7	0.0	0.0
	Food for livestock	2.0	2.7	1.7
	Cultivated foods	1.0	1.4	0.8
CULTURAL SERVICES	Tourism and Recreation	1.8	0.0	0.0
	Education and Research	1.5	0.4	1.0
	Cultural and Spiritual	1.7	0.5	0.5
Rating Categories		Very Low	0-0.79	
Low	0.8 – 1.29	Mod-Low	1.3 – 1.69	
Moderate	1.7 – 2.29	Mod-High	2.3 – 2.69	
High	2.7 – 3.19	Very High	3.2 - 4.0	

12.3.4.3 Wetland Health

The present ecological state (PES) of the wetlands identified within the project area is provided in **Table 17**. Overall, the NFEPA listed depression (HGM 3) was found to be the most intact wetland with a PES of Largely Natural (Class B) while the channelled valley-bottom (HGM 2) and seeps (HGM 3) were rated as Moderately Modified (Class C).

Although most of the channelled valley-bottom (HGM 1) remains in a largely intact and natural state the wetland has been somewhat degraded by a number of minor impacts. These include crop farming in the catchment, flow impediment (small dam at the confluence near the eastern boundary and a narrow road crossing) as well as patches of alien and invasive vegetation which includes one large clump of *Salix babylonica* and *Populus* x *canescens* near the farmstead. The flow impeding features are, however, minor and appear to have had little effect on the geomorphology of the wetland and the sediment regime remains in a stable to very slightly erosive state.

The seeps (HGM 2) are, for the most part, closely surrounded by current or past croplands. Additionally, these wetlands are heavily utilised for cattle grazing and predominantly dry and only temporarily inundated. Hydromorphic vegetation is sparse or missing altogether. The hydrological regime of the seeps remains relatively intact but some impacts from increased floodpeaks and sedimentation following heavy rainfall is anticipated. Otherwise, the geomorphology remains largely

intact and no signs of erosion are evident, which is likely aided by the clay rich soils and low inundation levels. The main impact to these wetlands is from significant encroachment by croplands and utilisation by cattle.

The NFEPA listed depression in the south-west (HGM3) remains in a largely natural state. It has been excluded from crop farming and is only negligibly impacted by cattle grazing.

Table 17: Summary of the scores for the wetland PES (Clark, 2022a)

Wetland	Hydrology	Geomorphology	Vegetation	Overall
HGM 1	C: Moderately Modified (3)	C: Moderately Modified (2.2)	C: Moderately Modified (3.2)	C: Moderately Modified (2.9)
HGM 2	C: Moderately Modified (2.5)	C: Moderately Modified (2)	B: Largely Natural (1.8)	**C: Moderately Modified (2.2)**
HGM 3	B: Largely Natural (1.5)	B: Largely Natural (1.3)	B: Largely Natural (1.9)	B: Largely Natural (1.6)

12.3.4.4 The Ecological Importance

The results of the ecological and importance (EIS) assessment are shown in **Table 18**. At a regional scale the NFEPA Wetveg database recognises Dry Highveld Grassland Group 4 channelled valley-bottoms (HGM1) and seeps (HGM2) as Critically Endangered, while depressions (HGM3) are classified as Least Threatened (Nel and Driver, 2012). None of the wetlands within the project area or the 500 m regulated surrounding it are recognised as NFEPA rivers. However, the depression (HGM3) is recognised as a wetland FEPA. Portions of HGM1 is zoned as CBA 2. The National Wetland Map 5 does not list updated conservation statuses for any the wetlands in the project area nor does it recognise any wetland other than the depression.

At a more local scale, only HGM1 is rated as having a High EIS on account of its largely natural vegetation, large size, high saturation levels and importance for general biodiversity maintenance. The seeps (HGM2) are considered to have a Moderate EIS as they are intermediary in size and intactness, have a moderate to low habitat diversity and are only temporarily inundated and thus are only considered to have a Moderately-High importance in terms of maintaining biodiversity. Although largely natural the depression (HGM3) is small, isolated and lacks habitat diversity and is thus considered to have a low ecological importance.

Table 18: Ecological Importance and sensitivity results for the wetland area (Clark, 2022a)

Aspect	HGM 1	HGM 2	HGM 3
Ecological Importance	**H (2.5)**	**M (1.5)**	**L (0.8)**

12.3.4.5 Sensitivity and Buffer Analysis

A map was produced to visually represent the sensitivity of the wetlands based on the findings of the wetland assessment (see to **Figure 58** below). With the exception of the highly degraded HGMs 5 and 6 which occur outside project area but within 500 m regulated area (rated as Moderate sensitivity) all wetlands were classified as having a High sensitivity. All wetland buffers were

assigned a Moderate sensitivity. All other non-wetland areas including excavations within the 500 m regulated area were assigned a Low sensitivity from a wetland perspective.

The "*Buffer zone guidelines for wetlands, rivers and estuaries*" (Macfarlane and Bredin 2017) was used to determine the appropriate wetland buffer zone for the proposed activity, in this case renewable energy. The channelled valley-bottom (HGM1) and unchanneled valley-bottom (HGM4, outside project area) was assigned a minimum development buffer of 41 m. This was based primarily on their Moderately Modified PES and High EIS combined with the potential for increased sediments and turbidity as a result of the construction of the PV farm.

The seeps (HGM2 and 5), depressions (HGM3 and 6) and western-most unchanneled valley-bottom (HGM 5) were assigned a buffer of 29 m. The main impacts influencing the buffer determination tool, in all instances, included increase in sediment inputs and turbidity as well alteration of floodpeaks.

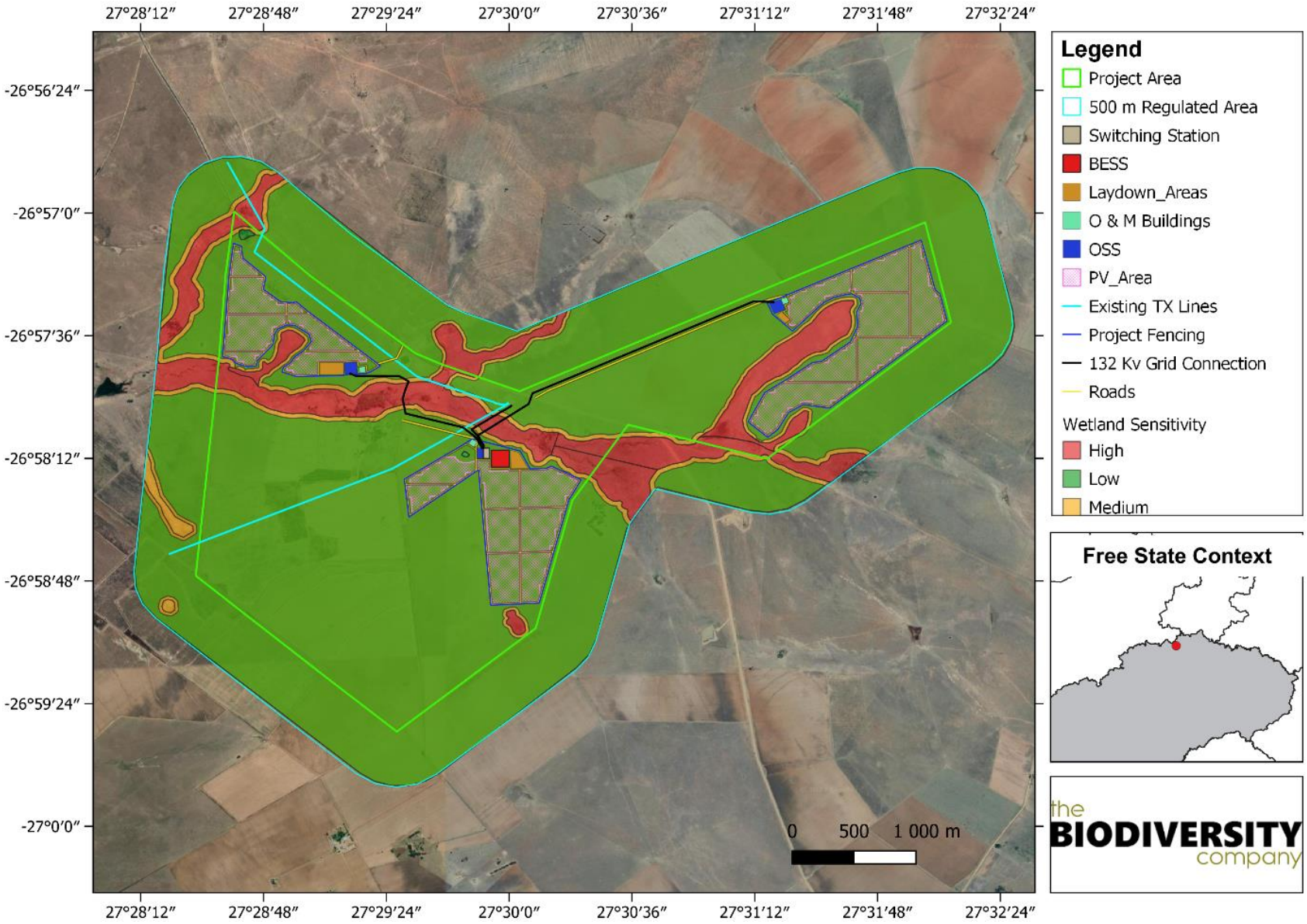


Figure 58: Wetland sensitivity in relation to the proposed layout (Clark, 2022a)

The unchanneled valley-bottom (HGM1) was assigned a minimum development buffer of 41m. This was based primarily on the Moderately Modified PES and Moderate EIS combined with the potential for increased sediments and turbidity as a result of the construction of the PV farm. The flat (HGM2) and depression (HGM3) wetlands were prescribed a buffer of 30m each on account of their Moderately Modified PES and the less impactful nature of the development faced by them, namely overhead electrical transmission infrastructure.

12.3.5 Impact Assessment

Refer to **Section 13.12** below for the results from the impact assessment from this study.

12.3.6 Conclusions

Of the six wetland HGMs identified within the 500 m regulated area only HGMs 1-3 have the potential to be adversely impacted by the solar PV development. These wetlands were assessed in terms of their present ecological state (PES), ecosystem services and ecological importance. The anticipated impacts to these wetlands were then rated. Overall, the most prominent wetland in the project area is the relatively wide channelled valley-bottom (tributary of the Skulpspruit) that flows east to west, but seeps and a small NFEPA listed depression also occur. Of the various wetland units in the project are HGM 1 provides the most important ecosystem services (mainly relating to biodiversity maintenance sediment trapping, nutrient assimilation and provision of water for human use) and is considered to have a high ecological importance (especially in terms of meeting provincial conservation targets). This wetland is slightly impacted by alien bushclumps and flow impediments and was thus rated as Moderately Modified (Class: C). The seeps (HGM3) are very temporarily inundated and sparsely vegetated which limits their ecosystem services provision (mainly restricted to biodiversity maintenance and food for livestock). Impacts from cattle grazing and cropland encroachment affords HGM3 seeps a PES of Moderately Modified (Class: C). The most intact wetland is the small NFEPA depression (Class: B) but this wetland is small and isolated to provide meaningful ecosystem services and is considered to be of low overall ecological importance.

12.4 Terrestrial Biodiversity Compliance Statement

A summary of the Terrestrial Biodiversity Compliance Statement (Jacobs & Burger, 2022) follows. The specialist report is contained in **Appendix E2**.

12.4.1 Details of the Specialist

The details of the specialists that compiled the Terrestrial Biodiversity Compliance Statement follow.

Organisation:	The Biodiversity Company	
Name:	A. Husted	C. Burger

Qualifications:	MSc Aquatic Health	BSc Hons Ecological Interactions & Ecosystem Resilience
Affiliation (if applicable):	SACNASP Professional Natural Scientist (Registration No.: 400213/11)	SACNASP Candidate Natural Scientist (Registration No.: 121757)

12.4.2 Objectives of the Study

The principal aim of this study was to adequately assess the current state of the terrestrial biodiversity in order to identify any significant and/or sensitive ecological receptors that may be impacted upon by the proposed Project.

The following tasks were completed in fulfilment of the terms of reference for this study:

- To describe the baseline environment specific to the field of expertise (including the general surrounding area as well as the site-specific environment) ;
- To identify and describe the any sensitive receptors in terms of relevant specialist disciplines (i.e., terrestrial biodiversity) that occur in the project area, and the manner in which these sensitive receptors may be affected by the activity;
- To identify 'significant' ecological, botanical and faunal features within the proposed project area;
- To identify conservation significant habitats around the project area which might be impacted;
- To identify any critical issues (potential fatal flaws) that may result in a rejection of the application;
- To provide a map to identify sensitive receptors in the project area, based on available maps and database information; and
- To present recommended mitigation measures (outcomes to be included in the Management Plan) that should be used to mitigate or minimise impacts from the activity, either on terrestrial habitat or ecology directly

12.4.3 Methodology

The assessment included the following tasks (amongst others):

- Existing data layers were incorporated into GIS software to establish how the proposed project might interact with any ecologically important entities.
- A desktop vegetation and botanical assessment was undertaken, which encompassed an assessment of all the vegetation units and habitat types within the Project area. This focused on an ecological assessment of pre-anthropogenic habitat types as well as identification of any Red Data and protected species within known distribution of the Project area.
- The field work methodology included timed meanders, sensitivity analysis based on structural and species diversity, identification of protected floral species, and identification of floral red-data or red-listed species (i.e., Species of Conservation Concern [SCC]).

- A faunal assessment was undertaken, which included the following:
  - The faunal desktop assessment encompassed:
    - Compilation of expected species lists;
    - Identification of any Red Data or SCC potentially occurring in the area; and
    - Emphasis was placed on the probability of occurrence of species of provincial, national and international conservation importance.
  - The field survey component of the assessment utilised a variety of sampling techniques including, but not limited to, the following -
    - Visual observations;
    - Active hand-searches, used for species that shelter in or under particular micro-habitats;
    - Identification of tracks and signs; and
    - Utilisation of local knowledge.
  - Various field guides and texts were consulted for identification purposes in the field during the survey.

The dry season fieldwork was completed during May 2022. Owing to the low sensitivity of the terrestrial habitat this is not considered to be a notable limitation, with limited benefit being achieved from a wet season survey in comparison.

12.4.4 Key Findings of the Study

A description of the terrestrial ecological features in the Project Area is contained in **Section 11.7** above. Key findings from the study follow.

12.4.4.1 Flora and Vegetation

During the field assessment five habitat units have been identified and included transformed areas, degraded grassland, secondary grassland, a ridge/rocky outcrop and wetland habitat.

Transformed Habitat

The transformed areas can be found along the central, southern and north eastern portions of the project area. The majority of the transformed habitat comprised of agricultural fields utilised for crop production of *Zea Mays* (corn). Smaller areas were associated with residential and agricultural buildings as wells as an electrical substation. The transformed areas have little to no remaining natural vegetation due to land transformation by various agricultural activities. These habitats exist in a constant disturbed state as it cannot recover to a more natural state unless through human intervention. No protected or SCC flora species were observed in this habitat unit and is not expected to occur due to the modified nature of the majority of the area.

Degraded Grassland Habitat

The degraded grassland habitat can be found along two sections of the project area located in the central and western portion. This habitat is regarded as areas that have been impacted on more by

historic mismanagement and land use. Historical vegetation clearing to make way for agricultural practices has led to alterations of the natural grassland habitat and current utilisation of the area for grazing as well as ongoing human infringement, especially in areas close to residential and agricultural buildings, are still impacting on this habitat unit. Vegetation associated with this habitat included species such as *Chloris Gayana* which is commonly associated with planted pastures and has spread from adjacent areas to this habitat. Additional species found included grass species such as *Aristida congesta, Cynodon dactylon, Eragrostis chloromelas, Hyparrhenia hirta* and alien and invasive species such as *Tagetes minuta, Verbena bonariensis, Gomphocarpus physocarpus* and *Erigeron bonariensis.*

These habitats aren't entirely transformed but in a constant disturbed state, as they can't recover to a more natural state due to ongoing disturbances and impacts as a result of grazing and anthropogenic related activities. No protected or SCC flora species were observed in this habitat unit and is not expected to occur due to the modified nature of the majority of the area.

Secondary Grassland Habitat

The secondary grassland habitat is located in the north and north eastern section of the project area (see **Figure 59** below). This habitat is associated with grassland habitat that has been exposed to modifications due to land use and mismanagement but differs from the degraded grassland in the extent of disturbance that has taken place, with the degraded grassland being exposed to more severe disturbance. Dominant species within this habitat unit included *Themeda triandra, Aristida congesta, Hyparrhenia hirta, Eragrostis chloromelas, Agave americana, Verbena bonariensis* and *Tagetes minuta.*

Based on the current ecological condition of this habitat the driving forces are inconsistent due to the current land uses. The condition difference within this habitat depends on the extent of the disturbance in some areas being more severe, usually related to one being more overgrazed and exposed to current anthropogenic activities than the other. As a result of the ongoing and historic disturbances the plant community is no longer considered as being fully representative of the reference vegetation. During the assessment two species of the genus *Hypoxis* (*H. hemerocallidea* and *H. rigidula*), one species of the genus *Aloe (Aloe greatheadii),* one species of the genus *Boophone (Boophone disticha)* and one species of the genus *Helichrysum (Helichrysum nudifolium*) listed as protected under Schedule 6 of the Free State Nature Conservation Ordinance 8 of 1969 were recorded within the secondary grassland (see **Figure 60** below).

Figure 59: Secondary Grassland Habitat (Jacobs & Burger, 2022)

Rocky outcrop/ridge Habitat

A single rocky outcrop has been identified within the north western corner of the project area (see **Figure 61** below). This feature represents portions of more in-tact natural habitat and supported a diversity of locally indigenous trees and shrubs such as *Ziziphus mucronata*, *Celtis africana*, and *Searsia lancea*. The area did, however, also include alien and invasive species such as *Opuntia ficus-indica, Tagetes minuta and Solanum linnaeanum.*

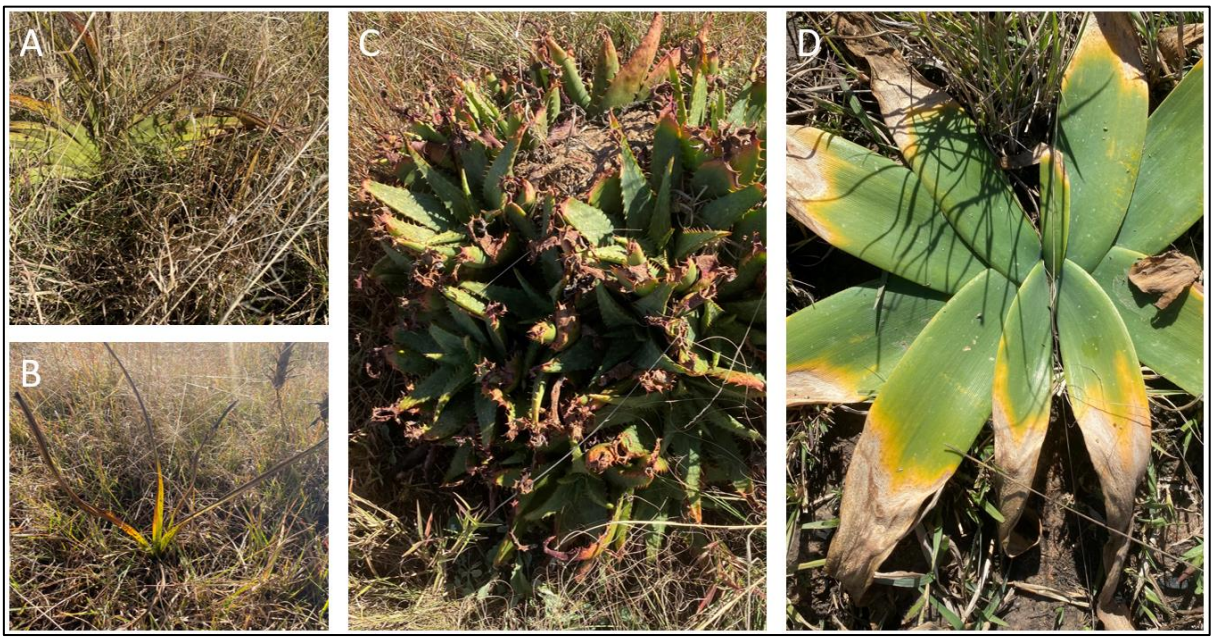


Figure 60: Protected floral species A) *Hypoxis hemerocallidea*, B) *H. rigidula,* C) *Aloe greatheadii*, and D) *Ammocharis coranica* were observed within the secondary grassland and wetland habitat (Jacobs & Burger, 2022)

Figure 61: **A single small-medium rocky habitat feature was found in the western corner of the project area and supported indigenous flora (Jacobs & Burger, 2022)**

Wetland Habitat

Wetland habitat was found predominantly traversing the central portion of the project area and then in smaller scattered areas. These areas provided habitat to various hydrophytic plant species such as *Cyperus fastigiatus, Paspalum cf. scrobiculatum, Cyperus longus, Cyperus congestus, Juncus effuses, Schoenoplectus brachyceras* and *Crinum bulbispermum*. Some of the wetland systems along the project area were dominated by the alien and invasive species *Populus alba*, which is listed as category 1b invasive species as per the latest NEMBA legislation. During the assessment *Ammocharis coranica* listed as protected under Schedule 6 of the Free State Nature Conservation Ordinance 8 of 1969 were recorded within the wetland habitat.

These habitats were assessed in the Wetland Delineation and Risk Assessment. Even though somewhat disturbed, the ecological integrity, importance and functioning of these areas play a crucial role as a water resource system and an important habitat for various fauna and flora.

12.4.4.2 Fauna

Mammal activity was considered to be moderate as only common mammal species such as *Cynictis penicillate* (Yellow Mongoose), *Raphicerus campestris* (Steenbok), *Suricata suricatta* (Suricate) and *Xerus inauris* (Cape Ground Squirrel) (see **Figure 62** below) were observed throughout the project area. Eastern rock elephant shrew (*Elephantulus myurus*) was found in the ridge area. No species of reptile or amphibians were recorded within the project area during the survey period. However, there is the possibility of at least several species being present, as certain reptile and

amphibian species are secretive and longer-term surveys are required in order to ensure adequate sampling.

Due to the limited in-tact and suitable habitat found within the project area it is unlikely that any mammal or herpetofauna SCC will occur nearby.

Figure 62: ***Xerus inauris*** **(Cape Ground Squirrel) were observed throughout the project (Jacobs & Burger, 2022)**

12.4.4.3 Habitat Survey and Site Ecological Importance

The main habitat types identified across the project area were initially identified and pre-delineated largely based on aerial imagery from late 2021. These habitat types were then refined based on the field coverage and data collected during the survey. Five habitat units are delineated for the project area: transformed, degraded grassland, secondary grassland, rocky outcrop and wetland.

The transformed habitat represents the largest portion of habitat across the project area. The transformed areas have little to no remaining natural vegetation due to land transformation by various agricultural activities. Impacts recorded across this habitat include the transformation of the entire habitat in preceding years to accommodate agricultural practises, residential buildings as well as infrastructural development such as the electrical substation and associated powerlines.

Degraded grassland habitat as well as secondary grassland habitat were identified along the project area. Both these habitats have been impacted upon by historic mismanagement and land use activities, most notably to accommodate various agricultural practises such as planted pastures

and grazing. The difference between the secondary grassland habitat and the disturbed thornveld is the extent of the disturbance in the degraded grassland being more severe.

A single rocky outcrop/ ridge area was identified along the western corner of the project area and represent a healthy node of mixed indigenous vegetation and useful microhabitat for reptile and mammal species. There were only minimal signs of disturbance and the local trees and shrubs had mostly reached a healthy maturity. It is however noted that portions of the rocky outcrop have become invaded by alien and invasive vegetation such as *Tagetes minuta* and *Opuntia ficus-indica*.

Various wetland systems were identified across the project area, with the largest system traversing the central portion of the project area. The wetland habitat unit is one of the more sensitive portions of the project area due to the unique, habitat specific flora and fauna found within the section. It is however noted that some of the wetland systems are under significant pressure from the invasive *Populus alba*.

Based on the Site Ecological Importance criteria, the five delineated habitat types have each been allocated a sensitivity category, or Site Ecological Importance (SEI), and this breakdown is presented in **Table 19** below. To identify and spatially present sensitive features in terms of the relevant specialist discipline, the sensitivities of each of the habitat types delineated within the project area are mapped in **Figure 63**.

Table 19: Site Ecological Importance assessment summary of the habitat types delineated within the project area (Jacobs & Burger, 2022)

Habitat	Conservation Importance	Functional Integrity	Biodiversity Importance	Receptor Resilience	Site Ecological Importance
Transformed	Very Low	Low	Very Low	High	Very Low
Degraded Grassland	Medium	Low	Low	High	Very Low
Secondary Grassland	Medium	Low	Low	Medium	Low
Rocky Area/Ridge	Medium	High	Medium	Medium	Medium
Wetland	Medium	High	Medium	Medium	Medium

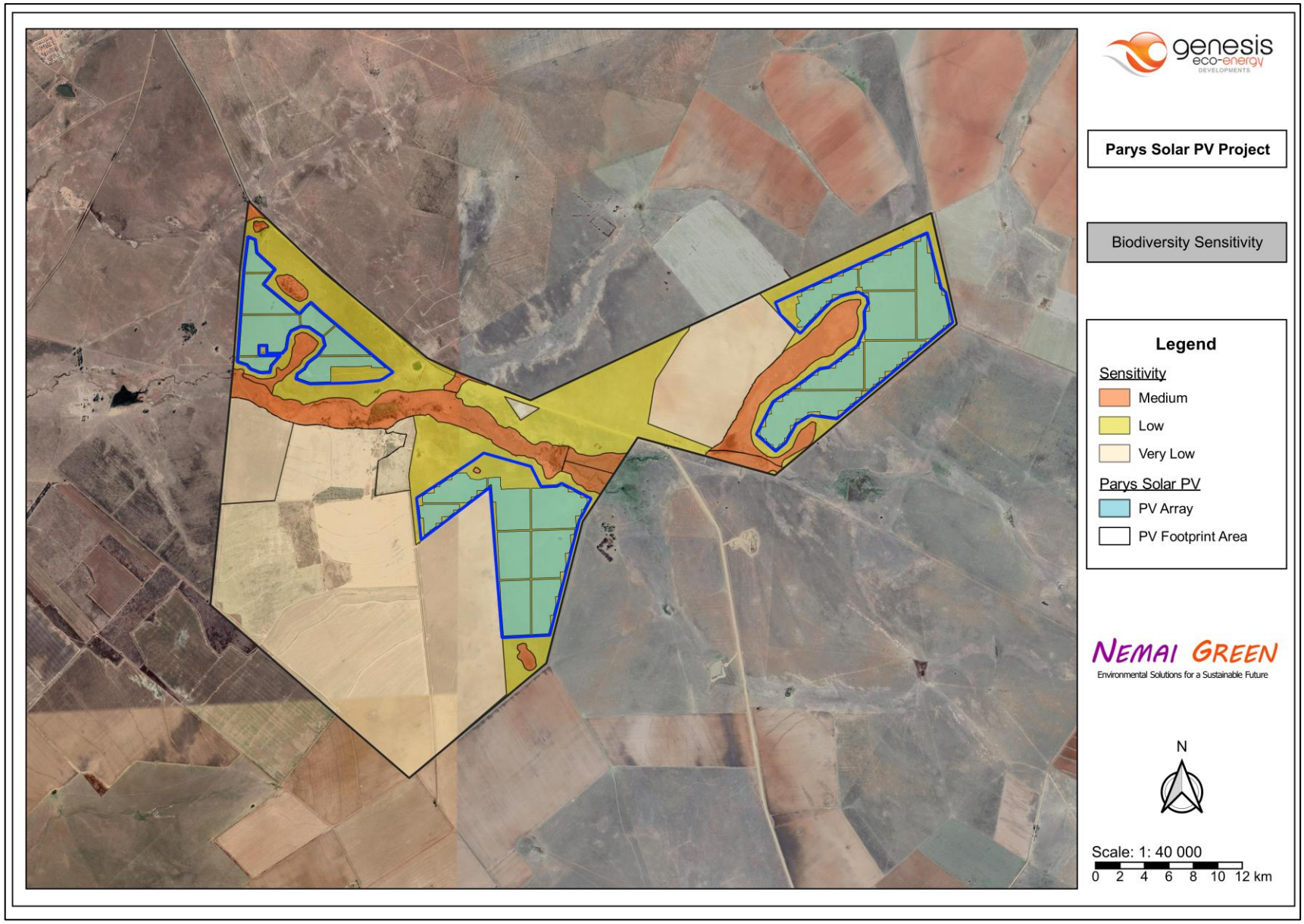
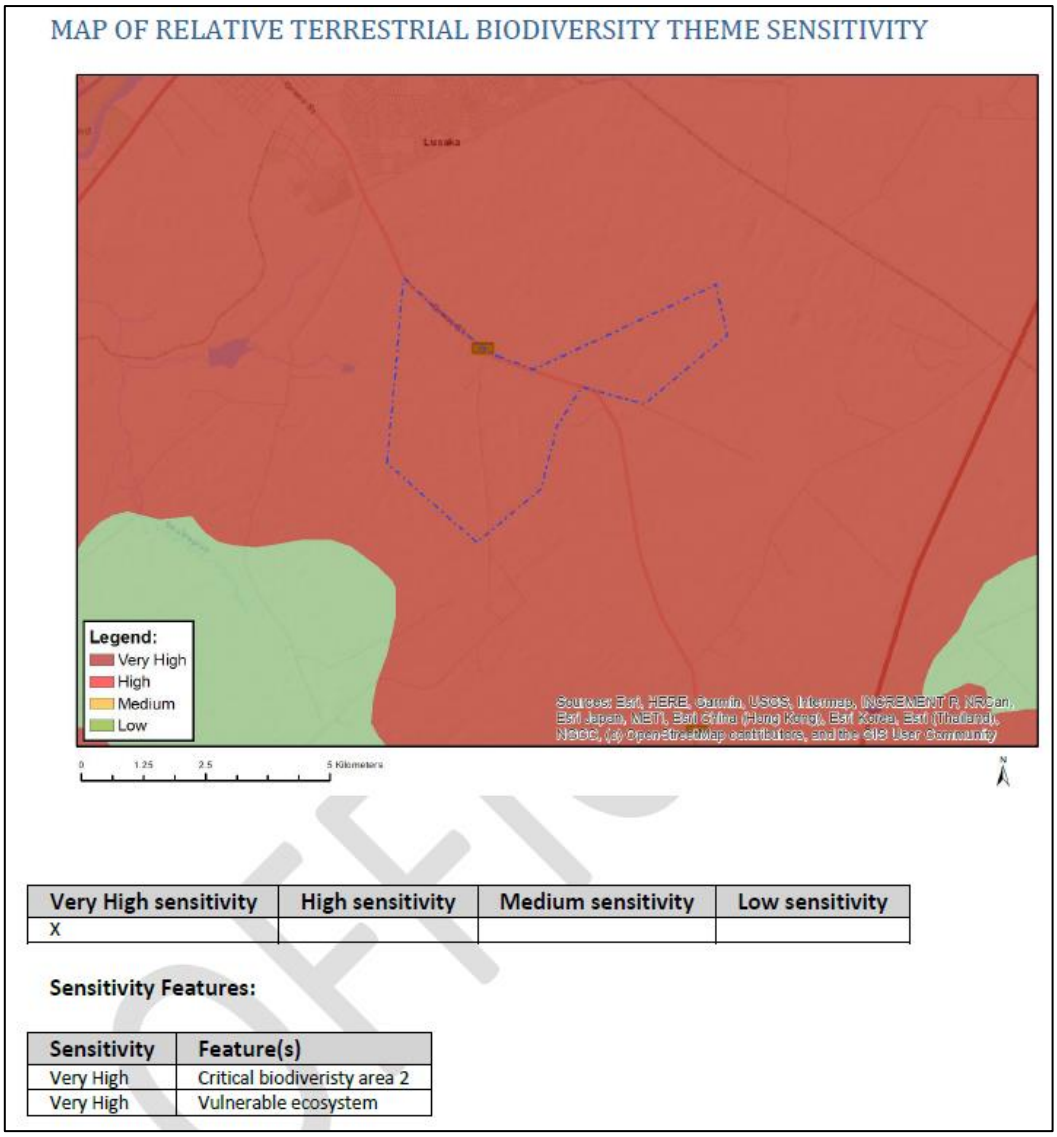


Figure 63: **Biodiversity SEI delineation relevant to the Project Area**

The following guidelines apply when interpreting the SEI:

- Very Low: Minimisation mitigation - Development activities of medium to high impact acceptable and restoration activities may not be required.
- Low: Minimisation and restoration mitigation - Development activities of medium to high impact acceptable followed by appropriate restoration activities.
- Medium: Minimisation and restoration mitigation - Development activities of medium impact acceptable followed by appropriate restoration activities.

The terrestrial biodiversity theme sensitivity as indicated in the screening report (compiled by the National Web based Environmental Screening Tool) was derived to be 'Very High' (see **Figure 64** below)**,** mainly due to the fact that a small area is classified as CBA and the fact that it lies within a VU ecosystem. The completion of the terrestrial desktop and field studies disputes the 'Very High' sensitivity presented by the screening report. As discussed above, the project area is largely degraded and as such is assigned a sensitivity rating of 'Very Low' to 'Low' (with minor exceptions).



Very High sensitivity	High sensitivity	Medium sensitivity	Low sensitivity
X			

Sensitivity Features:

Sensitivity	Feature(s)
Very High	Critical biodiveristy area 2
Very High	Vulnerable ecosystem

Figure 64: Biodiversity sensitivity according to Screening Tool (Jacobs & Burger, 2022)

The screening report classified the animal species theme sensitivity as being of a 'Medium' sensitivity and the plant species theme as 'Low' sensitivity. Following the findings of the field survey, both the animal and plant species themes may be classified as having 'Low' sensitivities. This is due to the fact that there is very little suitable habitat available to support the occurrence of any species of conservation concern within the project area.

12.4.5 Impact Assessment

Refer to **Section 13.13** below for the results from the impact assessment from this study.

12.4.6 Conclusions

The majority of the project area has historically been modified to accommodate agricultural practices and as such remain in a transformed state. The project area does, however, contain unique habitat features such as the wetland systems that traverse the central portion of the project area as well as the rocky area/ridge.

Completion of the terrestrial biodiversity assessment led to a disputing of the 'Very High' classification for the terrestrial biodiversity theme sensitivity as allocated by the National Environmental Screening Tool. The majority of the project area has instead been assigned a 'Very Low' to 'Low' sensitivity, because of the high levels of environmental disturbance that have taken place and the fact that no SCC were observed - or are very likely to occur. It is noted that two areas have been assigned higher sensitivities, with both the wetland and ridge habitat allocated a 'Medium' sensitivity. The ridge and wetland areas remain in a moderately natural condition as it has been predominantly excluded from direct historic anthropogenic activities and as such still provides habitat to support indigenous vegetation and common faunal species.

12.5 Avifaunal Baseline and Impact Assessment

A summary of the Avifaunal Baseline and Impact Assessment (Clark, 2022b) (contained in **Appendix E3**) follows.

12.5.1 Details of the Specialist

The details of the specialists that undertook the Wetland Delineation and Risk Assessment follow.

Organisation:	The Biodiversity Company
Name:	T. Clark
Qualifications:	MSC Zoology
Affiliation (if applicable):	SACNASP Professional Natural Scientist (Registration No.: 121338)

12.5.2 Objectives of the Study

The objectives of this study included the following:

- ❑ Provide a description of the baseline avifaunal community;
- ❑ Identify present or potentially occurring SCC;
- ❑ Undertake a sensitivity assessment and map identified sensitive areas in the project area;
- ❑ Assess the proposed project's potential impact on avifaunal species; and
- ❑ To provide mitigation measures to prevent or reduce possible impacts.

12.5.3 Methodology

The assessment included the following methodologies and tasks (amongst others):

- ❑ Incorporate existing data layers into GIS software to establish how the proposed Project might interact with any ecologically important entities as relevant to avifauna;
- ❑ Identify expected species likely to occur in the area, making use of the relevant datasets;
- ❑ Undertaken sampling, consisting of standardized point counts as well as random incidental surveys; and
- ❑ Analise sampling data.

12.5.4 Key Findings of the Study

A description of the avifauna in the Project area is contained in **Section 11.7** above. Key findings from the study follow.

12.5.4.1 Habitat types

Three main avifaunal habitat types were identified within the project area namely Wetlands, Grasslands and Croplands. From an avifaunal perspective the Wetland habitat includes only the valley-bottom wetlands and excludes the seepage areas. Land under commercial annual crop production comprised the Croplands habitat. All remaining non-cultivated or built-up areas between these represent the Grasslands avifaunal habitat. This habitat includes both seepage and terrestrial grassland as the habitat structure of the temporary seep grasslands is similar and no meaningful distinction could be made in-field in terms of their respective species assemblages.

12.5.4.2 Site Diversity

Of the approximately 283 regionally occurring species, some 225 species are considered highly likely to occur on a regular basis. A further 47 species are likely to occur sporadically while the remaining species are only likely to occur very rarely or not at all. However, when considering seasonal variation in species assemblages and local movements the actual number of species likely to be encountered on any one day in the project area is likely to be < 120 species. This represents moderate diversity in the South African context.

During the site visit, a total of 58 bird species were recorded within the project area. However, conditions were cold and rainy which limited detection. Of these, 54 were recorded during the standardised point counts (n=24) while the remaining species were detected incidentally (while moving between point counts).

12.5.4.3 Habitat Diversity

A summary the diversity rankings as indicated by Shannon's H (an index of habitat diversity) for each of the main habitat types is presented in **Table 20.** From this table it is apparent that the highest avian diversity was observed in the Grassland habitat followed by Wetland and lastly Croplands. The Grassland and Wetland habitats are the most diverse habitat types due to their higher microhabitat diversity, structural complexity and resource diversity.

Table 20: Comparison of diversity between the main habitats (Clark, 2022b)

Habitat	Shannon's H
Wetlands	2.69
Grasslands	2.42
Croplands	2.39

12.5.4.4 Habitat Uniqueness

The non-metric multidimensional scaling (NMDS) ordination shown in **Figure 65** provides a visual representation of the difference / similarity in the species composition between the three habitat types. From the ordination it can be observed that no one habitat stands out as being completely unique in terms of its avifaunal assemblage. However, the Grassland and Wetland species assemblages differed most from one-another while the croplands community is comprised of low diversity mix of generalist species found in both Grassland and Wetland habitats.

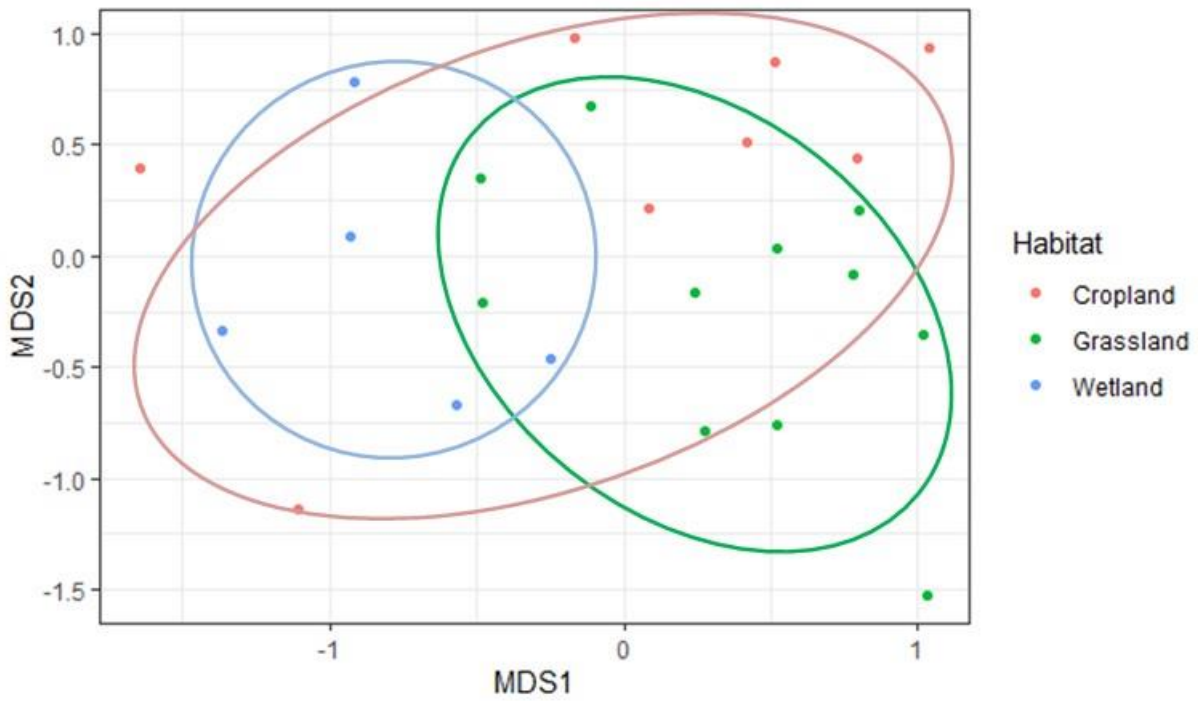


Figure 65: **Non-metric multidimensional scaling ordination contrasting the avifaunal species assemblages within the project area (Clark, 2022b)**

12.5.4.5 Species of Conservation Concern

A total of 24 SCC are known to occur in the region (**see Table 21**). Of these, four have been recorded during SABAP2 surveys within the three pentads relevant to the project area namely Secretarybird (*Sagittarius serpentarius*), Caspian Tern (*Sterna caspia*), Yellow-billed Stork (*Mycteria ibis*) and Blue Korhaan (*Eupodotis caerulescens*) (SABAP2, 2022). In the Free State province, all birds are protected except for generalist species such as; Mousebirds, Bulbuls, Red-winged Starling, Pied Starling, Common Myna, Cape and House Sparrow, Crows, weavers, Queleas, Widowbirds, Bishops, Speckled Pigeon, Cape Turtle Dove, Ostrich, Laughing Dove, Reed Cormorant, and White-breasted Cormorant (Nature Conservation Ordinance 8 of 1969). The provincially protected species are listed in the full list provided in Appendix A. The National Environmental Screening tool flags the pans and dams in the immediate vicinity as being of importance for Yellow-billed Stork and Caspian Tern.

During the site visit, one SCC was detected within the project area namely Blue Korhaan. However and additional 11 SCC are considered highly likely to occur within the project area based on habitat availability and suitability. These include African Marsh Harrier (*Circus ranivorus*), Yellow-billed Stork (*Mycteria ibis*), African Grass Owl (*Tyto capensis*), Caspian Tern (*Sterna caspia*), Blue Crane (*Anthropoides paradiseus*), Melodious Lark (*Mirafra cheniana*), Greater Flamingo (*Phoenicopterus roseus*), Lesser Flamingo (*Phoeniconaias minor*), Abdim's Stork (*Ciconia abdimii*), Black-winged Pratincole (*Glareola nordmanni*) and Maccoa Duck (*Oxyura maccoa*). Of these, potentially suitable breeding habitat exists for Caspian Tern, African Grass Owl and Melodious Lark.

Table 21: List of present and potentially occurring SCC avifauna (Clark, 2022b)

Common Name	Scientific Name	Status				LO	Atlas
		Global	Regional	NEMBA	FS		
White-backed Vulture	*Gyps africanus*	CR	CR	EN	PG	4	
Cape Vulture	*Gyps coprotheres*	EN	EN	EN	PG	3	
African Marsh Harrier	*Circus ranivorus*	LC	EN		PG	2	
Yellow-billed Stork	*Mycteria ibis*	LC	EN		PG	2	x
Black Harrier	*Circus maurus*	VU	EN		PG	3	
Martial Eagle	*Polemaetus bellicosus*	VU	EN	EN	PG	3	
African Grass Owl	*Tyto capensis*	LC	VU		PG	2	
Caspian Tern	*Sterna caspia*	LC	VU		PG	2	x
Lanner Falcon	*Falco biarmicus*	LC	VU		PG	3	
Great White Pelican	*Pelecanus onocrotalus*	LC	VU		PG	3	
Pink-backed Pelican	*Pelecanus rufescens*	LC	VU		PG	3	
Black Stork	*Ciconia nigra*	LC	VU		PG	4	
Secretarybird	*Sagittarius serpentarius*	VU	VU		PG	3	x
Blue Crane	*Anthropoides paradiseus*	VU	NT	PS	OG	2	
Melodious Lark	*Mirafra cheniana*	NT	LC		PG	2	
Greater Flamingo	*Phoenicopterus roseus*	LC	NT		PG	2	
Abdim's Stork	*Ciconia abdimii*	LC	NT		PG	2	
Marabou Stork	*Leptoptilos crumeniferus*	LC	NT		PG	4	
Maccoa Duck	*Oxyura maccoa*	NT	NT		PG	2	
Chestnut-banded Plover	*Charadrius pallidus*	NT	NT		PG	3	
Black-winged Pratincole	*Glareola nordmanni*	NT	NT		PG	2	
Pallid Harrier	*Circus macrourus*	NT	NT		PG	3	
Red-footed Falcon	*Falco vespertinus*	NT	NT		PG	3	
Lesser Flamingo	*Phoeniconaias minor*	NT	NT		PG	2	
Blue Korhaan	Eupodotis caerulescens	NT	LC		PG	1	x

Key: Status: CR = Critically Endangered; DD = Data Deficient; EN = Endangered; LC = Least Concern; NA = Not Assessed; NT = Near Threatened; OG = Ordinary Game; PG = Protected Game; PS = Protected Species; VU = Vulnerable. Likelihood of Occurrence (LO): 1 = Present; 2 = High; 3 = Moderate. Sources: Taylor et al. (2015); BirdLife South Africa (2016); SABAP 2 (2022)

12.5.4.6 Species Congregations and Flyways

The project area was not found to support any globally significant congregations of water birds or other birdlife. The floodplain wetland was, however, found to support significant flocks of Red-billed Quelea (*Quelea quelea*), Yellow-crowned Bishop (*Euplectes afer*) and Southern Red Bishop (*Euplectes orix*) as well as numerous waterbirds. These breeding congregations should be considered important on a regional scale. The project area is not situated in any globally recognised avifaunal flyway.

12.5.4.7 Collision Prone Species

The proposed solar PV may pose a collision risk to avifauna. However, the current body of scientific research on this topic is scant. Since the effects of PV solar farms on birds were investigated several monitoring studies have reported evidence of bird mortalities within and immediately surrounding PV farms. Several causes for these mortalities have been put forward but perhaps the widely cited are collisions. Collisions are thought to arise when birds (particularly waterbirds) mistake the panels for waterbodies, known as the “lake effect” (Lovich and Ennen 2011), or when migrating or dispersing birds become disorientated by the polarised light reflected by the panels. Mixed views have been presented on the significance of collisions as an impact, with a definitive answer precluded by a lack of long-term data. Currently the consensus is that collisions due to the lake effect is unlikely and that other impacts associated with the construction and operation of solar facilities (e.g., habitat loss, collision with fences, electrocution on transmission lines, increased predation pressure as birds attempt to forage beneath solar panels and struggle to escape) may be of greater overall consequence to avifauna (Birdlife, 2012). Nevertheless, given the paucity of empirical research on this topic, the precautionary principle is adopted here, and the potential for collision and (to a lesser intensity electrocution) considered possible.

For the purposes of this project a subset of collision prone species have been identified. These species are listed in **Table 22** along with their likelihood of occurrence (LO), conservation status and mean SABAP2 reporting rate (%). The reporting rate provides a rough indication of the residency and commonness of these species, one of several factors which may increase their susceptibility to collision. Species are ranked in this table from highest to lowest reporting rate. Based on this data six species emerge with a high probability of collision having been seen on more 50% of the time during SABAP surveys. These include Northern Black Korhaan (*Afrotis afraoides*), Hadeda Ibis (*Bostrychia hagedash*), Helmeted Guineafowl (*Numida meleagris*), Egyptian Goose (*Alopochen aegyptiaca*), Western Cattle Egret (*Bubulcus ibis*), Swainson’s Spurfowl (*Pternistis swainsonii*), Black-winged Kite (*Elanus caeruleus*) and Yellow-billed Duck (*Anas undulata*).

Species considered particularly prone and likely to collision based on in-field count data, and flight patterns include Blue Korhaan (*Eupodotis caerulescens*), Red-billed Quelea (*Quelea quelea*), Helmeted Guineafowl (*Numida meleagris*), Long-tailed Widowbird (*Euplectes progne*), Southern Red Bishop (*Euplectes orix*), Common Waxbill (*Estrilda astrild*), Black-shouldered Kite (*Elanus caeruleus*), Northern Black Korhaan (*Afrotis afraoides*), Amur Falcon (*Falco amurensis*), Cape Teal (*Anas capensis*) and White-winged Widowbird (*Euplectes albonotatus*).

Table 22: List of collision and electrocution prone species sorted by reporting rate (Clark, 2022b)

Common Name	Scientific Name	LO	Status	Mean SABAP RR (%)
Northern Black Korhaan	*Afrotis afraoides*	1		88.15
Hadeda Ibis	*Bostrychia hagedash*	1		76.6
Helmeted Guineafowl	*Numida meleagris*	1		76.3
Egyptian Goose	*Alopochen aegyptiaca*	2		72.3
Western Cattle Egret	*Bubulcus ibis*	1		70.45

Common Name	Scientific Name	LO	Status	Mean SABAP RR (%)
Swainson's Spurfowl	*Pternistis swainsonii*	1		68.3
Black-winged Kite	*Elanus caeruleus*	1		54.9
Yellow-billed Duck	*Anas undulata*	1		50.9
Black-headed Heron	*Ardea melanocephala*	1		48.9
African Sacred Ibis	*Threskiornis aethiopicus*	2		45.1
Reed Cormorant	*Phalacrocorax africanus*	1		39.1
Spur-winged Goose	*Plectropterus gambensis*	2		34.9
Glossy Ibis	*Plegadis falcinellus*	2		33.4
Amur Falcon	*Falco amurensis*	1		21.55
African Spoonbill	*Platalea alba*	2		21.55
Grey Heron	*Ardea cinerea*	2		17.7
African Wattled Lapwing	*Vanellus senegallus*	2		15.4
South African Shelduck	*Tadorna cana*	1		13.7
White-faced Whistling Duck	*Dendrocygna viduata*	2		11.7
Red-billed Teal	*Anas erythrorhyncha*	1		11.55
Greater Kestrel	*Falco rupicoloides*	2		7.7
Blue Korhaan	*Eupodotis caerulescens*	1	NT,LC	5.85
Common (Steppe) Buzzard	*Buteo buteo*	2		3.85
Lanner Falcon	*Falco biarmicus*	3	VU, LC	3.85
Secretarybird	*Sagittarius serpentarius*	3	VU, VU	3.85
Yellow-billed Stork	*Mycteria ibis*	2	EN, LC	3.85
African Darter	*Anhinga rufa*	2		0
White-breasted Cormorant	*Phalacrocorax lucidus*	2		0
Cape Shoveler	*Anas smithii*	2		0
Little Egret	*Egretta garzetta*	2		0
African Fish Eagle	*Haliaeetus vocifer*	2		0
White-backed Duck	*Thalassornis leuconotus*	2		0
Maccoa Duck	*Oxyura maccoa*	2	NT, VU	0
African Black Duck	*Anas sparsa*	2		0
Southern Pochard	*Netta erythrophthalma*	2		0
Purple Heron	*Ardea purpurea*	2		0
Squacco Heron	*Ardeola ralloides*	2		0
Spotted Eagle-Owl	*Bubo africanus*	2		0
Gabar Goshawk	*Melierax gabar*	2		0
Hamerkop	*Scopus umbretta*	2		0
Black-crowned Night Heron	*Nycticorax nycticorax*	2		0
Cape Teal	*Anas capensis*	1		0
Black Heron	*Egretta ardesiaca*	2		0
Goliath Heron	*Ardea goliath*	2		0
Fulvous Whistling Duck	*Dendrocygna bicolor*	3		0
Great Egret	*Egretta alba*	3		0
Greater Flamingo	*Phoenicopterus roseus*	2	NT, LC	0
Lesser Flamingo	*Phoeniconaias minor*	2	NT, NT	0
Hottentot Teal	*Anas hottentota*	2		0
Yellow-billed (Intermediate) Egret	*Egretta intermedia*	2		0

Common Name	Scientific Name	LO	Status	Mean SABAP RR (%)
Black Stork	*Ciconia nigra*	4	VU, LC	0
African Marsh Harrier	*Circus ranivorus*	2	EN, LC	0
Western Barn Owl	*Tyto alba*	2		0
Marsh Owl	*Asio capensis*	2		0
Little Bittern	*Ixobrychus minutus*	2		0
Abdim's Stork	*Ciconia abdimii*	2	NT, LC	0
Caspian Tern	*Sterna caspia*	2	LC,VU	0

12.5.4.8 Sensitivity Assessment

Areas of avifaunal sensitivity within the project area is presented in **Figure 66.** Overall, the large valley-bottom wetland was designated High sensitivity, while all remaining non-cultivated grassland was afforded a Medium sensitivity. The valley-bottom wetland is assigned a High importance and sensitivity on account of its capacity to support water associated SCC as well as significant abundances of waterfowl and seedeaters. This wetland supports potential breeding habitat for African Grass Owl (*Tyto capensis*) and is likely to be utilised from a foraging perspective in the summer months by African Marsh Harrier, Yellow-billed Stork (sporadic), Caspian Tern (sporadic) and potentially Maccoa Duck. This wetland also supported by far the highest species richness and abundance of avifauna within the entire project area as well as the highest abundances of collision prone species. It also represents a potentially busy corridor for bird movements. This habitat has been excluded from the PV development footprint but three 132 kV grid connection lines are planned to be spanned over this wetland which poses a noteworthy collision risk.

The solar PV areas and associated infrastructure (e.g. BESS, collectors, OSS) do, however occur in the Medium sensitivity grassland. These areas have been assigned a Medium Sensitivity on account of the largely natural condition of the grassland and its capacity to support most of the regionally occurring grassland SCC. Noteworthy species in this regard include Blue Korhaan (observed) and Melodious Lark (potentially occurring), both of which are Near-Threatened and likely to breed in this habitat. These grasslands also provide important foraging habitat for Amur Falcon and Black-winged Pratincole.

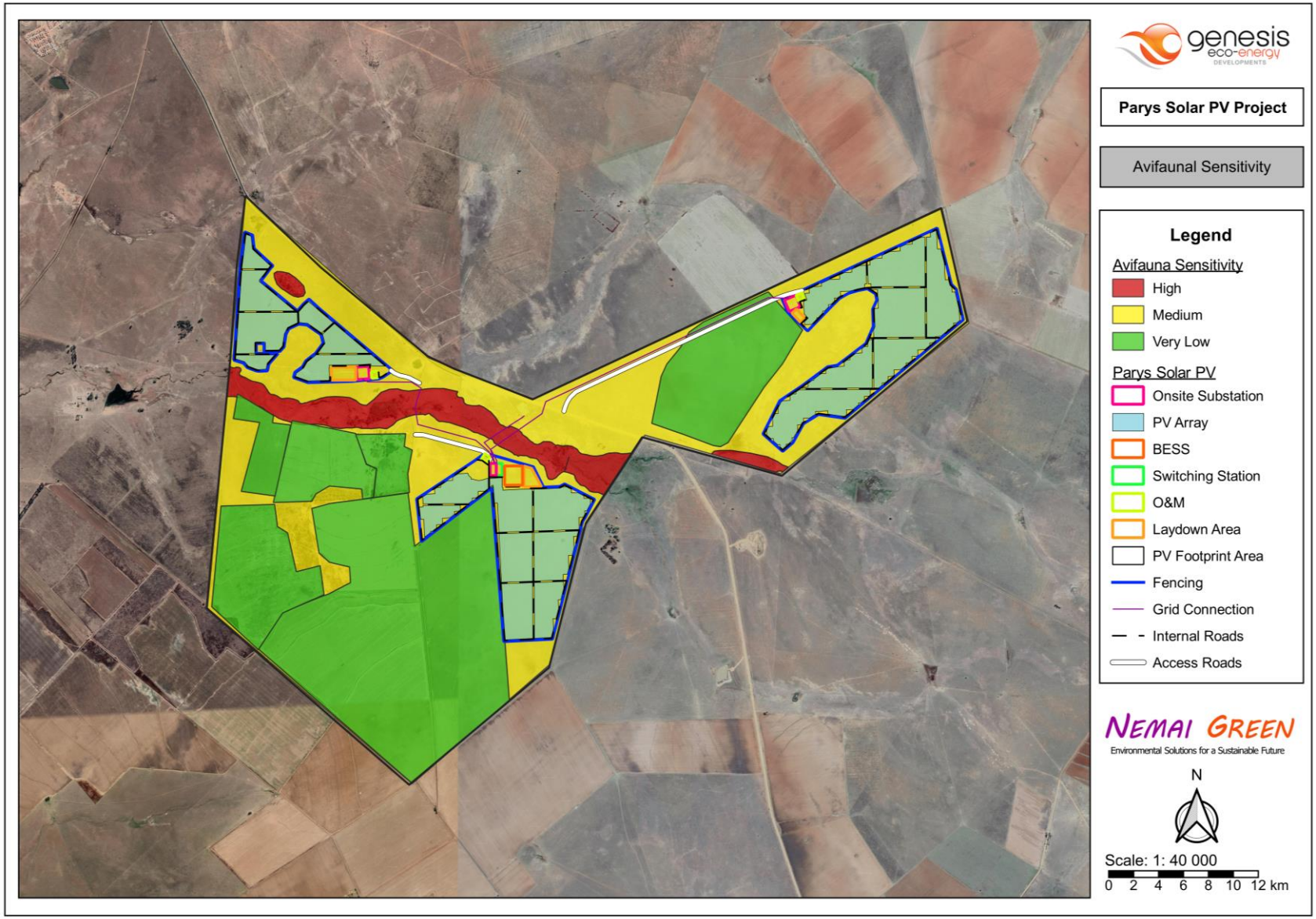


Figure 66: **Site-based avifaunal sensitivity map showing overlain preferred infrastructure layout**

12.5.5 Impact Assessment

Refer to **Section 13.14** below for the results from the impact assessment from this study.

12.5.6 Conclusions

During the site visit a total of 59 species were observed within the project area through a combination of point counts and incidental observations. Of the three habitats the highest avian diversity was observed in the Grassland habitat. The Grassland and Wetland habitats supports the most diverse and unique avifaunal assemblage due to their relatively intact state and overall higher microhabitat diversity, structural complexity and resource availability.

The survey yielded one SCC in the project area, namely Blue Korhaan (*Eupodotis caerulescens*). An additional 11 SCC are considered highly likely to occur within the project area based on habitat availability and suitability. These include African Marsh Harrier (*Circus ranivorus*), Yellow-billed Stork (*Mycteria ibis*), African Grass Owl (*Tyto capensis*), Caspian Tern (*Sterna caspia*), Blue Crane (*Anthropoides paradiseus*), Melodious Lark (*Mirafra cheniana*), Greater Flamingo (*Phoenicopterus roseus*), Lesser Flamingo (*Phoeniconaias minor*), Abdim's Stork (*Ciconia abdimii*), Black-winged Pratincole (*Glareola nordmanni*) and Maccoa Duck (*Oxyura maccoa*). Of these, potentially suitable breeding habitat exists for Caspian Tern, African Grass Owl and Melodious Lark.

In terms of avifaunal sensitivity the large east-west flowing valley-bottom wetland that bisects the project area was designated High sensitivity while the largely intact Grasslands surrounding the wetland and croplands are assigned a Medium sensitivity. The solar PV areas and associated infrastructure (e.g. BESS, collectors, OSS) do, however occur in the Medium sensitivity grassland. These areas have been assigned a Medium Sensitivity on account of the largely natural condition of the grassland and its capacity to support most of the regionally occurring grassland SCC. Noteworthy species in this regard include Blue Korhaan (observed) and Melodious Lark (potentially occurring), both of which are Near-Threatened and likely to breed in this habitat. These grasslands also provide important foraging habitat for Amur Falcon and Black-winged Pratincole. All croplands were afforded a Very Low sensitivity. On a regional scale the National Environmental Screening Tool flags small pans and dams in the nearby vicinity of the project area as being of High Sensitivity for both Yellow-billed Stork and Caspian Tern. The Avifauna Theme shows that the project is situated within 20 km radius of a known vulture restaurant situated near Parys which the screening tool classifieds as being of High sensitivity.

Overall, it is the opinion of the specialist that the project is feasible from an avifaunal perspective, provided the suggested mitigation and recommendations are effectively applied.

12.6 Agricultural Impact Assessment

A summary of the Agricultural Impact Assessment (Gouws, 2022) (contained in **Appendix E4**) follows.

12.6.1 Details of the Specialist

The details of the specialist that undertook the Agricultural Impact Assessment follow.

Organisation:	Index
Name:	Dr A. Gouws
Qualifications:	PhD Integrated Land Use Modelling
Affiliation (if applicable):	▪ Council of Natural Sciences.No:400036/93, Category: Agricultural sciences. ▪ Member of the Soil Science Society of South Africa

12.6.2 Objectives of the Study

The objectives of the Agricultural Impact Assessment includes the following:

- ❑ Check the agricultural sensitivity of the overall site;
- ❑ Assess agricultural impacts of the proposed layout (development footprint);
- ❑ Assist with responding to any study-related comments that may be raised during the environmental assessment;
- ❑ Identify the preferred alternative in terms of the two power line route options; and
- ❑ Adhere to the Procedures for the Assessment and Minimum Criteria for Reporting on identified Environmental Themes in terms of Section 24(5) (a) and (h) and 44 of NEMA ("the Protocols") promulgated in GN No. 320 of 20 March 2020.

12.6.3 Methodology

The results of this study followed a site visit on 9 September 2022. Satellite images were used as backdrop and the present land uses digitised. A number of soil profiles were assessed by using a soil augur or soil probe.

Vegetation was simultaneously logged to determine veld condition. Grazing capacity is according to DALRRD and then adapted to present veld conditions.

Capability classification is according to the guidelines published on the AGIS website of the National Department of Agriculture (NDA) was used to determine the capability of soils and their agricultural potential (DALRRD, 2019).

Climate data was obtained from SA Weather and other on-line sources available on the internet.

12.6.4 Key Findings of the Study

12.6.4.1 Land Use Capability

Land Capability is determined by the collective effects of soil, terrain and climate features and shows the most intensive long-term use of land. At the same time, it indicates the permanent limitations associated with the different land-use classes. Land capability classes are interpretive groupings of land with similar potential and limitations or similar hazards. The following classic eight-class land capability system was adapted for use by the South African Department of Agriculture in their Agriculture Geographic Information System (AGIS):

- Order A: Arable land – high potential land with few limitations (Classes i and ii);
- Order B: Arable land – moderate to severe limitations (Classes iii and iv);
- Order C: Grazing and forestry land (Classes v, vi and vii);
- Order D: Land not suitable for agriculture (Class viii).

Figure 67 below indicates the land use capability of the soil observations. Note that the land within the footprint was assessed and not the entire property. Some observations, however, were made on the cultivated land to evaluate the micro placement of the infrastructure. Of the 42 soil observations made, only 2,4% is arable. It falls into Class iii capability. Thirty eight percent (38%) is potentially arable and falls into Class iv, but they are shallow (depth less than 500mm) and have moderate potential and is medium sensitive agricultural land. The balance of 60% soil observations is on shallow and rocky soils that is not arable and only suitable for animal grazing.

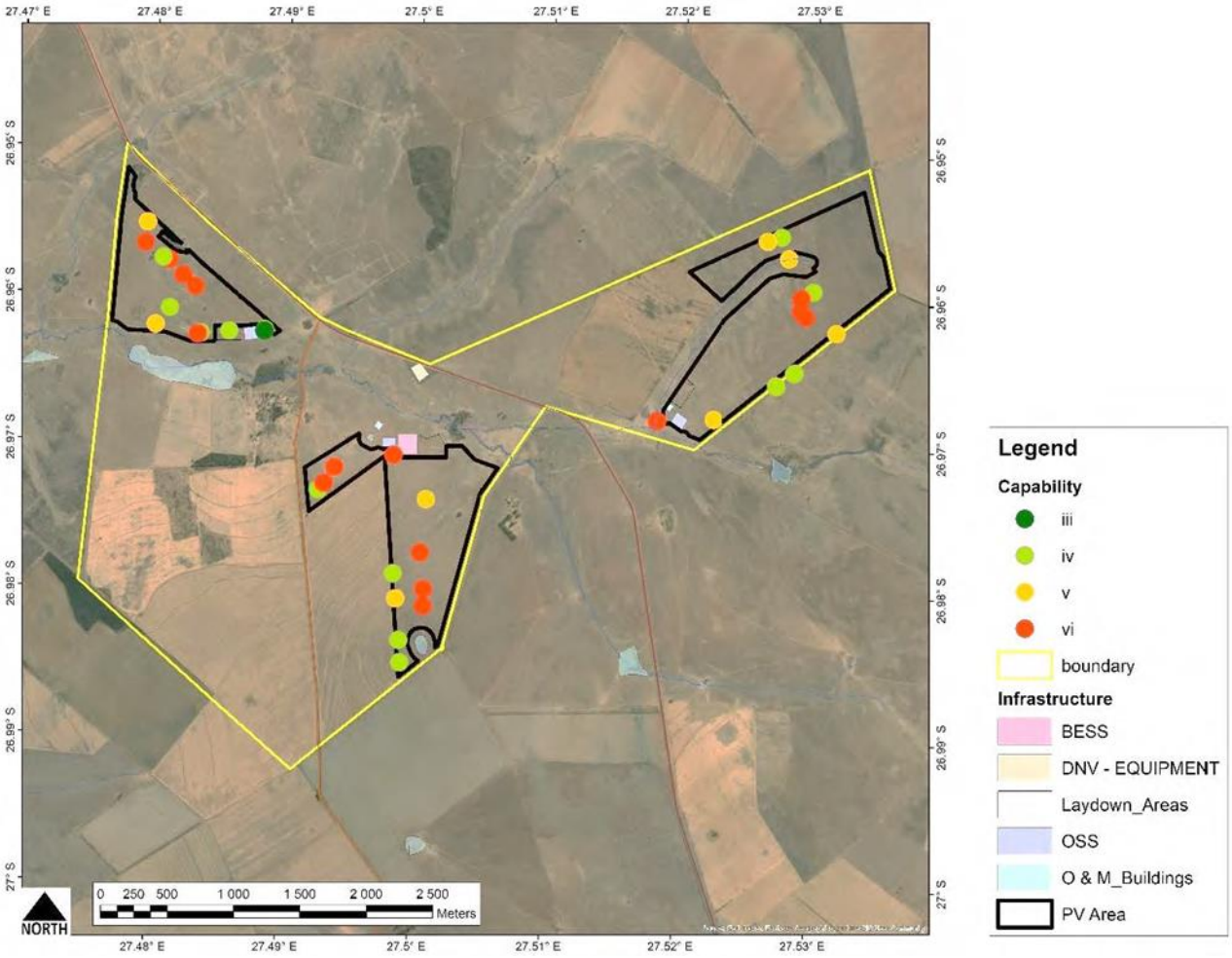


Figure 67: Land capability description (Gouws, 2022)

12.6.4.2 Grazing Capacity

The area proposed for the development is classified as grassland. The vegetation cover is good and the species composition in climax succession state. According to DALRRD the grazing capacity is 6 ha per large livestock unit (LSU).

Where the PV panels will be placed, as well as where and the support infrastructure will be fenced and not be available for animal grazing for the life of the project. This area is 328 ha and could accommodate approximately 54 LSU.

12.6.4.3 Agricultural Sensitivity – Screening Tool

According to the National DFFE Environmental Screening Tool (see **Figure 68** below), the site in general has high sensitivity for the land that was previously cultivated fields and medium sensitivity for the vacant and the grazing land. The dataset extracted from the tool indicates the high sensitivity land occurs only on a portion on the western boundary.

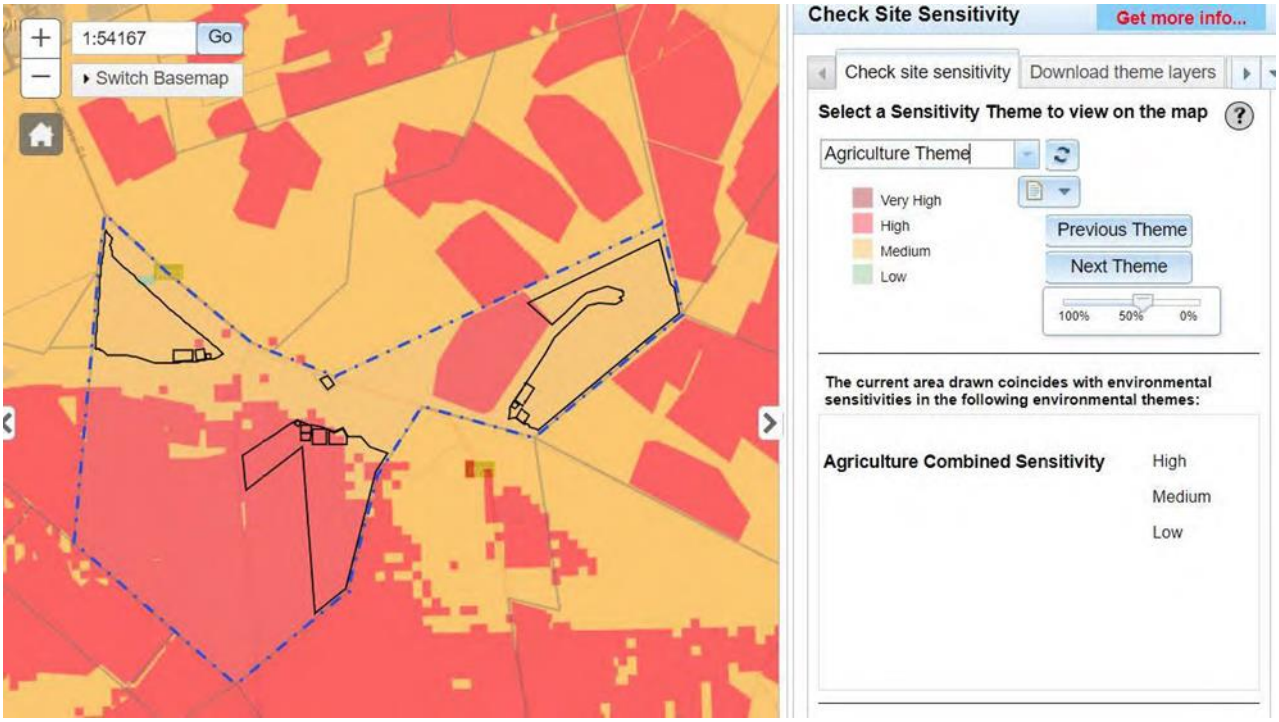


Figure 68: Agricultural sensitivity of Project Area according to Screening Tool (Gouws, 2022)

The following was found during the site analysis:

- There is a direct relationship between soil capability and sensitivity. Of all the observations made, only small portions fall into the medium sensitive category. Due to rock outcrops and shallow surrounding soils, the land portions are too small to create a land unit that can gainfully be cultivated. This is likely also the reason why they have never been cultivated (see **Figure 69** below).
- Many rocky outcrops were found on the southern section of the farm where a section of the PV site is proposed and which was indicated by the screening tool as highly sensitive.

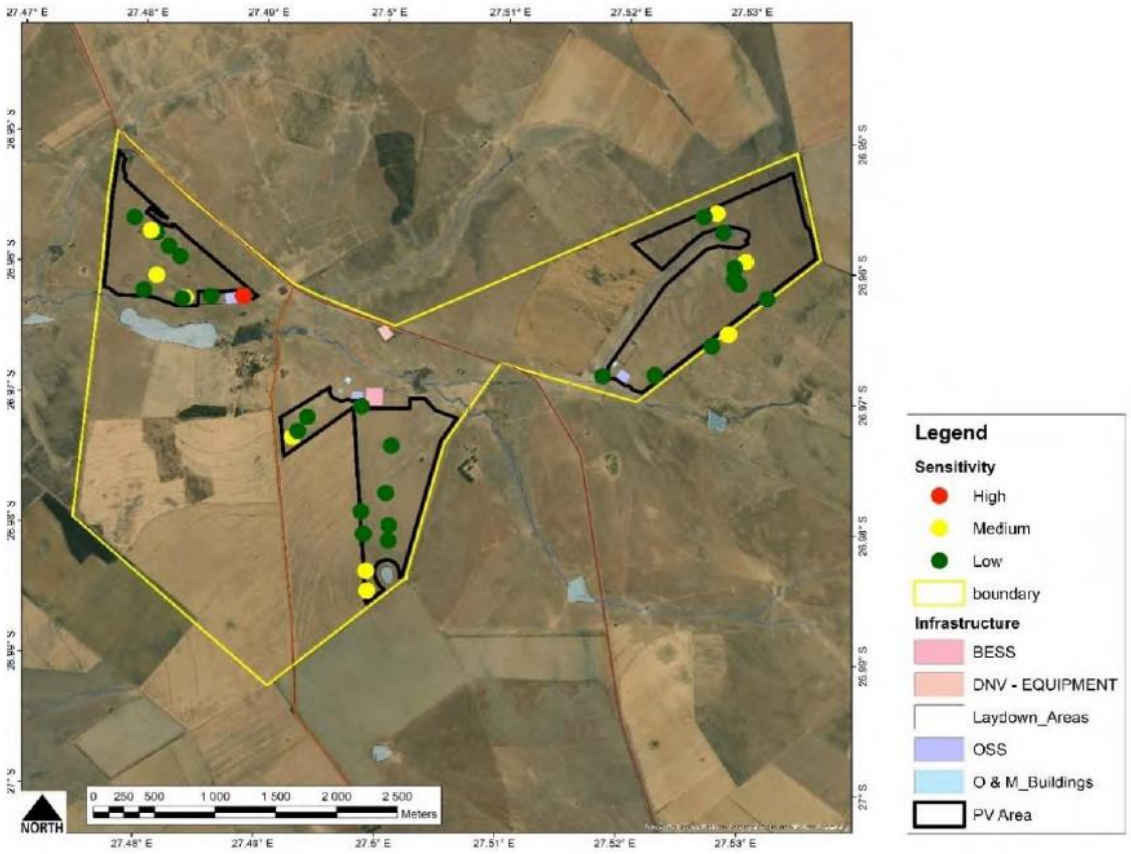


Figure 69: Land sensitivity description (Gouws, 2022)

12.6.5 Impact Assessment

Refer to **Section 13.15** below for the results from the impact assessment from this study.

12.6.6 Conclusions

The Agricultural Impact Assessment drew the following conclusions:

- Thirty eight percent of the land where the PV's will be placed is potentially arable and falls into Class iv, but they are shallow and have moderate potential – it is medium sensitive agricultural land. The balance of 60% is on shallow and rocky soils that is not arable and only suitable for animal grazing.
- Many rocky outcrops were found on the southern section of the farm where a section of the PV site is proposed. This is the area that the Screening Tool indicated as highly sensitive towards agriculture. However, the screening tool did not consider the rock outcrops and spots that are waterlogged.
- Having taken the former into consideration, the conclusion is that the site is medium to low sensitive to farming.
- The site is located in a predominantly animal grazing with a low potential. The income that can be generated by the land proposed for the PV project will only make a negligible contribution to the local or country's economy.

- No high potential land will be lost. Loss of the grazing land will have a low to moderate impact on local farmers.

12.7 Phase 1 Cultural Heritage Impact Assessment

A summary of the Phase 1 Cultural Heritage Impact Assessment (Van Schalkwyk, 2022) (contained in **Appendix E5**) follows.

12.7.1 Details of the Specialist

The details of the specialist that undertook the Phase 1 Cultural Heritage Impact Assessment follow.

Name:	J. van Schalkwyk
Qualifications:	D Litt et Phil
Affiliation (if applicable):	Heritage Consultant: ASAPA Registration No.: 164 - Principal Investigator: Iron Age, Colonial Period, Industrial Heritage.

12.7.2 Objectives of the Study

The main objective of the study was to provide an informed heritage-related opinion regarding the proposed development.

The specific objectives of this study included the following:

- Evaluate the potential impacts of construction, operation and maintenance of the proposed development on archaeological, cultural and historical resources;
- Recommend mitigation measures to ameliorate any negative impacts on areas of archaeological, cultural or historical importance; and
- Provide guideline measures to manage any impacts that might occur during the proposed project's construction and implementation phases.

12.7.3 Methodology

The methodology employed during this study consisted of the following:

- A survey of the relevant literature was conducted with the aim of reviewing the previous research done and determining the potential of the area. In this regard, various anthropological, archaeological and historical sources were consulted;
- A survey of Heritage Impact Assessments for projects in the region by various heritage consultants was conducted with the aim of determining the heritage potential of the area;
- The Heritage Atlas Database, various SAHRA databases, the Environmental Potential Atlas, the Chief Surveyor General and the National Archives of SA were consulted. Database surveys produced a number of sites located in the larger region of the proposed development; and
- Aerial photographs, topocadastral and other maps were also studied.

12.7.4 Key Findings of the Study

12.7.4.1 Survey Results

Refer to below **Figure 70** for the sites, features and objects of cultural significance that were identified in the project area.

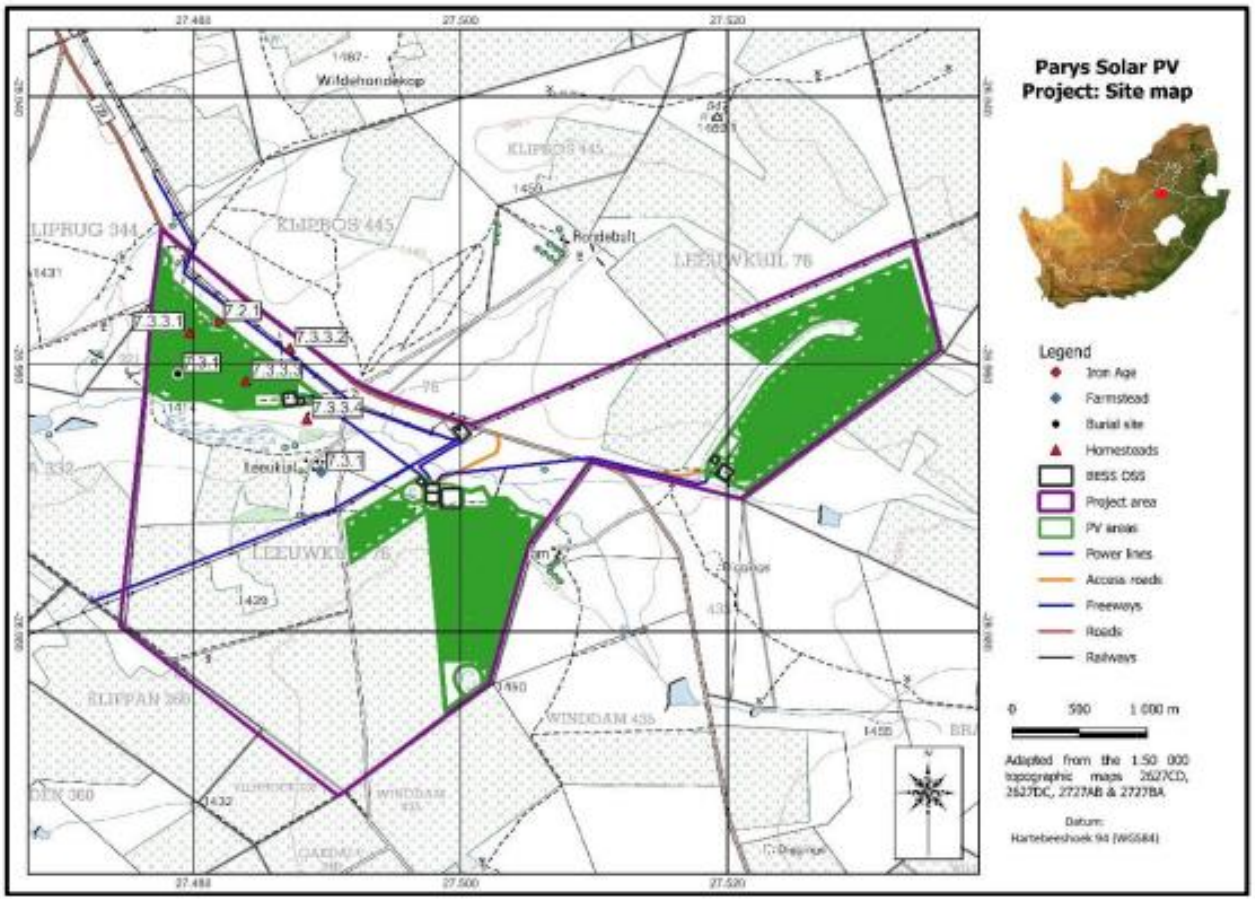


Figure 70: Location of heritage sites in the project area (Van Schalkwyk, 2022)

The sites, features and objects of cultural significance identified during the survey include the following:

- Stone age – No sites, features or objects of cultural significance dating to the Stone Age were identified in the project area.
- Iron age – A small, elongated hill, on the older maps referred to as 'Leeuwkop', on which a number of circular stone walls were identified. More significantly there are many located on the eastern side at the foot of the hill (see **Figures 71** and **72** below). It is at present not clear if this walling dates to the Late Iron Age, or early historic period. Unfortunately, the site has been impacted on by large amounts of plastic bottles, computer circuit boards and pieces of glass. No traditional pottery could be identified.

  The site is provisionally classified as belonging to the Late Iron Age as the layout is typical of that period. Larger enclosures to hold cattle, as well as a number of smaller

ones for small-stock (goats, pigs, etc. It is in all probability a cattle outpost for Setswana-speaking people who were living in large numbers a few kilometres to the north, although some Late Iron Age sites also occur to the west. This material is rated to have medium significance due to the limited number of occurrences in the immediate region.

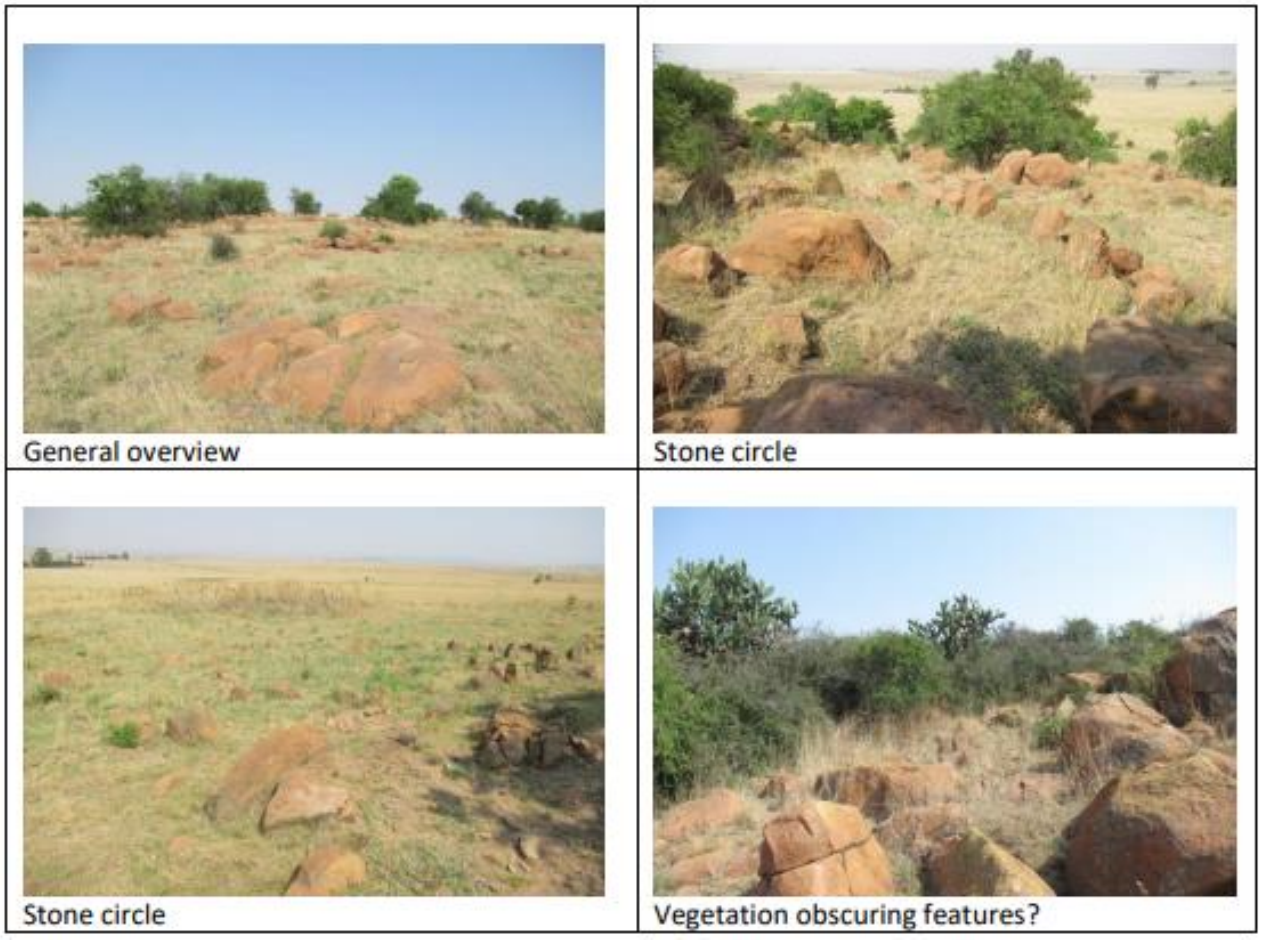


Figure 71: A view of the stone walled site and some of the walling (Van Schalkwyk, 2022)

- Historic period – A farmhouse probably dating to the 1930s. Although abandoned, it is still in good condition. It shows a Cape-Dutch revival gable at the front door. A number of outbuildings, all built in similar style, are spread over the larger farmstead (see **Figure 73** below).

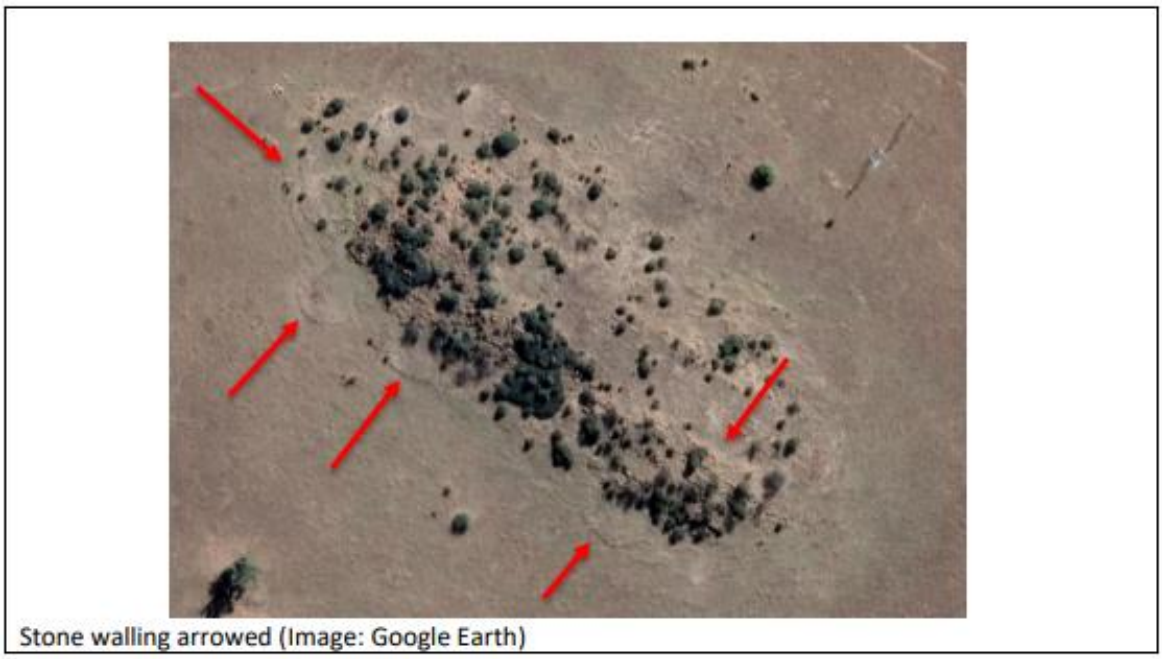


Figure 72: **The hill known as Leeukop, showing some of the stone walling (Van Schalkwyk, 2022)**

Figure 73: **Views of the farmhouse and outbuildings (Van Schalkwyk, 2022)**

- Burial Site – An informal burial site with at least 30 graves, most of which are only marked with stone cairns. Death dated that could be identified range between 1963 and 1984. The site is unfenced and many of the headstone have been pushed over, probably by cattle rubbing themselves against the stones. No recent signs of maintenance of visitation could be seen (see **Figure 74** below).

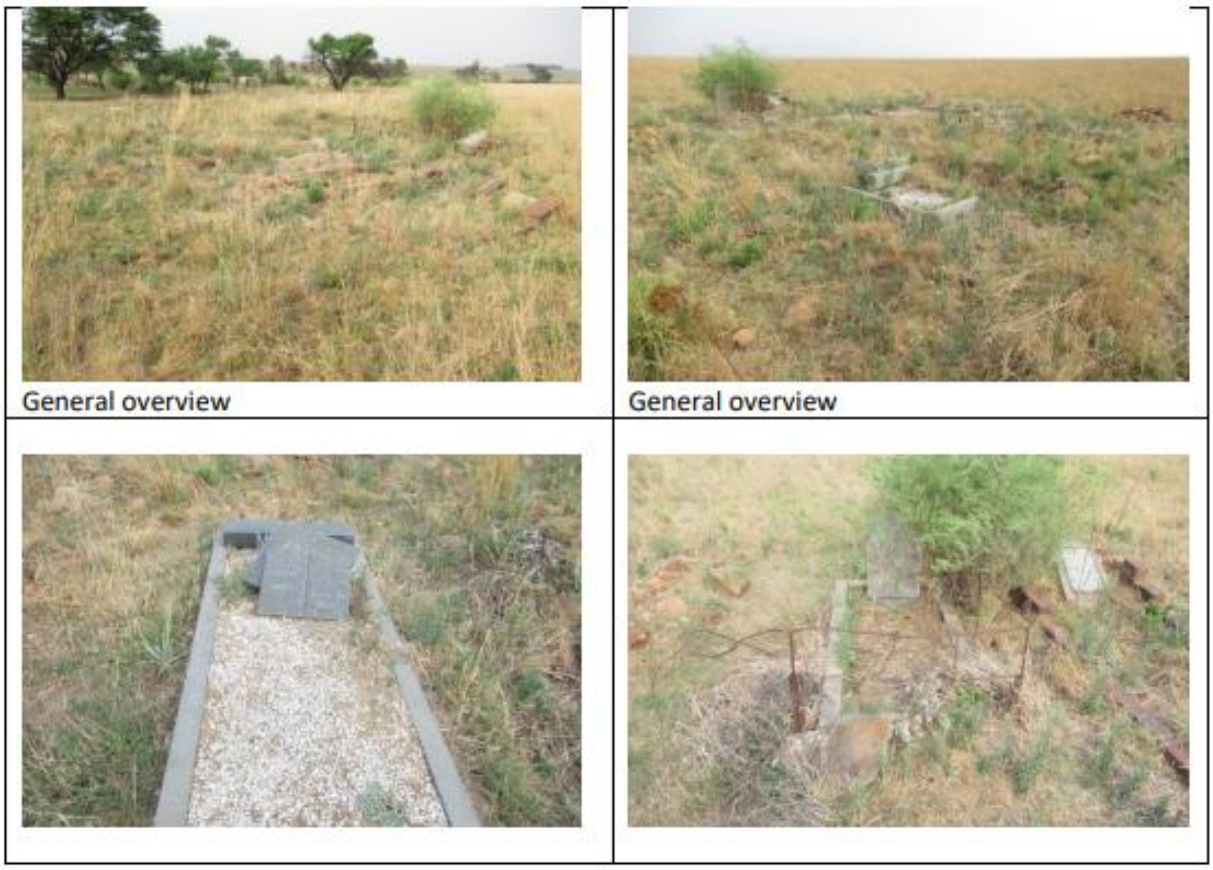


Figure 74: Views of the burial site and some graves (Van Schalkwyk, 2022)

- Homesteads - A number of homesteads, all probably occupied by former farm labourers, occur scatted across the western part of the project area. A homestead typically consists of the ruins (foundations) of a house, a kitchen midden, smallstock midden (dung heaps) and limited garden development – mostly trees that were plants adjacent to the house. It is not possible to date these features correctly. However, some are depicted on the 1944 version of the 1:50 000 topographic map and can also be seen on the 1944 aerial photograph. There might also be a link between these sites and the burial site 7.3.2 above. Although some of the graves might be much older, the death dates that could be identified range 1964 and 1983. This gives an approximate date for at least some of the sites (see **Figure 75** below).

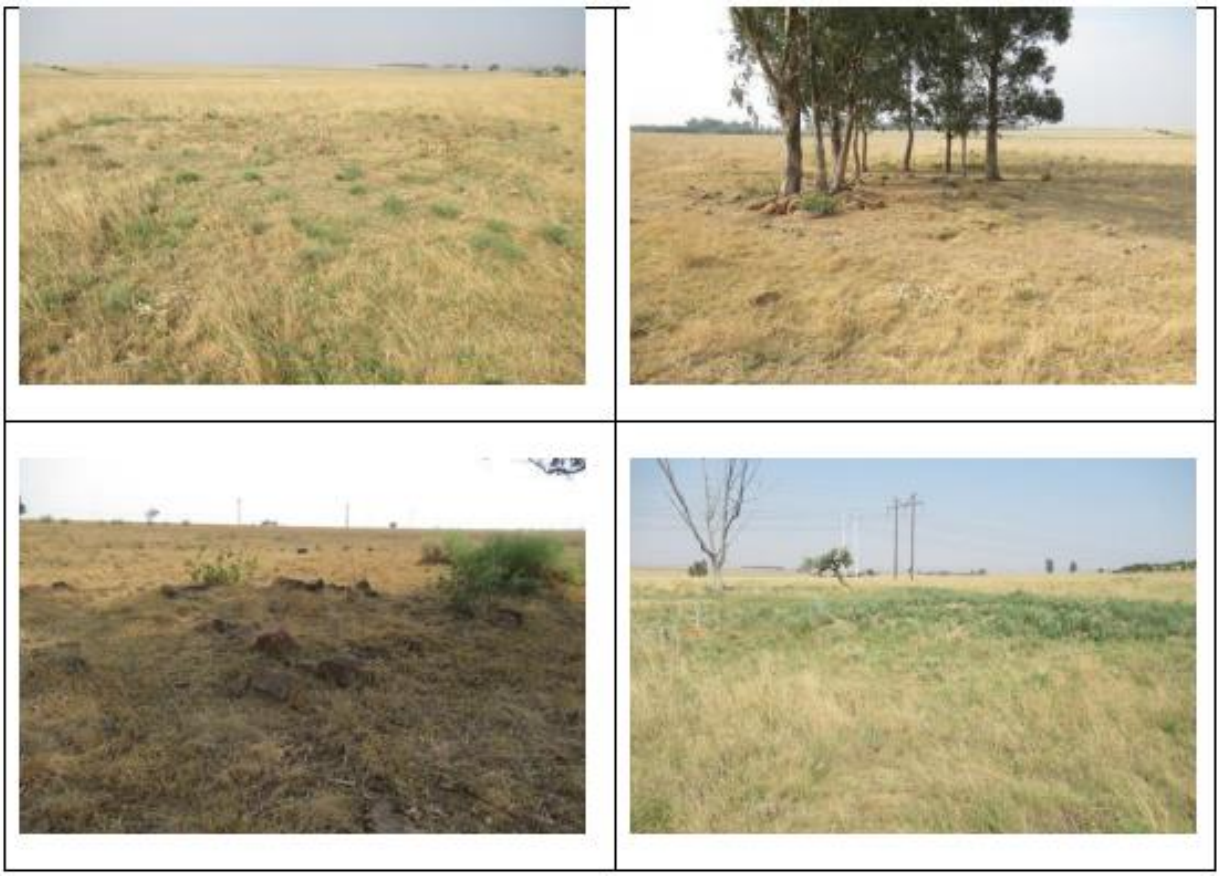


Figure 75: Some of the views of homesteads (Van Schalkwyk, 2022)

12.7.5 Impact Assessment

Refer to **Section 13.16** below for the results from the impact assessment from this study.

12.7.6 Conclusions

From a heritage point of view, it is recommended that the proposed Project be allowed to continue on acceptance of the mitigation measures and conditions that emanated from the study.

12.8 Desktop Palaeontological Desktop Assessment

A summary of the Palaeontological Desktop Assessment (Butler, 2022) (contained in **Appendix E6**) follows.

12.8.1 Details of the Specialist

The details of the specialist that undertook the Palaeontological Desktop Assessment follow.

Organisation:	Banzai Environmental
Name:	E. Butler
Qualifications:	MSc Zoology (specializing in Palaeontology)
Affiliation (if applicable):	Member of the Palaeontological Society of South Africa (PSSA)

12.8.2 Objectives of the Study

The general objectives of a Palaeontological Impact Assessment include the following:

- ❑ To identify the palaeontological importance of the rock formations in the footprint;
- ❑ To evaluate the palaeontological magnitude of the formations;
- ❑ To clarify the impact on fossil heritage; and
- ❑ To suggest how the developer might protect and lessen possible damage to fossil heritage.

12.8.3 Methodology

The following sources were reviewed as part of this study:

- ❑ Geological map 1:100 000, Geology of the Republic of South Africa (Visser 1984);
- ❑ A Google Earth map with polygons of the proposed development was obtained;
- ❑ 1:250 000 Christiana 2724 Geological map (1993) (Council of Geoscience, Pretoria); and
- ❑ Shape files produced by the Council of Geosciences (Pretoria).

12.8.4 Key Findings of the Study

The proposed development is underlain by sediments of the Vredefort Dome (Archaean granitoid intrusions). The largest portion of the development is underlain by the Inlandsee Leucogranofels with a small patch in the north west underlain by the Outer Granite Gneiss. This geology corresponds with that of the updated geology. The Palaeosensitivity map of the South African Heritage Resources Information System (SAHRIS) indicates that the Palaeontological Sensitivity of the granitoid intrusions of the Vredefort dome is Zero.

12.8.5 Impact Assessment

Refer to **Section 13.17** below for the results from the impact assessment from this study.

12.8.6 Conclusions

It is therefore considered that the proposed development will not lead to detrimental impacts on the palaeontological resources of the area. The construction and operation of the project may be

authorised, as the whole extent of the development footprint is not considered sensitive in terms of palaeontological heritage.

12.9 Visual Impact Assessment

A summary of the Visual Impact Assessment (Naidoo, 2022) (contained in **Appendix E7**) follows.

12.9.1 Details of the Specialist

The details of the specialist that undertook the Visual Impact Assessment follow.

Organisation:	Eco Elementum (Pty) Ltd	
Name:	N. Breitenbach	N. Naidoo
Qualifications:	B.Sc. Geography	B.Sc. Hons. Environmental Science
Affiliation (if applicable):	-	SACNASP (Cand. Sci. Nat.)

12.9.2 Objectives of the Study

The scope of work for the Visual Impact Assessment included the following:

- Describing the existing visual characteristics of the proposed site and its environment;
- Viewshed and viewing distance determination using Geographic Information System (GIS) analysis up to 15 Kilometres (km) from the proposed structures.
- Visual Exposure Analysis comprising the following aspects:
  - Terrain Slope - Slope angle is determined from the Digital Surface Model (DSM) and the location of the proposed structures given a ranking depending on the steepness of the slope.
  - Aspect of structure location - Aspect of the slope where the structures are to be built, are calculated from the DSM and given a ranking determined by the sun angle.
  - Landforms - Landform of the location of the proposed structures are determined from the DSM and ranked according to the type of landform. Structures built on certain landforms, e.g. ridges, will be more visible than structures built in valleys.
  - Slope Position of structure - Using GIS analysis, the position of the proposed structure is determined and ranked according to the position on the slope the structure is to be built.
  - Relative elevation of structure - Using the DSM, the elevation of the proposed structures relative to the surrounding elevation is determined and ranked according to the difference in height of the surrounding areas.
  - Terrain Ruggedness - The terrain ruggedness is determined from the DSM and given a ranking based on the homogeneousness of the terrain.
  - Viewer Sensitivity - The viewer sensitivity ranking of the surrounding areas is determined using various land cover and land use datasets and ranked according to the sensitivity of the related structures to the environment.

- ❑ Overall Visual Impact - Combing all the above datasets, a final visual impact of the proposed structures is calculated.
- ❑ Impact Identification and Ratings; and
- ❑ Mitigation of Identified Visual Impacts.

12.9.3 Methodology

The methodology employed for this study included the following:

Viewshed and viewing distance was modelled using GIS analysis up to 15 km from the proposed structures utilizing ArcGIS Pro 2.9.3 and Spatial Analyst Extension.

- ❑ In order to model the decreasing visual impact of the structures, concentric radii zones of 1 km to 15 km from the proposed development were superimposed on the viewshed to determine the level of visual exposure. The closest zone to the proposed structures indicates the area of most significant impact, and the zone further than 10 km from the structures indicates the area of least impact. The visual ratings of the zones have been defined as follows:
  - < 1 km (very high);
  - 1 - 2 km (high);
  - 2 - 5 km (moderate);
  - 5 - 10 km (low);
  - 10 - 15 km (very low); and
  - > 15 km (insignificant).
- ❑ A visual exposure analysis was conducted which included the following parameters:
  - Terrain Slope;
  - Aspect of structure location;
  - Landforms;
  - Slope position of structure;
  - Relative elevation of structure;
  - Terrain ruggedness;
  - Visual Absorption Capacity (VAC); and
  - Overall visual impact.

12.9.4 Key Findings of the Study

12.9.4.1 Landcover VAC

Figure 76 indicates the possible VAC of the study area calculated using the surrounding landcover. The results indicate that the study area has a low VAC therefore, the proposed infrastructure is expected not to blend in with the immediate surroundings.

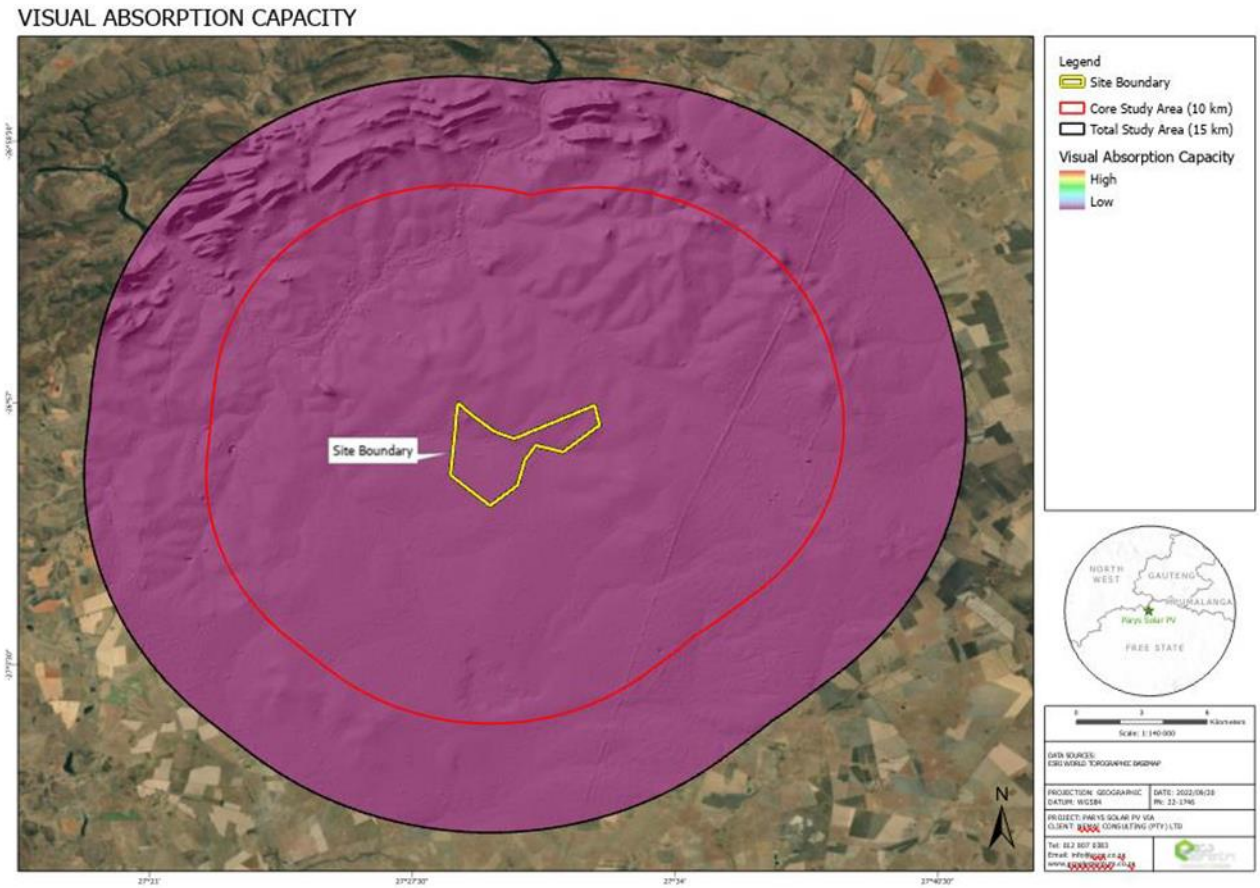


Figure 76: Potential VAC (Naidoo, 2022)

12.9.4.2 Viewshed Visibility

For the assessment of the visibility of the area, the proposed infrastructure was allocated 143 control points which were used as the observer points within the analysis. The viewshed shows the number of observer points that may be seen from any point within 15 km of the proposed project.

Figure 77 below indicates that the proposed project infrastructure is likely to be visible from the regions south to the east of the proposed site and from within the immediate vicinity of the site's boundary. Most of the proposed infrastructure is expected to be visible from the areas directly west of the project, within the core study area and total study area. A high number of observer points may also be visible from the hills located northwest and north of the site, beyond the core study area. A lower number of observer points are

expected to be visible from the east of the site, and the development is expected to be screened from the areas further southeast of the site.

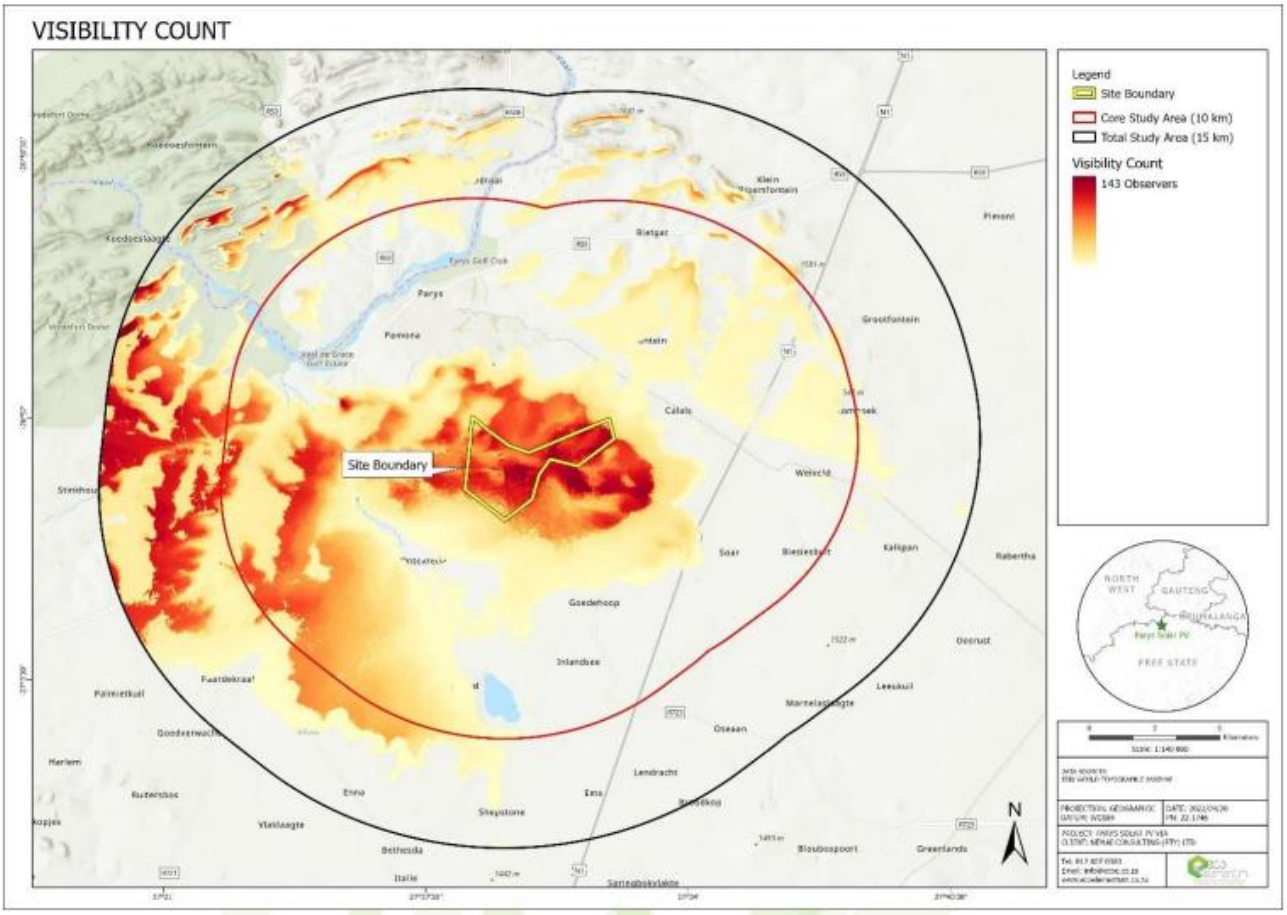


Figure 77: **Viewshed Visibility Count – showing the number of observer points that may be visible from within 15 km of the proposed site (Naidoo, 2022)**

12.9.4.3 Viewshed Visibility – Distance Ranking

The results from the viewshed visibility are further ranked based on the distance from the centre of the proposed site. The distances are ranked according to **Table 23** below.

Table 23: **Visibility Rating (Naidoo, 2022)**

12 – 15 km	Very Low
9 – 12 km	Low
6 – 9 km	Medium
3 – 6 km	High
0 – 3 km	Very High

The results in **Figure 78** below shows that the visibility of the proposed infrastructure will be highest within the eastern and southern parts of the site boundary. The visibility impact decreases as the distance from the site increases.

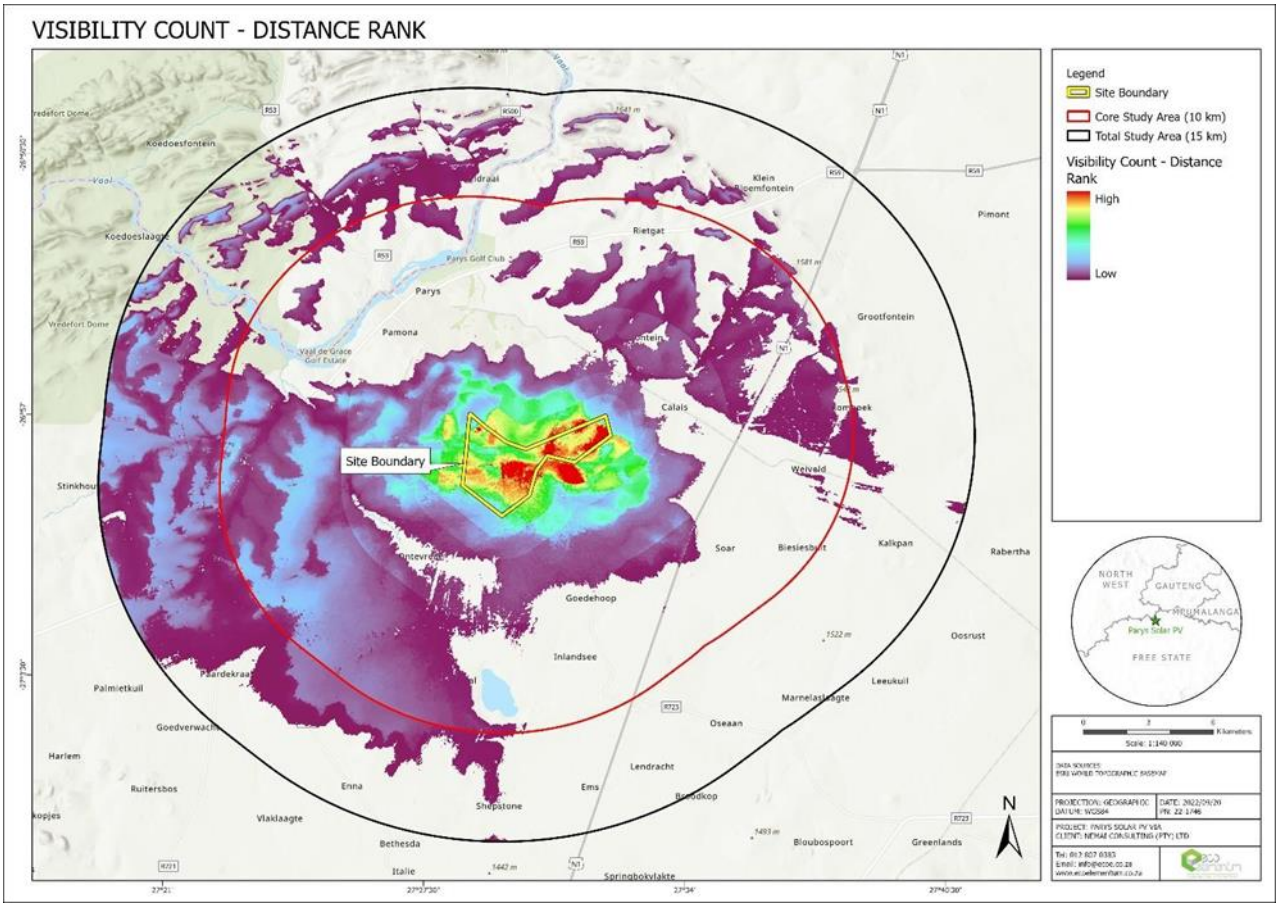


Figure 78: Visibility Count Distance Rank – showing the number of observer points that may be visible from within 15 km of the proposed site, ranked according to the distance from the proposed infrastructure (Naidoo, 2022)

12.9.4.4 Visual Exposure Ranking

The viewshed visibility and distance ranking is combined with the slope angle, slope aspect, slope position, ruggedness, relative elevation, landforms and landcover VAC to obtain a quantitative visual exposure ranking of all areas where the proposed infrastructure may potentially be visible from. Table 24 below indicates the visual exposure ranking.

Table 24: Visual Exposure Ranking (Naidoo, 2022)

1 - 2	Very Low
3 - 4	Low
5 - 6	Medium
7 - 8	High
9 - 10	Very High

The overall visual exposure (see **Figure 79** below) indicates that the areas surrounding the immediate study area, and the areas south to the east of the study area will experience some level of visual impact. The highest level of visual exposure is expected from the hills northwest and north of the site towards the edge of the total study area. Lower levels of visual impact are expected from the areas northeast, southwest and west of the site. No visual impact is expected from the areas southeast of the site approaching the edge of the core study area. Low to no levels of visual impact is expected along the Vaal River. Overall, figure 79 indicates that low levels of visual impact from the proposed project is expected.

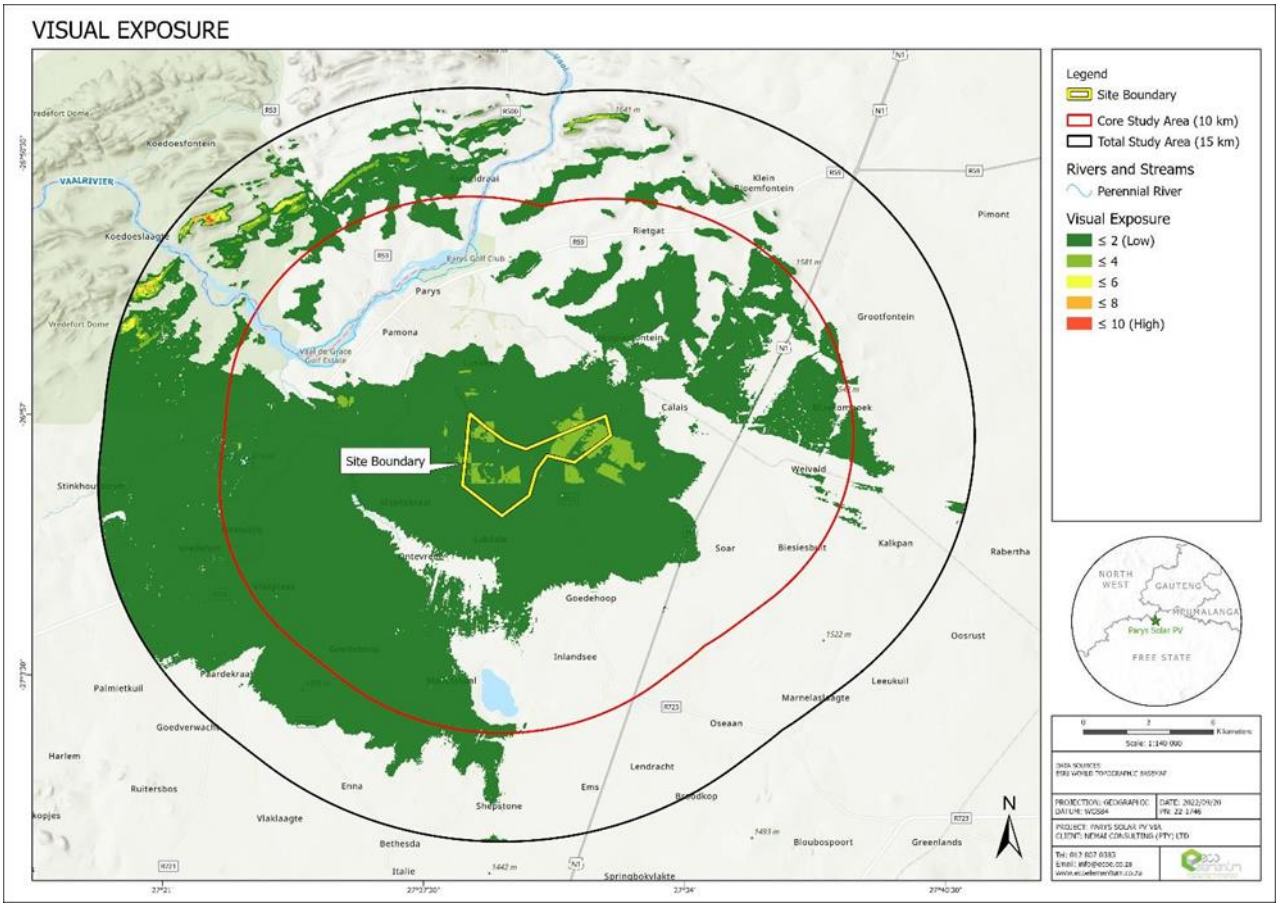


Figure 79: **Visual exposure – showing the level of visual exposure which may be experienced within 15 km of the proposed site (Naidoo, 2022)**

12.9.4.5 Viewpoints

Each identified sensitive receptor is then overlaid on the visual exposure ranking. It is important to note that the GIS tools used to quantify the overall visual exposure levels potentially experienced by the identified sensitive receptors only incorporates the variables as described in this report. Factors such as real time and micro scale vegetation are not considered, thus the actual level of visual exposure may be lower or higher depending on the updated land use in the vicinity or latest vegetation growth or height on a micro and macro scale. The results are by no means a rating of visual quality; it is rather used to

determine the likelihood of the proposed infrastructure being visible from the viewpoint receptors

Figure 80 below shows that the identified homesteads/schools/recreational facilities/accommodation are expected to experience low levels of visual exposure. The figure also indicates that the identified subplaces are expected to experience low to no levels of visual exposure. Furthermore, the Klein Paradys Bird Sanctuary is not expected to experience any level of visual exposure however, the northern boundary of the Vechthoek Private Nature Reserve is expected to experience medium levels of visual exposure. Lastly, the identified road network is expected to experience low to no levels of visual exposure.

Overall, the proposed project is expected to have a low visual impact on the identified sensitive receptors.

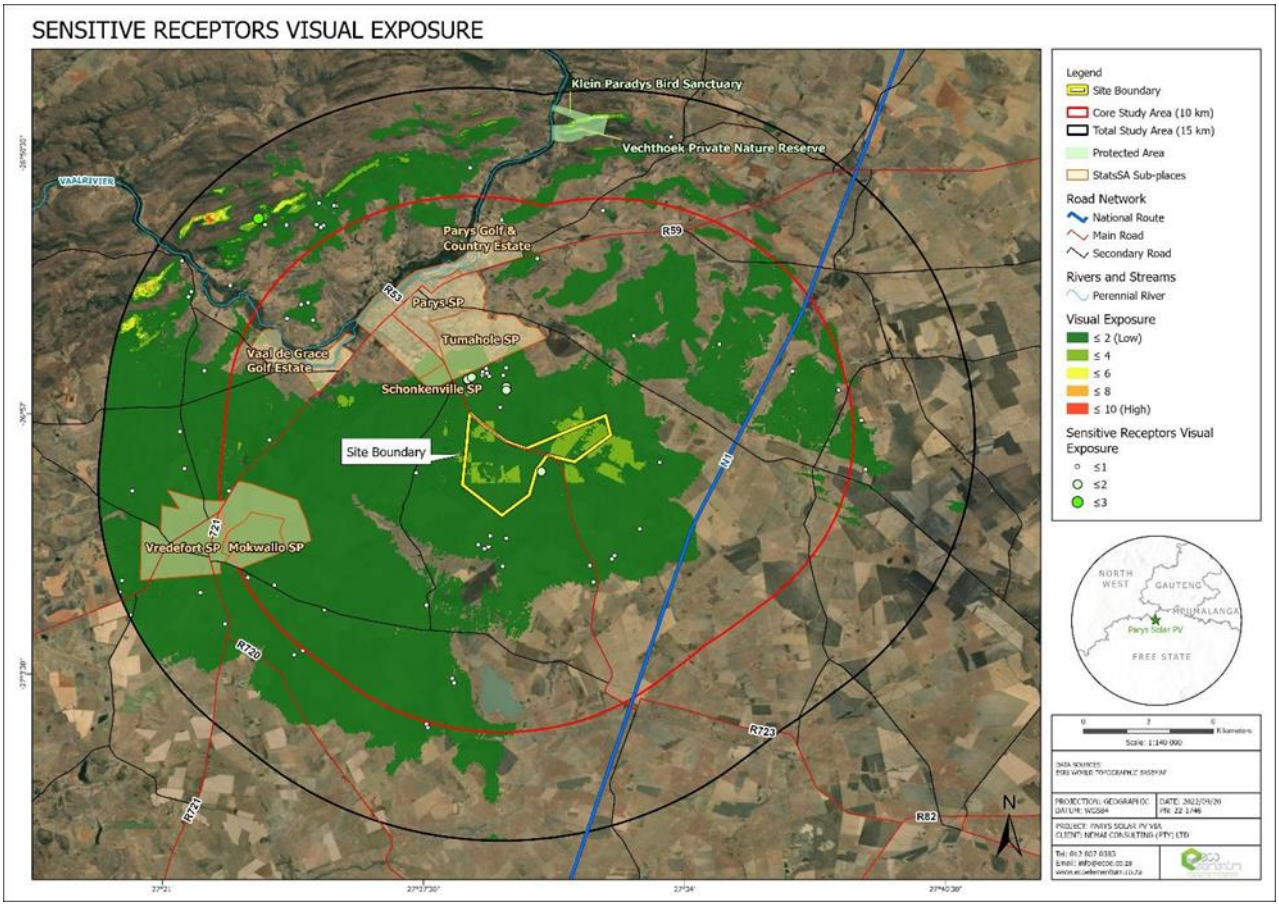


Figure 80: Visual exposure and sensitive receptors – showing the level of visual exposure potentially experienced by identified sensitive receptors (Naidoo, 2022)

12.9.5 Impact Assessment

Refer to **Section 13.18** below for the results from the impact assessment from this study.

12.9.6 Conclusions

The above assessment analysed the potential visual impacts that the proposed project may have on the surrounding area. From a visual perspective, the results indicate that the proposed infrastructure will create a moderate negative visual impact on the surrounding areas during each phase of the activity. These impacts can be reduced after the recommended mitigation measures are implemented. However, the overall visual impact will remain as a moderate negative impact during the operational phase of the project. This is mainly due to permanent nature of the structures.

Given the presence of existing powerlines, an Eskom substation and agricultural/farming activities within the study area, the proposed project is expected to increase the cumulative visual impact experienced by the identified sensitive receptors. The proposed solar plant is also expected to alter the sense of place of the study area and may set a precedent for future renewable energy plants. Although the development of new infrastructure to ensure sustainable electricity to the region forms part of the municipality's 5-year goal and the expected visual exposure of the proposed project is low, the proposed solar plant, in conjunction with any further renewable energy plants, will have a negative visual impact on the surrounding study area mainly due to the areas high scenic quality attributed to the presence of the Vredefort Dome and tourism along the Vaal River.

12.10 Social Impact Assessment

A summary of the Social Impact Assessment (Nemai Consulting, 2022) (contained in **Appendix E8**) follows.

12.10.1 Details of the Specialist

The details of the specialist that undertook the Socio-Economic Impact Assessment follow.

Organisation:	Nemai Consulting
Name:	C. Chidley
Qualifications:	BA (Economics); BSc Eng (Civil); MBA

12.10.2 Objectives of the Study

The key objectives of the Socio-Economic Impact Assessment included the following:

- ❑ Collecting baseline data on the current socio-economic environment.
- ❑ Assessing the socio-economic impacts (positive and negative) of the Project;
- ❑ Considering the outcomes of the public participation process to date;
- ❑ Suggesting suitable mitigation measures to address the identified impacts; and
- ❑ Making recommendations on preferred options from a socio-economic perspective (if relevant).

12.10.3 Methodology

The Socio-Economic Impact Assessment set out the socio-economic baseline of the study area, predicted social impacts on the Project and made recommendations for mitigating impacts. The socio-economic baseline level was based on both primary and secondary data. The primary data was collected directly from the community members, community leaders, and private farmers. Secondary data was accessed through South African Databases, available reports and articles, as well as internet searches.

The profile of the baseline conditions included describing the current status quo of the community, including information on a number of social and economic issues such as:

- Demographic factors;
- Socio-economic factors such as income and population data;
- Access to services;
- Institutional environment;
- Social Organisation (Institutional Context); and
- Statutory Regulatory Environment.

12.10.4 Key Findings of the Study

- The regional study area is a rural economy with a narrow base;
- The project site has few social receptors surrounding the site, and the project has a low footprint on the social environment; and
- The social and economic impacts of the project are expected to be mainly positive in the sense that the local economy will be stimulated and broadened.

12.10.5 Impact Assessment

Refer to **Section 13.25** for the results from the impact assessment from this study.

12.10.6 Conclusions

The study assessed the social and economic impacts of the proposed Project. As expected, there were several positive and negative socio-economic impacts identified.

The negative impacts are limited in nature and scope and can be successfully mitigated by management rules and practices. It is therefore found that the project, once the recommended mitigation measures have been implemented, has a nett positive impact on the social environment or the regional study area.

12.11 Traffic Impact Assessment

A summary of the Traffic Impact Assessment (TIA) (Wink, 2023) follows. The specialist report is contained in **Appendix E9**.

12.11.1 Details of the Specialist

The details of the specialist that undertook the TIA follow.

Organisation:	iWink Consulting (Pty) Ltd
Name:	I. Wink
Qualifications:	MSc Eng (Civil & Transportation)
Affiliation (if applicable):	Professional Engineer registered with the Engineering Council of South Africa (Registration No.: 20110156)

12.11.2 Objectives of the Study

The TIA is aimed at determining the traffic impact of the proposed land development proposal and whether such development can be accommodated by the external transportation system.

The report deals with the items listed below and focuses on the surrounding road network in the vicinity of the site:

- The proposed development;
- The existing road network and any future road planning proposals;
- Trip generation for the proposed development during the construction, operation, and decommissioning phases of the facility;
- Anticipated traffic impact of the proposed development;
- Access requirements and feasibility of proposed access points;
- Determine a main route for the transportation of components to the proposed project site;
- Determine a preliminary transportation route for the transportation of materials, equipment and people to site;
- Recommend alternative or secondary routes, where possible and required;
- Assess Public Transport accessibility;
- Assess Non-motorised Transport availability; and
- Recommended high-level upgrades to the road network, if necessary.

12.11.3 Methodology

The TIA includes the following tasks:

- Project Assessment;
- Access and Internal Roads Assessment;
- Haulage Route Assessment;
- Traffic Estimation and Impact; and
- Reporting.

The following information sources and guidelines have been used to determine the extent of the TIA:

- Project Information provided by the Client;
- Google Earth.kmz provided by the Client;
- Google Earth Pro Satellite Imagery;
- Road Traffic Act, 1996 (Act No. 93 of 1996);
- National Road Traffic Regulations, 2000;
- SANS 10280/NRS 041-1:2008 - Overhead Power Lines for Conditions Prevailing in South Africa
- The Technical Recommendations for Highways (TRH 11): "Draft Guidelines for Granting of Exemption Permits for the Conveyance of Abnormal Loads and for other Events on Public Roads
- Manual for Traffic Impact Studies, Department of Transport, 1995;
- TRH26 South African Road Classification and Access Management Manual, COTO; and
- TMH 16 South African Traffic Impact and Site Traffic Assessment Manual (Vol 1/Vol2), COTO, August 2012.

12.11.4 Key Findings of the Study

- From a transport engineering perspective, the alternatives outlined for the development are equally acceptable as it does have a nominal impact on the traffic on the surrounding road network;
- It terms of site access, access for the western and central PV sites should be shared from the R723. Allowing for two separate access points in close proximity of each other may result in conflict points between construction vehicles and congestion on the R723;
- The access point to the eastern PV site from the R723 should connect with the R723 at a 90-degree angle as close as possible to ensure that drivers leaving the site have full view of the R723;
- The main impact on the external road network will be during the construction phase. This phase is temporary in comparison to the operational period;
- The number of abnormal load vehicles was estimated and to be found to be able to be accommodated by the road network; and
- During operation, it is expected that maintenance and security staff will periodically visit the facility and water be transported to site possibly twice a year for the cleaning of panels. The generated trips can be accommodated by the external road network.

12.11.5 Impact Assessment

Refer to **Section 13.21** for the results from the impact assessment from this study.

12.11.6 Conclusions

The construction and decommissioning phases of a solar power facility are the only significant traffic generators and therefore noise and dust pollution will be higher during these phases. The

duration of these phases is of temporary nature, i.e., the impact of the solar power facility on the external traffic on the surrounding road network is temporary and solar facilities, when operational, do not add any significant traffic to the road network. The proposed development project is supported from a transport engineering perspective.

13 IMPACT ASSESSMENT

13.1 General

This section focuses on the pertinent environmental impacts that could potentially be caused during the pre-construction, construction and operational phases of the Project.

Note that an 'impact' refers to the change to the environment resulting from an environmental aspect (or activity), whether desirable or undesirable. An impact may be the direct or indirect consequence of an activity. In accordance with the NEMA EIA Regulation, 2014 (as amended), 'activity' is defined in this report as an activity listed in GN No. R 983, GN No. 984 and GN No. 985 of 04 December 2014 (as amend).

Impacts were identified as follows:

- ❑ Impacts associated with listed activities contained in the EIA Regulations' Listing Notices;
- ❑ Impacts identified during the Scoping phase;
- ❑ An appraisal of the Project's activities and components;
- ❑ An assessment of the receiving biophysical, social, economic and built environments;
- ❑ Findings from specialist studies;
- ❑ Issues highlighted by environmental authorities; and
- ❑ Comments received during public participation from IAPs.

13.2 Impacts associated with Listed Activities

As mentioned, the Project requires Environmental Authorisation for certain activities listed in the NEMA EIA Regulations, 2014 (as amended), which serve as triggers for the EIA. The potential impacts associated with the key listed activities are broadly stated in **Table 25** below.

Table 25: Potential Impacts associated with the key listed activities

Listed Activities	Potential Impact Overview
GN No. R. 983 of 4 December 2014 (as amended) (Listing Notice 1)	
GN No. R.983 – Activity 11(i): 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 the 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;	• Impacts associated with the footprint of the physical infrastructure (proposed power line). • Potential loss of sensitive environmental features (e.g. heritage resources, sensitive fauna and flora species, ecosystems, cultivated land) along the proposed power lines. • Visual impact associated with the proposed power line. • Impacts to agricultural land. • Cumulative impacts associated with aligning the proposed power line alongside linear developments (including existing roads and power lines).

Listed Activities	Potential Impact Overview
(c) within an existing transmission line servitude; and (d) will be removed within 18 months of the commencement of development.	
GN No. R.983 – Activity no. 12(ii)(a) & (c): 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; 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; - 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.	• Impacts associated with the footprint of the physical infrastructure within 32 m of a watercourse. • Adverse effects to resource quality (i.e. flow, in-stream and riparian habitat, aquatic biota and water quality) associated with working in-stream and alongside watercourses. • Loss of riparian and instream vegetation within construction domain. • Destabilisation of affected watercourses. • Reduction in water quality of receiving watercourses due to improper management of storm water, hazardous material and sanitation. • Altering the drainage of the site.
GN No. R.983 – Activity no. 19: *The infilling or depositing of any material of more than 10 cubic metres into, or the dredging, excavation, removal or moving of soil, sand, shells, shell grit, pebbles or rock of more than 10 cubic metres from a watercourse;* *but excluding where such infilling, depositing, dredging, excavation, removal or moving -* *(a) will occur behind a development setback;* *(b) is for maintenance purposes undertaken in accordance with a maintenance management plan;* *(c) falls within the ambit of activity 21 in this Notice, in which case that activity applies;* *(d) occurs within existing ports or harbours that will not increase the development footprint of the port or harbour; or* *(e) where such development is related to the development of a port or harbour, in which case activity 26 in Listing Notice 2 of 2014 applies.*	• Adverse effects to resource quality (i.e. flow, in-stream and riparian habitat, aquatic biota and water quality) associated with working in-stream and alongside watercourses. • Loss of riparian and instream vegetation within construction domain. • Destabilisation of affected watercourses. • Reduction in water quality of receiving watercourses due to improper management of storm water, hazardous material and sanitation. • Altering the drainage of the site.
GN No. R.983 – Activity no. 24(ii): *The development of a road -* *(i) 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* *(ii) 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*	• Impacts associated with access roads. • Potential loss of sensitive environmental features (e.g. heritage resources, sensitive fauna and flora species). • Traffic disruptions during construction. • Impacts associated with obtaining access from the R723.

Listed Activities	Potential Impact Overview
(c) which is 1 kilometre or shorter.	
GN No. R.983 – Activity no. 28(ii): 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.	• Clearance of large areas associated with the construction footprint of the PV Site and associated infrastructure. • Loss of agricultural land. • Socio-economic impacts associated with construction activities.
GN No. R.983 – Activity 56 (i & ii): *The widening of a road by more than 6 metres, or the lengthening of a road by more than 1 kilometre-* *(i) where the existing reserve is wider than 13,5 meters; or* *(ii) where no reserve exists, where the existing road is wider than 8 metres;* *excluding where widening or lengthening occur inside urban areas.*	• Impacts associated with access roads. • Potential loss of sensitive environmental features (e.g. heritage resources, sensitive fauna and flora species). • Traffic disruptions during construction.
GN No. R. 984 of 4 December 2014 (as amended) (Listing Notice 2)	
GN No. R.984 – Activity no. 1: *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, excluding where such development of facilities or infrastructure is for photovoltaic installations and occurs -* *(a) within an urban area; or* *(b) on existing infrastructure.*	• Impacts associated with generating electricity from the Solar PV Plant. • Impacts associated with the footprint of the physical infrastructure. • Impacts to land use. • Potential loss of sensitive environmental features (e.g. heritage resources, sensitive fauna and flora species). • Visual impacts. • Soil destabilisation and subsequent erosion. • Proliferation of alien and invasive species. • Socio-economic impacts. • Traffic impacts.
GN No. R.984 – Activity no. 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.*	• Clearance of large areas of indigenous vegetation associated with the construction footprint of the PV Site and associated infrastructure. • Potential loss of sensitive environmental features (e.g. sensitive fauna and flora species). • Visual impacts. • Soil destabilisation and subsequent erosion. • Proliferation of alien and invasive species. • Socio-economic impacts associated with construction activities.
GN No. R. 985 of 4 December 2014 (as amended) (Listing Notice 3)	
GN No. R.985 – Activity no. 4 - (b)(i)(ee) & (gg): The development of a road wider than 4 metres with a reserve less than 13,5 metres. b. Free State i. Outside urban areas: (ee) Critical biodiversity areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans.	Impacts associated with building an access road within CBA 2, including loss of biodiversity. Potential cumulative impact of access roads on the Vredefort Dome WHS.

Listed Activities	Potential Impact Overview
(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, excluding disturbed areas.	
GN No. R.985 – Activity no. 12 - (b)(ii) & (iv): The clearance of an area of 300 square metres or more of indigenous vegetation except where such clearance of indigenous vegetation is required for maintenance purposes undertaken in accordance with a maintenance management plan. b. Free State ii. Within critical biodiversity areas identified in bioregional plans; iv. Areas within a watercourse or wetland; or within 100 metres from the edge of a watercourse or wetland.	The clearance of large tracts of indigenous vegetation and potential loss of sensitive fauna and flora species within areas consisting of CBA 2 and within 100 m from the edge of a watercourse or wetland.
GN No. R.985 – Activity no. 14(ii)(a) & (c) - (b)(i)(ff) & (hh): The development of— (i) dams or weirs, where the dam or weir, including infrastructure and water surface area exceeds 10 square metres; or (ii) infrastructure or structures with a physical footprint of 10 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 has been adopted, within 32 metres of a watercourse, measured from the edge of a watercourse; excluding the development of infrastructure or structures within existing ports or harbours that will not increase the development footprint of the port or harbour. b. Free State i. Outside urban areas: (ff) Critical biodiversity areas or ecosystem service areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans. (hh) 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 of a biosphere reserve.	• Impacts to biodiversity within CBA 2 as a result of the development of powerline infrastructure within 32 m from watercourses. • Effects to resource quality (i.e. flow, in-stream and riparian habitat, aquatic biota and water quality) associated with working in-stream and alongside the watercourses within CBA 2.
GN No. R.985 – Activity 18(b)(i)(ee)(gg) & (hh): The widening of a road by more than 4 metres; or the lengthening of a road by more than 1 kilometre. b. Free State i. Outside urban areas: (ff) Critical biodiversity areas or ecosystem service areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans. (hh) 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 of a biosphere reserve.	Impacts associated with building an access road within CBA 2, including loss of biodiversity. Potential cumulative impact of access roads on the Vredefort Dome WHS.

13.3 Project Activities

To understand the impacts related to the Project it is necessary to expand on description the activities associated with the project life-cycle, as done in the sub-sections below.

13.3.1 Project Phase: Pre-construction

Some of the main Project activities, as well as high-level environmental activities, to be undertaken in the pre-construction phase are listed in **Table 26** below.

Table 26: Simplified List of Activities associated with Pre-Construction Phase

Project Phase: Pre-construction
Project Activities
• Negotiations and agreements with the affected landowner, stakeholders and authorities
• Lease Agreement
• Registration of power line servitude
• Detailed engineering design
• Detailed geotechnical investigations, including geophysical investigations
• Survey and mark development
• Procurement process for Contractor
• Review Contractor's method statements (as relevant)
• Establish new access roads and undertake selective improvements to existing access roads to facilitate the delivery of construction plant and materials
• Arrangements for accommodation of construction workers (off site)
• The building of a site office and ablution facilities
• Confirmation of the location and condition of all structures and infrastructure on the PV Site
• Determining and documenting the conditions of the roads to be used during construction
• Fencing off PV Site
High Level Environmental Activities
• Diligent compliance monitoring of the EMPr, Environmental Authorisation and other relevant environmental legislation
• Pre-construction environmental survey
• Develop Environmental Monitoring Programme (air quality, water quality, noise, traffic, social)
• Barricading of sensitive environmental features (e.g. wetland buffer)
• Obtain permits for impacts to SCC, if avoidance is not possible (if required)
• Obtain permits if heritage resources are to be impacted on and for the relocation of graves (if required)
• On-going consultation with I&APs
• Other activities as per EMPr

13.3.2 Project Phase: Construction

Some of the main Project activities, as well as high-level environmental activities, to be undertaken in the construction phase are listed in **Table 27** below.

Table 27: Simplified List of Activities associated with Construction Phase

Project Phase: Construction
Project Activities
• Site establishment
• Relocation of existing structures and infrastructure
• Prepare access roads
• Establish construction laydown area
• Bulk fuel storage
• Delivery of construction material
• Transportation of equipment, materials and personnel
• Storage and handling of material
• Construction employment
• Site clearing (as necessary)
• Excavation
• Concrete Works
• Mechanical and Electrical Works
• Electrical supply
• Material delivery and offloading
• Construction of PV Plant infrastructure
• Stockpiling
• Stringing of transmission lines
• Waste and wastewater management
High Level Environmental Activities
• Diligent compliance monitoring of the EMPr, Environmental Authorisation and other relevant environmental legislation
• Implement Environmental Monitoring Programme (air quality, water quality, noise, traffic, social)
• Reinstatement and rehabilitation of construction domain (as necessary)
• On-going consultation with I&APs
• Other activities as per EMPr

13.3.3 Project Phase: Operation

Some of the main Project activities, as well as high-level environmental activities, to be undertaken in the operational phase are listed in **Table 28** below.

Table 28: Simplified List of Activities associated with Operational Phase

Project Phase: Operation
Project Activities
• Testing and commissioning the facility's components
• Cleaning of PV modules
• Servitude access arrangements and requirements
• Routine maintenance inspections of power lines and servitudes
• Controlling vegetation
• Managing stormwater and waste
• Conducting preventative and corrective maintenance

Project Phase: Operation
• On-going consultation with directly affected parties
• Monitoring of the facility's performance
High Level Environmental Activities
• On-going consultation with I&APs
• Other activities as per EMPr for Operational Phase

13.4 Environmental Aspects

Environmental aspects are regarded as those components of an organisation's activities, products and services that are likely to interact with the environment and cause an impact.

The environmental aspects that have been identified for the proposed Project, which are linked to the project activities, are provided in **Table 29** below. Note that only high level aspects are provided.

Table 29: Environmental Aspects associated with Project Life-Cycle

Project Phase: Pre-construction
Environmental Aspects
• Inadequate consultation with landowner and other relevant stakeholders
• Inadequate environmental and compliance monitoring
• Poor construction site planning and layout
• Site-specific environmental issues not fully understood
• Land occupancy by temporary buildings, provisional on-site facilities and storage areas
• Inaccurate pre-construction environmental survey
• Absence of relevant permits (e.g. for protected trees, heritage resources)
• Lack of barricading of sensitive environmental features (e.g., wetland buffer)
• Poor waste management
• Absence of ablution facilities
Project Phase: Construction
Environmental Aspects
• Inadequate consultation with landowner
• Inadequate environmental and compliance monitoring
• Lack of environmental awareness creation
• Indiscriminate site clearing
• Poor site establishment
• Poor management of access and use of access roads
• Disruptions to traffic
• Poor transportation practices
• Poor fencing arrangements
• Erosion
• Disruptions to existing services
• Disturbance of topsoil
• Poor management of excavations
• Inadequate storage and handling of material

• Inadequate storage and handling of hazardous material
• Poor maintenance of equipment and plant
• Poor management of labour force
• Pollution from ablution facilities
• Inadequate management of construction camp
• Poor waste management practices – hazardous and general solid, liquid
• Wastage of water
• Poor management of pollution generation potential
• Damage to significant flora (if encountered)
• Damage to significant fauna (if encountered)
• Impact to resource quality of wetland in central part of PV site
• Inadequate stormwater management
• Environmental damage to sensitive areas
• Damage to cultural heritage and palaeontological features (if encountered)
• Poor reinstatement and rehabilitation
Project Phase: Operation
Environmental Aspects
• Inadequate environmental and compliance monitoring
• Inadequate management of access, routine maintenance and maintenance works
• Inadequate management of vegetation
• Inadequate stormwater management
• Pollution caused by cleaning of panels
• Impacts caused by fire, explosion or leaks associated with BESS
• Pollution caused by dangerous good (e.g. transformer oils) associated with substation
• Inadequate management of light pollution
• Failure to comply with health, safety and environmental specifications

13.5 Potentially Significant Environmental Impacts

Environmental impacts are the change to the environment resulting from an environmental aspect, whether desirable or undesirable. This section will focus on the potentially significant direct, indirect, residual and cumulative impacts identified during the Scoping phase and any additional issues identified during the EIA phase.

The potentially significant environmental impacts associated with the Project, as listed in **Table 29** below, were identified through an appraisal of the following:

- ❑ Project-related components and infrastructure (see **Section 9**);
- ❑ Activities associated with the project life-cycle (i.e. pre-construction, construction and operation);
- ❑ Nature and profile of the receiving environment and potential sensitive environmental features and attributes (see **Section 11**);
- ❑ Findings from specialist studies (see **Section 12**);

- ❑ Understanding of direct and indirect effects of the Project as a whole (see **Section 13**);
- ❑ Comments received during public participation (see **Section 15**); and
- ❑ Legal and policy context (see **Section 5**).

It is noted that the potentially significant environmental impacts listed in **Table 30** were evaluated as part of the specialist studies and suitable mitigation measures were identified where it was found that these impacts could possible occur. These impacts are assessed in **Sections 13.9 – 13.26** below.

Table 30: Potentially Significant Environmental Impacts associated with the Project

Environmental Factor	Construction Phase Potential Issues / Impacts	Operational Phase Potential Issues / Impacts
Land Use	▪ Sterilisation of land for other land use types. ▪ Setbacks / conditions associated with surrounding land and infrastructure.	▪ Sterilisation of land for other land use types up to the decommissioning of the Project. ▪ Servitude restrictions.
Geology	▪ Suitability of geological conditions to support the Solar PV Plant.	▪ Suitability of geological conditions to support the Solar PV Plant.
Geohydrology	▪ Groundwater pollution due to spillages and poor construction practices. ▪ Utilisation of boreholes, if required.	▪ Groundwater pollution due to poor operation and maintenance practices. ▪ Utilisation of boreholes, if required.
Topography	▪ Visual impacts. ▪ Erosion of areas cleared for construction purposes. ▪ Crossing topographic features (watercourses).	▪ Crossing topographic features (watercourses). ▪ Visual impact caused by proposed Project infrastructure and landscape transformation. ▪ Glint and glare from solar panels.
Soil	▪ Soil erosion due to clearance and inadequate stormwater management. ▪ Soil compaction. ▪ Soil contamination due to spillages and poor construction practices. ▪ Loss of topsoil.	▪ Soil erosion due to inadequate stormwater management. ▪ Soil contamination due to poor operation and maintenance practices.
Surface Water	▪ Alteration of drainage over the PV Site. ▪ Surface water pollution due to spillages and poor construction practices. ▪ Encroachment of construction activities into watercourses and their buffer zones. ▪ Impacts where access roads and ancillary infrastructure cross / are in close proximity to watercourses (e.g., sedimentation, loss of vegetation, destabilisation of watercourse structure).	▪ Sedimentation through silt-laden runoff, caused by inadequate stormwater management. ▪ Damage to the PV facility and towers of the power line from major flood events. ▪ Water resources could be contaminated through inadequate storage and handling of hazardous materials, leaks from the BESS and poor management of waste and wastewater. ▪ Water use requirements of the Project need to be satisfied.
Flora & Fauna	▪ Habitat loss / fragmentation. ▪ Potential loss, disturbance or displacement of protected fauna and flora species. ▪ Human - animal conflicts. ▪ Noise and vibration impacts to fauna. ▪ Nights lights may affect nocturnal faunal species. ▪ Illegal harvesting and poaching of faunal and floral species by construction workers. ▪ Pollution of the biophysical environment from poor construction practices. ▪ Proliferation of invasive alien species in disturbed areas.	▪ Habitat fragmentation (e.g., barriers to animal movement). ▪ Reflection of sunlight from the solar panels could adversely affect birds, including those species that use the wetlands on the site and surrounding areas ▪ Risk to birds from collision with infrastructure and from electrocution. ▪ Electrical faulting from birds. ▪ Chemical pollution associated with cleaning the PV panels. ▪ Proliferation of invasive alien species in disturbed areas.
Socio-economic Environment	▪ Influx of people seeking employment and associated impacts (e.g., foreign workforce, cultural conflicts, squatting, demographic changes). ▪ Safety and security. ▪ Use of local road network.	▪ Direct and indirect economic opportunities as a result of the Project.

Environmental Factor	Construction Phase Potential Issues / Impacts	Operational Phase Potential Issues / Impacts
	▪ Nuisance from dust and noise. ▪ Consideration of local labourers and suppliers in area – stimulation of local economy (positive impact). ▪ Transfer of skills (positive impact).	
Air Quality	▪ Dust from the use of dirt roads by construction vehicles. ▪ Dust from bare areas that have been cleared for construction purposes. ▪ Emissions from construction equipment and machinery. ▪ Exhaust emissions from construction vehicles.	▪ The efficiency of the solar plant could be reduced if the modules are soiled (covered) by particulates/dust. ▪ Impacts to air quality caused by the operation and maintenance of the facility include dust from the use of dirt roads and exhaust emissions from vehicles.
Noise	▪ Localised increases in noise may be caused by construction activities.	N/A
Agriculture	▪ Loss of fertile soil through land clearance. ▪ Soil erosion. ▪ Loss of topsoil. ▪ Risk of harm to livestock from construction activities.	▪ Loss of possible future agricultural land use due to direct occupation by the development footprint. ▪ Soil erosion due to inadequate stormwater management.
Historical and Cultural Features	▪ Possible direct impacts on below-ground archaeological deposits and fossils as a result of ground disturbance. ▪ Possible direct impacts on cultural and historical resources (e.g. grave sites, iron age sites)	▪ Possible impacts to the cultural landscape as a result of the introduction of incompatible structures and infrastructure to the rural landscape.
Existing Structures & Infrastructure	▪ Setbacks/conditions associated with surrounding land and infrastructure. ▪ Crossing of existing infrastructure by power line.	▪ Setbacks/conditions associated with surrounding land and infrastructure. ▪ Disturbances to infrastructure traversed by power line during maintenance activities.
Transportation	▪ Increase in traffic on the local road network. ▪ Transportation of materials and construction personnel to site. ▪ Impacts to road conditions. ▪ Speeding and reckless driving by construction personnel. ▪ Construction vehicles accessing and leaving the sites via provincial roads. ▪ Use of oversized vehicles/abnormal loads, as required. ▪ Risks to other road users.	▪ Transportation of maintenance materials, as well as operational and maintenance personnel, to site. ▪ Safe access, taking into consideration the high speed environment along the R723. ▪ Sun glare off PV panels.
Aesthetics	▪ Landscape transformation. ▪ Visual impacts associated with construction activities.	▪ Landscape transformation. ▪ Inadequate reinstatement and rehabilitation of construction footprint. ▪ Light pollution. ▪ Glint and glare from PV facility. ▪ High visibility of power lines to visual receptors.
Health	▪ Hazards related to construction work. ▪ Increased levels of dust and particulate matter. ▪ Increased levels of noise. ▪ Water (surface and ground) contamination. ▪ Poor water and sanitation. ▪ Communicable diseases. ▪ Psychosocial disorder (e.g. social disruptions).	▪ Hazards related to operation and maintenance work. ▪ Fire and explosion risks during BESS operation.

Environmental Factor	Construction Phase Potential Issues / Impacts	Operational Phase Potential Issues / Impacts
	▪ Safety and security. ▪ Lack of suitable health services.	

The cumulative impacts are discussed in **Section 13.28** below.

The findings of the specialists are of particular importance in terms of understanding the impacts of the Project and managing these during the project life-cycle, as these studies focused on the significant environmental issues identified during the execution of the EIA. As can be seen from the various impact assessments performed by the specialists, there are a host of cross-cutting impacts that are addressed in a number of these studies, with particular reference to the land use, terrestrial ecology and socio-economic effects of the Project. The mitigation measures proposed by the specialists for these similar types of impacts are regarded as complementary and they are aligned with best practices and principles.

13.6 Impact Assessment Methodology

The impacts and the proposed management thereof are first discussed in **Section 13.9** to **Section 13.26** below on a qualitative level and thereafter quantitatively assessed by evaluating the nature, extent, magnitude, duration, probability and ultimately the significance of the impacts (refer to methodology provided in **Table 30** below). Where applicable, the impact assessments and significance ratings provided by the respective specialists are included.

The assessment considers impacts before and after mitigation, where in the latter instance the residual impact following the application of the mitigation measures is determined.

Table 30: Quantitative Impact Assessment Methodology

Nature (/Status)
The project could have a positive, negative or neutral impact on the environment.

Extent
- Local - extend to the site and its immediate surroundings.
- Regional - impact on the region but within the province.
- National - impact on an interprovincial scale.
- International - impact outside of SA.

Magnitude
Degree to which impact may cause irreplaceable loss of resources.
- Low - natural and social functions and processes are not affected or minimally affected.
- Medium - affected environment is notably altered; natural and social functions and processes continue albeit in a modified way.
- High - natural or social functions or processes could be substantially affected or altered to the extent that they could temporarily or permanently cease.

Duration
- Short term - 0-5 years.
- Medium term - 5-11 years.

- Long term - impact ceases after the operational life cycle of the activity either because of natural processes or by human intervention.
- Permanent - mitigation either by natural process or by human intervention will not occur in such a way or in such a time span that the impact can be considered transient.

Probability

- Almost certain - the event is expected to occur in most circumstances.
- Likely - the event will probably occur in most circumstances.
- Moderate - the event should occur at some time.
- Unlikely - the event could occur at some time.
- Rare/Remote - the event may occur only in exceptional circumstances.

Significance

Provides an overall impression of an impact's importance, and the degree to which it can be mitigated. The range for significance ratings is as follows-
0 – Impact will not affect the environment. No mitigation necessary.
1 – No impact after mitigation.
2 – Residual impact after mitigation.
3 – Impact cannot be mitigated.

In the case of the specialist studies, some of the impact assessment methodologies deviated from the approach shown in **Table 30** above. However, the quantitative basis for these specialist evaluations of the impacts to specific environmental features still satisfied the intention of the EIA.

13.7 Impact Mitigation

13.7.1 Mitigation Hierarchy

Impacts are to be managed by assigning suitable mitigation measures, where the objectives are to:

- ❑ Find more environmentally sound ways of executing an activity;
- ❑ Enhance the environmental benefits of a proposed activity;
- ❑ Avoid, minimise or remedy negative impacts; and
- ❑ Ensure that residual negative impacts are within acceptable levels.

Mitigation should strive to abide by the following hierarchy – (1) prevent; (2) reduce; (3) rehabilitate (or remediate); and/or (4) compensate for the environmental impacts.

The proposed mitigation of the impacts associated with the Project includes specific measures identified by the technical team (including engineering solutions) and environmental specialists, stipulations of environmental authorities and environmental best practices.

Note that the mitigation measures in the subsequent sections are not intended to be exhaustive, but rather focus on the potentially significant impacts identified.

The EMPr (contained in **Appendix H**) provides a comprehensive list of mitigation measures for specific elements of the Project and the receiving environment, which extends beyond the impacts evaluated in the body of the EIA Report.

13.7.2 EMPr Framework

An EMPr represents a detailed plan of action prepared to ensure that recommendations for enhancing positive impacts and/or limiting or preventing negative environmental impacts are implemented during the life-cycle of a project.

The content of an EMPr must either contain the information set out in Appendix 4 of the EIA Regulations or must be a generic EMPr relevant to an application as identified and gazetted by the Minister in a Government Notice. Once the Minister has identified, through a Government Notice, that a generic EMPr is relevant to an application for Environmental Authorisation, that generic EMPr must be applied by all parties involved in the EA process, including, but not limited to, the Applicant and the Competent Authority.

In accordance with the above, the following EMPr's were developed for the Project:

- Generic EMPr for the development and expansion for overhead electricity transmission and distribution infrastructure (contained in **Appendix H1**);
- Generic EMPr for the development and expansion of substation infrastructure for the transmission and distribution of electricity (contained in **Appendix H2**); and
- Normal EMPr for the Solar PV Plant (contained in **Appendix H3**).

All liability for the implementation of the EMPr (as well as the EIA findings and Environmental Authorisation, if granted) lies with the Applicant.

The following considerations and assumptions accompany the compilation of the EMPr for the Solar PV Plant:

- The EMPr is guided by the following principles, based on Lochner (2005) -
  - **Continuous improvement -** The Applicant should be committed to review and to continually improve environmental management, with the objective of improving overall environmental performance;
  - **Broad level of commitment** - A broad level of commitment is required from all levels of management as well as the workforce in order for the implementation of the EMPr to be successful and effective; and
  - **Flexible and responsive** - The implementation of the EMPr needs to be responsive to new and changing circumstances. The EMPr report is a dynamic "living" document that will need to be updated regularly throughout the duration of the project life-cycle.
- Compliance with the EMPr must be audited in terms of Regulation 34 of the EIA Regulations.
- The EMPr provides the framework for the overarching environmental management requirements for the project life-cycle. Following detailed design and planning, the EMPr may need to be revised to render the management actions more explicit and accurate to the final project specifications. Any amendments to the EMPr must be undertaken in accordance with Regulations 35 – 37 of the EIA Regulations.

- ❑ The EMPr will be linked to the project's overall Environmental Management System (EMS) (if applicable), where the EMS constitutes an iterative process that aims achieve continuous improvement and enhanced environmental performance.
- ❑ Although every effort has been made to ensure that the scope and level of detail of the EMPr are tailored to the level of environmental risk (i.e., type and scale of activity and the sensitivity of the affected environment) and the project- and site-specific conditions, certain of the environmental management requirements within the EMPr may be regarded as generic to make provision for activities that may take place as part of the overall Project.

13.8 Land Use

13.8.1 Impact Description

Land is required for constructing the proposed infrastructure associated with the Solar PV Plant. In addition, a servitude will be required for the proposed power line (grid connection).

The land is currently used for agricultural purposes including grazing and crop production. The landowner presently rents out the cultivated land. Land proposed for the PV site is used for animal grazing, hence no high potential or cultivated land will be lost.

13.8.2 Impact Assessment

Please refer to the mitigation measures and impacts assessment provided in **Section 13.15** below.

13.9 Soils

13.9.1 Impact Description

According to Gouws (2022), the soil at the PV Site is sensitive to erosion. During the construction phase areas will be cleared of vegetation, which may lead to soil erosion. Erosion could also take place in the absence of suitable stormwater management. The EMPr includes suitable storm water management measures to prevent the occurrence of erosion.

Soil may be polluted by poor storage or handling of material, spillages and inadequate housekeeping practices. Specific mitigation measures are contained in the EMPr, where the primary objective is the effective and safe management of materials on site, in order to minimise the impact of these materials on the biophysical environment. The same objective applies to the correct management and handling of hazardous substances (e.g. fuel, transformer oil, batteries).

13.9.2 Impact Assessment

Environmental Feature	Soils
Relevant Alternatives & Activities	**Construction and operational activities**
Project life-cycle	**Construction & operational phases**
Potential Aspects & Impacts	**Proposed Management Objectives / Mitigation Measures**
• Soil erosion. • Soil compaction. • Soil pollution.	• Stabilisation of cleared areas to prevent and control erosion. • Manage drainage from sites to minimise erosion. • Reinstate and rehabilitate disturbed areas to prevent future erosion. • See mitigation measures for hazardous substances and waste.

	+/- Impacts	Extent	Magnitude	Duration	Probability	Significance
Before Mitigation	-	local	medium-high	short-term	likely	3
After Mitigation	-	local	low	short-term	unlikely	1

13.10 Geohydrology

13.10.1 Impact Description

Groundwater may be impacted by the Project as follows:

- ❑ Possible influence on groundwater flow as a result of trenching and building of infrastructure and structures associated with the development footprint during construction;
- ❑ Use of groundwater during construction and operational phases; and
- ❑ Potential contamination of groundwater during construction and operational phases as a result of inadequate management of wastewater and spillages of dangerous goods.

13.10.2 Impact Assessment

Environmental Feature	Geohydrology
Relevant Alternatives & Activities	**Construction and operational activities**
Project life-cycle	**Construction & operational phases**
Potential Aspects & Impacts	**Proposed Management Objectives / Mitigation Measures**
• Groundwater pollution. • Groundwater use. • Impacts to groundwater flow.	• Provide suitable protection of groundwater during excavations. • All storage tanks containing hazardous materials must be placed in bunded containment areas with impermeable surfaces. The bunded area must be able to contain 110% of the total volume of the stored hazardous material. • Provide sufficient and suitable sanitation facilities during construction and operational phases, which shall conform to all relevant health and safety standards and codes. • Reduce sediment loads in water from dewatering operations. All dewatering shall be done through temporary sediment traps (e.g. constructed out of geo-textiles and hay bales). • If any groundwater is to be used during the construction and operational phases, it will need to comply with the provisions of the NWA, 1998.

	+/- Impacts	Extent	Magnitude	Duration	Probability	Significance
Before Mitigation	-	local	medium-high	long-term	likely	3
After Mitigation	-	local	low	long-term	unlikely	1

13.11 Surface Water

13.11.1 Hydrology

13.11.1.1 Impact Description

Key hydrological features associated with the PV Sites include the following:

- ❑ The east-west flowing perennial Jagkraalspruit traverses the site and drains into the Skulpspruit located approximately 7km to the west; and
- ❑ A total of six natural wetland HGM units were identified both within the 500 m regulated area and the project area.

Potential impacts related to the movement of water over the PV Site include the following:

- ❑ The development may alter the drainage on the site and cause an increase in runoff;
- ❑ Impacts where access roads and ancillary infrastructure cross watercourses;
- ❑ Impacts caused by inadequate stormwater management at the PV Site; and
- ❑ Damage to the development from major flood events.

13.11.1.2 Impact Assessment

Environmental Feature	**Hydrology**
Relevant Alternatives & Activities	**Construction and operational activities**
Project life-cycle	**Construction & operational phases**
Potential Aspects & Impacts	**Proposed Management Objectives / Mitigation Measures**
• Alteration of drainage over site. • Watercourse crossings. • Inadequate stormwater management. • Damage caused by floods.	• Structures associated with the PV facility are to be developed outside of the 1:100 year floodline of any watercourse. • Design suitable stormwater drainage system for the PV Site. • Identify appropriate protection measures during the design stage, taking into consideration foundation stability, access road stability, and electrical connections (amongst others). • Erosion protection measures to be installed where there are possibilities of surface water sheet flow causing erosion. • The construction camp shall not be situated within 100m or within the 1:100 year flood line of any watercourse. • Stabilisation of watercourses at crossings (access roads and ancillary infrastructure). • Carry out earthworks in phases across the PV Site to reduce the total area of disturbed ground at any one time.

	+/- Impacts	Extent	Magnitude	Duration	Probability	Significance
Before Mitigation	-	local	medium-high	long-term	likely	2
After Mitigation	-	local	low	long-term	unlikely	1

13.11.2 Wetlands

The findings from the Wetland Delineation and Risk Assessment (Clark, 2022a) follow. The specialist report is contained in **Appendix E1**.

13.11.2.1 Impact Description

It is mentioned that the solar PV panels will be bifacial and that, as a consequence, the ground beneath the PV grid will be completely cleared. Although the vegetation in most of the seeps is short, sparse, heavily overgrazed and in most places devoid of obligate hydrophytes (if not completely cleared by agriculture), the clearing of what little vegetation exists beneath the PV grids introduces a number of challenges. This is because vegetation plays an important role in the maintenance of hydrological and sediment regimes in wetlands. Removal of vegetation, particularly in the seep zones has the potential to decrease infiltration and increase surface runoff. It also has the potential to result in erosion of the seep zones while at the same time increasing sediment loads and potentially toxicants delivered to the valley-bottom wetlands.

However, given the small spatial extent of wetlands relative to the total project area and their amicable spatial arrangement within the project area, complete avoidance of wetlands and their buffers is entirely possible and is strongly advocated in this case. Excluding the wetlands and their prescribed buffers 1050.88 ha developable land remains representing 85.91 % of the project area. This risk assessment thus assumes full avoidance of the identified wetlands and their prescribed buffers. Any development within the wetlands would require strong motivation, would constitute a Very High residual impact rating and would warrant a full water use licence application and the development and implementation of a comprehensive wetland offset strategy.

Considering full avoidance the main risks which remain centre on increased flood peaks, sedimentation and erosion especially to HGM1. This risk is likely to stem from the exposed soil surfaces created during clearing in the construction phase but also during operation from maintaining cleared surfaces beneath the bifacial solar panels. The key objective should be to as far as possible increase the permeability and drainage of the soil beneath the solar panels while reducing the loss of sediments from this area during rainfall.

13.11.2.2 Impact Assessment

This risk-based impact assessment was conducted in line with Section 21(c) and (i) of the NWA to investigate the level of risk posed by the construction and operation of the proposed solar PV farm. **Table 31** below lists the potential risks posed by the development to the identified wetlands (HGMs 1-6). Significance ratings for each identified risk are given for scenarios with and without mitigation.

Table 31: Risk and impact assessment matrix (Clark, 2022a)

Activity	Aspect	Impact	Wetland Type	Severity					Spatial scale	Duration	Consequence	Frequency of activity	Frequency of impact	Legal Issues	Detection	Likelihood	Significance	Risk Rating	Control Measures
				Flow Regime	Water Quality	Habitat	Biota	Severity											
Construction																			
Clearing and preparation of PV footprint and access roads	Disturbance of wetland habitat.	Loss or degradation of wetland vegetation.	Without	4	4	4	5	4.3	2	5	11	4	4	5	3	16	180	H	• Use the wetland shapefiles provided by TBC to clearly demarcate (on the ground) the edge of the buffer on the valley-bottom (41 m buffer) and seep (29 m) wetlands. Regard these as strict no-go areas and sign post as environmentally sensitive. • All activities (including driving and equipment storage) must remain outside of the wetlands identified. • Use existing farmer's access road and crossing point across the main channelled valley-bottom wetland (HGM 1) to access the PV farm. All new roads and activities (including driving and equipment storage) must remain outside of the wetlands identified. Avoid constructing any new crossings by accessing other PV areas via new gates along the main regional sand road.
			With	1	1	2	2	1.5	2	5	8.5	2	2	1	1	6	51	L	
		Increased bare surfaces, floodpeaks and potential for erosion	Without	4	5	4	4	4.3	2	5	11	4	4	5	1	14	158	H	• Hold off on the clearing of vegetation as long as possible, ensuring that all construction materials are in place and the PV infrastructure is sourced and ready prior to clearing. • Take every measure to ensure that the bulk of the site clearing and earth moving activities take place in
			With	3	3	2	2	2.5	2	2	6.5	3	3	1	1	8	52	L	

Activity	Aspect	Impact	Wetland Type	Severity					Spatial scale	Duration	Consequence	Frequency of activity	Frequency of impact	Legal Issues	Detection	Likelihood	Significance	Risk Rating	Control Measures
				Flow Regime	Water Quality	Habitat	Biota	Severity											
																			winter when rainfall is lowest (and the grass sward is thinnest) to minimize environmental damage, erosion, sedimentation and contamination. • Ensure soil stockpiles and concrete / building sand are sufficiently safeguarded against rain wash. • Scrape the area where mixing and storage of sand and concrete occurred to clean and re-grass once finished. • Revegetate all accidentally cleared areas beyond the buildings as soon as possible
		Introduction and spread of alien and invasive vegetation	Without	2	2	4	4	3	2	5	10	3	3	5	1	12	120	**M**	• Promptly remove all alien and invasive plant species that may emerge during construction (i.e. weedy annuals and other alien forbs) • Appropriately stockpile topsoil cleared from the site. • Minimize unnecessary clearing of vegetation beyond the infrastructure footprints. • Lightly till any disturbed soil around the development to avoid compaction.
			With	1	1	1	1	1	1	2	4	2	1	1	1	5	20	**L**	

Activity	Aspect	Impact	Wetland Type	Severity					Spatial scale	Duration	Consequence	Frequency of activity	Frequency of impact	Legal Issues	Detection	Likelihood	Significance	Risk Rating	Control Measures
				Flow Regime	Water Quality	Habitat	Biota	Severity											
Excavation and installation of PV infrastructure.	Alteration of Hydrological Regime	Decreased flow inputs to wetlands and altered floodpeaks	Without	3	3	4	4	3.5	2	5	11	4	4	5	1	14	147	M	• Aim to maximise infiltration of rain water and maintain diffuse subsurface drainage below PVs. • Develop a sound stormwater management plan that is engineered to promote rainfall infiltration, maintain diffuse subsurface flows in seep areas, minimise the development of preferential flow paths. The stormwater plan would also benefit from Lidar based topography maps and / or site-specific contours that allow for the identification of flow paths. • Stormwater leaving the site should not be concentrated in a single exit drain but spread across multiple drains around the site each fitted with energy dissipaters (e.g. slabs of concrete with rocks cemented in). • Minimise the extent of concreted / paved / gravel areas. • Avoid excessively compacting the ground beneath the solar panels. • Introduce coarse, preferably washed, gravel beneath PV arrays.
			With	3	3	1	1	2	2	2	6	3	3	1	1	8	48	L	
	Soil disturbance	Increased sediment loads to downstream reaches	Without	4	5	4	4	4.3	2	5	11	4	4	5	1	14	158	H	• See mitigation for increased bare surfaces, runoff and potential for erosion • Introduce coarse, preferably washed, gravel beneath PV arrays.
			With	2	2	2	2	2	2	2	6	3	3	1	1	8	48	L	

Activity	Aspect	Impact	Wetland Type	Severity					Spatial scale	Duration	Consequence	Frequency of activity	Frequency of impact	Legal Issues	Detection	Likelihood	Significance	Risk Rating	Control Measures
				Flow Regime	Water Quality	Habitat	Biota	Severity											
Operation																			
Routine operation and maintenance	Residual vegetation disturbance	Proliferation of alien and invasive species	Without	1	1	2	2	1.5	2	5	8.5	2	2	5	1	10	85	**M**	• Continue to remove all alien and invasive plant species as they arise (i.e. weedy annuals and other alien forbs) . • Attempt to plant only locally indigenous plant species within the gardens.
			With	1	1	1	1	1	2	5	8	2	2	1	1	6	48	**L**	
	Increased contamination	Nutrient enrichment of wetlands	Without	1	5	4	4	3.5	2	5	11	4	4	5	2	15	158	**H**	• Make sure all excess consumables and building materials / rubble is removed from site and deposited at an appropriate waste facility. • Do not store any construction materials or equipment within any of the identified wetlands or their buffers. • Mixing of concrete must under no circumstances take place within any wetland. • Release only clean water into the environment.
			With	1	1	1	1	1	1	2	4	2	1	1	1	5	20	**L**	
	Altered sediment regime	Increased sedimentation from cleared ground beneath solar PV areas	Without	1	1	4	4	2.5	2	5	9.5	3	3	5	1	12	114	**M**	• Develop a sound stormwater management plan that is engineered to promote rainfall infiltration, maintain diffuse subsurface flows in seep areas, minimise the development of preferential flow paths. The stormwater plan would also benefit from Lidar based topography maps and / or site-specific contours that allow for the identification of flow paths. • Consider the use of a coarse
			With	1	1	1	1	1	2	2	5	3	3	1	1	8	40	**L**	

Activity	Aspect	Impact	Wetland Type	Severity					Spatial scale	Duration	Consequence	Frequency of activity	Frequency of impact	Legal Issues	Detection	Likelihood	Significance	Risk Rating	Control Measures
				Flow Regime	Water Quality	Habitat	Biota	Severity											heavy metal-free gravel beneath the solar panels to promote infiltration and minimize surface run-off and erosion during high rainfall events. The gravel should be free of heavy metal contaminants.
Decommissioning																			
Demolition	Vehicle access	Degradation of vegetation and proliferation of alien and invasive species	Without	1	4	4	4	3.3	5	3	11	3	1	1	1	6	68	**M**	• Decommissioning is unlikely for the foreseeable future, however, if the water supply infrastructure ever needs upgrading and needs to be moved the following is recommended: • See mitigation for the impacts on degradation of downslope wetlands and spread of alien and Invasive plants. • Alien and invasive species control should continue for a minimum of three years following decommissioning.
			With	1	1	1	1	1	1	2	4	2	1	1	1	5	20	**L**	
	Soil and vegetation disturbances	Increased bare surfaces, runoff and potential for erosion	Without	4	5	4	4	4.3	2	5	11	4	4	5	1	14	158	**H**	• See mitigation for increased bare surfaces, runoff and potential for erosion and increased sediment loads during construction • Landscape and rehabilitate project area.
			With	1	1	1	1	1	2	2	5	3	1	1	1	6	30	**L**	

The following mitigation measures are proposed in light of the above risk assessment (Clark, 2022a):

- Use the wetland shapefiles to clearly demarcate (on the ground) the edge of the buffer on valley-bottom (41 m buffer) and seep (29 m) wetlands. Regard all wetlands and their buffers as strict no-go areas and sign post as environmentally sensitive.
- Use existing farmers access road and crossing point across the main channelled valley-bottom wetland (HGM 1) to access the PV farm. All new roads and activities (including driving and equipment storage) must remain outside of the wetlands identified. Avoid constructing any new crossings by accessing other PV areas via new gates along the main regional sand road.
- Hold off on the clearing of vegetation as long as possible, ensuring that all environmental authorisations are in place, the site construction materials are in place and the PV infrastructure is sourced and ready prior to clearing.
- Take every measure to ensure that the bulk of the site clearing and earth moving activities take place in winter when rainfall is lowest (and the grass sward is thinnest) to minimize environmental damage, erosion, sedimentation and contamination.
- Minimize the disturbance footprint and the unnecessary clearing of vegetation outside of this area.
- Develop a sound stormwater management plan that is engineered to promote rainfall infiltration, maintain diffuse subsurface flows in seep areas, minimise the development of preferential flow paths. The stormwater plan would also benefit from Lidar based topography maps and / or site-specific contours that allow for the identification of flow paths.
- Stormwater leaving the PV areas should not be concentrated in a single exit drain but spread across multiple exit drains, each fitted with energy dissipaters (e.g. slabs of concrete with rocks cemented in).
- Consider the use of a coarse gravel beneath the solar panels to promote infiltration and minimize surface run-off and erosion during high rainfall events. The gravel should be free of heavy metal contaminants.
- Educate staff and relevant contractors on the location and importance of the identified wetlands through toolbox talks and by including them in site inductions as well as the overall master plan.
- Promptly remove / control all alien and invasive plant species that may emerge during construction (i.e. weedy annuals and other alien forbs) must be removed.
- Ensure soil stockpiles and concrete / building sand are sufficiently safeguarded against rain wash.

13.12 Terrestrial Ecology

The findings from the Terrestrial Biodiversity Compliance Statement (Jacobs & Burger, 2022) follow. The specialist report is contained in **Appendix E2**.

13.12.1 Impact Description

The majority of the project area has historically been modified to accommodate agriculture practices and as such remain in a transformed state. The Project Area does, however, contain unique habitat features such as the wetland systems that traverse the central portion of the project area as well as the rocky area/ridge.

The focus of the mitigation measures is to reduce the significance of the expected impacts associated with the development and thereby to:

- Prevent the further loss and fragmentation of vegetation communities within the natural areas in the vicinity of the project area;
- Reduce the negative fragmentation effects of the development and enable the safe movement of faunal species; and
- Prevent the direct and indirect loss and disturbance of floral and faunal species and communities (including any potential SCC).

13.12.2 Impact Assessment

According to the Protocol for the specialist assessment and minimum report content requirements for environmental impacts on terrestrial biodiversity (GN No. 320 of 20 March 2020), a Terrestrial Biodiversity Compliance Statement was prepared for the Project as the desktop assessment and field survey confirmed that the Project Area is mostly of a 'Low' sensitivity. This compliance statement does not include a quantitative assessment of the potential impacts to terrestrial biodiversity, however, it provides impact management actions that are contained in **Table 32** below.

Table 32: Mitigation measures from Terrestrial Biodiversity Compliance Statement (Jacobs & Burger, 2022)

Impact Management Actions	Implementation		Monitoring	
	Phase	Responsible Party	Aspect	Frequency
Management outcome: Vegetation and Habitats				
All planned activities should be realigned to prioritise development within the 'Very Low' to 'Low' sensitivity areas. Medium impact activities followed by appropriate restoration are allowed within the 'medium' sensitive rocky area. It is recommended that areas to be developed/disturbed be specifically demarcated so that during the construction/activity phase, only the demarcated areas be impacted upon.	Planning Phase, Construction Phase	Project manager, Environmental Officer	Construction footprint	During phase
All planned activities should be realigned to prioritise development within the 'Very Low' to 'Low' sensitivity areas. Medium impact activities followed by appropriate restoration are allowed within the 'medium' sensitive rocky area. It is recommended that areas to be developed/disturbed be specifically demarcated so that during the construction/activity phase, only the demarcated areas be impacted upon.	Planning Phase, Construction Phase	Project manager, Environmental Officer	Construction footprint	During phase
All planned activities should be realigned to prioritise development within the 'Very Low' to 'Low' sensitivity areas. Medium impact activities followed by appropriate restoration are allowed within the 'medium' sensitive rocky area. It is recommended that areas to be developed/disturbed be specifically demarcated so that during the construction/activity phase, only the demarcated areas be impacted upon.	Planning Phase, Construction Phase	Project manager, Environmental Officer	Construction footprint	During phase
Areas of dense and healthy indigenous vegetation, even secondary communities outside of the direct project footprint, should not be fragmented or disturbed further.	Life of operation	Project manager, Environmental Officer	Areas of indigenous vegetation	Ongoing
All vehicles and personnel must make use of the existing roads and walking paths, especially construction/operational vehicles.	Construction/Operational Phase	Environmental Officer & Design Engineer	Roads and paths used	During phase
All laydown, chemical toilets etc. should be restricted to 'Very Low' sensitivity areas. Any materials may not be stored for extended periods of time and must be removed from the project area once the construction/closure phase has been concluded.	Construction/Operational Phase	Environmental Officer & Design Engineer	Laydown areas and material storage & placement	During phase

Impact Management Actions	Implementation		Monitoring	
	Phase	**Responsible Party**	**Aspect**	**Frequency**
Areas that are denuded during construction that are not within the proposed footprint area need to be re-vegetated with indigenous vegetation to prevent erosion during flood events and strong winds and to support the adjacent habitat. This will also reduce the likelihood of encroachment by alien invasive plant species.	Closure Phase/Rehabilitation phase	Environmental Officer & Contractor	Assess the state of rehabilitation and encroachment of alien vegetation	Quarterly for up to two years after the closure
It should be made an offence for any staff to take/bring any plant species into/out of any portion of the project area. No plant species whether indigenous or exotic should be brought into/taken from the project area, to prevent the spread of exotic or invasive species or the illegal collection of plants.	Life of operation	Project manager, Environmental Officer	Any instances	Ongoing
Leaking equipment and vehicles must be repaired immediately or be removed from project area to facilitate repair.	Life of operation	Environmental Officer & Contractor	Leaks and spills	Ongoing
A hydrocarbon spill management plan must be put in place to ensure that should there be any chemical spill out or over that it does not run into the surrounding areas. • The Contractor shall be in possession of an emergency spill kit that must always be complete and available on site. • Drip trays or any form of oil absorbent material must be placed underneath vehicles/machinery and equipment when not in use. • No servicing of equipment is to take place on site unless necessary. • All contaminated soil shall be treated in situ or removed and be placed in containers. It is important to appropriately contain any diesel storage tanks and/or machinery spills (e.g., accidental spills of hydrocarbons, oils, diesel etc.) in such a way as to prevent them leaking and entering the environment.	Life of operation	Environmental Officer & Contractor	Spill events, Vehicles dripping	Ongoing
Consult a fire expert and compile and implement a fire management plan to minimise the risk of veld fires around the project site.	Life of operation	Environmental Officer & Contractor	Fire Management	During Phase
Any individual of the protected plants that are present needs a relocation or destruction permit in order for any individual that may be removed or destroyed due to the development. High visibility flags must be placed near any protected plants to avoid any damage or destruction of the species. If left undisturbed the sensitivity and importance of these species needs to be part of the environmental awareness program.	Life of operation	Project manager, Environmental Officer	Protected Tree/Plant species	Ongoing

Impact Management Actions	Implementation		Monitoring	
	Phase	**Responsible Party**	**Aspect**	**Frequency**
Infrastructure, development areas and routes where protected plants cannot be avoided, these plants should be removed from the soil and relocated/ re-planted in similar habitats where they should be able to resprout and flourish again.				
Management outcome: Fauna				
No trapping, killing, or poisoning of any wildlife is to be allowed. Signs must be put up to enforce this. These actions are illegal in terms of provincial environmental legislation.	Life of operation	Environmental Officer	Evidence of trapping etc	Ongoing
A qualified environmental control officer must be on site when clearing begins. The area must be walked though by a qualified ecologist prior to construction to ensure that no faunal species remain in the habitat and get killed. Should animals not move out of the area on their own relevant specialists must be contacted to advise on how the species can be relocated.	Pre-Construction, Construction Phase	Environmental Officer, Contractor	Presence of any floral or faunal species	During phase
Any holes/deep excavations must be dug in a progressive manner in order to allow burrowing animals time to move off and to prevent trapping. Should the holes remain open overnight they must be covered temporarily to ensure no fauna species fall in.	Planning and construction	Environmental Officer & Contractor, Engineer	Presence of trapped animals and open holes	Ongoing
The proposed area to be developed must be disturbed by walking the area, prior to clearing of the area. This will allow fauna to move off from the area.	Life of Operation	Environmental Officer, Contractor, and estate manager	Fauna	Construction phase
The areas to be developed (or activity areas) must be specifically demarcated to prevent the movement of staff or equipment/vehicles into the surrounding environments. Signs must be put up to enforce this.	Construction/Operational Phase	Project manager, Environmental Officer	Infringement into surrounding areas	During phase
The duration of the construction should be minimized to as short a term as possible, to reduce the period of disturbance on fauna.	Construction/Operational Phase	Project manager, Environmental Officer & Design Engineer	Construction timeframe	During phase
Outside lighting should be designed and limited to minimize impacts on fauna. Fluorescent and mercury vapor lighting should be avoided, and sodium vapor (yellow) lights should be used wherever possible.	Construction/Operational Phase	Project manager, Environmental Officer & Design Engineer	Light pollution and period of light	During phase
All construction and maintenance motor vehicle operators should undergo an environmental induction that includes instruction on the need to comply with speed limits, to respect all forms of wildlife. Speed limits must be enforced to ensure	Construction Phase	Health and Safety Officer	Compliance to the training	During phase

Impact Management Actions	Implementation		Monitoring	
	Phase	Responsible Party	Aspect	Frequency
that road killings and erosion is limited. Speed bumps should be built to force slow speeds.				
Noise must be kept to a minimum during the evenings/ at night to minimize all possible disturbances to amphibian species and nocturnal mammals.	Construction/Operational Phase	Environmental Officer	Noise levels	Ongoing
Signs must be put up in order to show the importance and sensitivity of surrounding areas and their functions. This especially pertains to the ridge and wetland areas.	Life of operation	Environmental Officer	Presence and condition of signs	Ongoing
Only use environmentally friendly dust suppressant products.	Construction and operation	Environmental Officer & Contractor, Engineer	Presence of chemicals in and around the project area	Ongoing
Management outcome: Alien Vegetation and Fauna				
The implementation of an Alien Invasive Plant management plan is very important, especially because of the invasive species identified on site which, if left unchecked, will continue to grow and spread prolifically leading to further and more significant deterioration to the health of the natural environment within the project area.	Life of operation	Project manager, Environmental Officer & Contractor	Assess and control presence and encroachment of alien vegetation	Quarterly monitoring
The footprint area of the construction should be kept to a minimum. The footprint area must be clearly demarcated to avoid unnecessary disturbances to adjacent areas.	Construction/Operational Phase	Project manager, Environmental Officer & Contractor	Footprint Area	During phase
Management outcome: Dust				
Dust-reducing mitigation measures must be put in place and must be strictly adhered to, particularly for all dirt roads and any earth dumps. This includes the wetting of exposed soft soil surfaces and not conducting activities on windy days which will increase the likelihood of dust being generated. Only environmentally friendly suppressants may be used to avoid the pollution of water sources. Speed limits must be put in place to reduce erosion, and speed bumps should also be constructed.	Construction Phase and Life of operation	Contractor	Dustfall	Ongoing, as per a dust monitoring program
Develop and implement a dust monitoring programme for the construction phase of the project.	Construction Phase	Environmental Officer	Dust monitoring	Construction phase
Management outcome: Waste Management				
Waste management must be a priority and all waste must be collected and stored adequately. It is recommended that all	Life of operation	Environmental Officer & Health and Safety Officer	Presence of waste	Life of operation

Impact Management Actions	Implementation		Monitoring	
	Phase	Responsible Party	Aspect	Frequency
waste be removed from site on a weekly basis to prevent rodents and pests entering the site. • Refuse bins must be emptied and secured; • Temporary storage of domestic waste shall be in covered waste skips; and Maximum domestic waste storage period must be 10 days.				
Any litter, spills, fuels, chemical and human waste in and around the project area must be removed and disposed of timeously and responsibly.	Construction/Closure Phase	Environmental Officer & Health and Safety Officer	Presence of Waste	Daily
It must be made an offence to litter or dump any material outside of specially demarcated and managed zones. Signs and protocols must be established to explain and enforce this.	Life of operation	Contractor, Environmental Officer & Health and Safety Officer	Presence of Waste and Dumping	Daily, Ongoing
A minimum of one toilet must be provided per 10 persons. Portable toilets must be regularly pumped dry to ensure that the system does not degrade over time and spill into the surrounding area.	Life of operation	Environmental Officer & Health and Safety Officer	Number of toilets per staff member. Waste levels	Daily
The Contractor should supply sealable and properly marked domestic waste collection bins and all solid waste collected shall be disposed of at a licensed disposal facility.	Life of operation	Environmental Officer & Health and Safety Officer, Contractor	Availability of bins and the collection of waste	Ongoing
Where a registered disposal facility is not available close to the project area, the Contractor/property owner shall provide a method statement with regards to waste management. Under no circumstances may domestic waste be burned on site. Waste may never be stored in an open pit where it is susceptible to the elements such as wind and rain.	Life of operation	Environmental Officer, Contractor & Health and Safety Officer	Collection/handling of waste	Ongoing
Management outcome: Environmental Awareness Training				
All personnel are to undergo Environmental Awareness Training. A signed register of attendance must be kept for proof. Discussions are required on all sensitive environmental receptors within the project area to inform contractors and site staff of the presence of sensitive habitat features such as ridges and wetlands, and management requirements in line with the Environmental Authorisation and within the EMPr.	Life of operation	Environmental Officer, Health and Safety Officer	Compliance to the training	Ongoing
Contractors and employees must all undergo a strict environmental induction and be made aware of the sensitive habitats within the project area.	Life of operation	Environmental Officer, Health and Safety Officer	Compliance to the training	Ongoing

13.13 Avifauna

A separate Avifauna Baseline and Impact Assessment (Clark, 2022b) was undertaken and the findings from this study follow. The specialist report is contained in **Appendix E3**.

13.13.1 Impact Description

Five impacts to avifauna are anticipated as a result of the establishment PV plant. These included:

- Habitat loss, degradation and fragmentation including loss of important bird congregations;
- Collision, electrocution and entrapment with PV infrastructure;
- Direct loss of SCC nests or suitable nesting habitat;
- Sensory disturbance and extirpation of SCC or large roosting flocks; and
- Cumulative effect on regional birdlife.

Habitat loss was assigned a residual risk of Medium on account of the anticipated loss of natural grassland habitat of Medium sensitivity. Efforts have been made to shift the infrastructure out of the High sensitivity habitat which would have constituted a High residual impact significance.

Collision and electrocution was assigned a Medium significance. Of particular significance is the potential for collisions with electrical transmission infrastructure. Based on the current infrastructure layout three short (<3 km) 132 kV lines will be constructed across the main valley-bottom wetland at different locations. Although one of the lines will parallel the existing transmission line (along the access road bridge across the wetland), the two other lines will cross 546 m upstream and 1 km downstream of this existing powerline corridor. The wetland represents a busy movement corridor for birds and the establishment of these two powerlines represents a significant novel collision risk. However with mitigation (route alignment and installation of visual flight diverters) this impact can be reduced to a Medium residual impact.

Loss of SCC nests or breeding habitat due to the loss of grassland is a noteworthy possible impact. This is because the grasslands provide suitable breeding habitat for Blue Korhaan and potentially Melodious Lark. However, their breeding status in these grasslands remains uncertain. With mitigation (walkdowns and construction timing) this impact can be greatly reduced to Medium or potentially even a Low residual impact significance. The remaining impacts are deemed to have a Low residual risk.

13.13.2 Impact Assessment

Refer to **Table 33** below for the assessment of the significance of potential impacts on avifauna. The mitigation measures to manage impacts to avifauna are captured in **Table 34** below.

Table 33: Assessment of significance of potential impacts on avifauna (Clark, 2022b)

Impact	Prior to mitigation						Post mitigation					
	Status	Extent	Duration	Magnitude	Probability	Significance	Status	Extent	Duration	Magnitude	Probability	Significance
Loss, degradation and fragmentation of sensitive avifaunal habitat	-	4	4	8	5		-	2	4	6	5	
	Negative	High	Long term	High	Definite	**High**	Negative	Low	Long term	Moderate	Definite	**Medium**
Collision, electrocution and entrapment with PV infrastructure	-	3	4	8	5		-	2	4	6	3	
	Negative	Moderate	Long term	High	Definite	**High**	Negative	Low	Long term	Moderate	Probable	**Medium**
Direct loss of SCC nests or suitable nesting habitat	-	3	5	8	4		-	2	4	6	3	
	Negative	Moderate	Permanent	High	Highly probable	**High**	Negative	Low	Long term	Moderate	Probable	**Medium**
Sensory disturbance and extirpation of SCC or large roosting flocks	-	3	4	6	4		-	2	4	4	2	
	Negative	Moderate	Long term	Moderate	Highly probable	**Medium**	Negative	Low	Long term	Low	Improbable	**Low**

Impact	Prior to mitigation						Post mitigation					
	Status	Extent	Duration	Magnitude	Probability	Significance	Status	Extent	Duration	Magnitude	Probability	Significance
Cumulative effect on regional birdlife	-	2	4	4	3		-	1	4	4	3	
	Negative	Low	Long term	Low	Probable	**Medium**	Negative	Very low	Long term	Low	Probable	**Low**

Table 34: Avifauna-specific mitigation measures, management actions and performance criteria (Clark, 2022b)

Project phase	Potential impact	Mitigation	Responsible person/ entity	Management actions & performance criteria
Construction, Operation and Decommissioning	Loss, degradation and fragmentation of sensitive avifaunal habitat	• Continue to use the sensitivity spatial layers provided by TBC to appropriately position all surface infrastructure so as to avoid placing solar panels and associated infrastructure within the areas demarcated as being of High avifaunal sensitivity. • Demarcate these areas on the ground during construction and sign post them as environmentally sensitive areas keep out. • Rehabilitate all areas that may have been redundantly disturbed immediately after construction. • Develop and implement an Alien and Invasive Plant Control Plan. • Continue to avoid all areas of High avifaunal sensitivity, this must be enforced through on-ground demarcation and education of staff and contractors through inductions and signage.	Developer ECO	Incorporate sensitivity shapefiles provided by TBC into masterplan of PV facility. Use these spatial files to demarcate the sensitive areas on the ground and signpost them as environmentally sensitive no-go areas.
				Develop and implement a Construction Environmental Management Programme (CEMPr). The CEMPr must make clear the areas of High and Medium avifaunal sensitivity in relation to the construction footprint. The plan must also specify rules regarding speed limits, environmental no-go areas (floodplain wetland and 41 m buffer as well as far northern wetlands and grasslands,) off-road driving; use of existing access routes. The plan must also specify reporting deliverables and timeframes.
				Produce a map every year showing the development of the PV footprint in relation to the High and Medium sensitivity habitats. Data must be available in georeferenced shapefile format. Initiate an offset strategy if clearing of sensitive land is anticipated or has happened incidentally.
				Illustrate and briefly discuss habitat loss maps in a brief environmental annual ops report.

Project phase	Potential impact	Mitigation	Responsible person/ entity	Management actions & performance criteria
				Educate staff and contractors on the location and rules regarding sensitive areas identified in the project area.
				Commission annual external audit of CEMPr and EMPr compliance as well as annual ops report
Construction and Operation	Collision, electrocution and entrapment with PV infrastructure	• If practically feasible, consider aligning all three 132 kV powerlines to cross the wetland at the existing powerline corridor along the existing access road. Alignment of the powerlines will help to reduce the spatial extent of collision risk and help to increase the visibility of the lines and the potential that inbound birds will either fly above or below the powerline corridor. • Install Eskom-approved flappers or coils on both new and old transmission lines (particularly the earth wire). These should be placed 1 m apart when crossing wetlands and can be further apart in non-wetland areas (Eskom guidelines specify five metres apart). Flight diverter structures should ideally alternate between light and dark shades to maximise visibility and contrast against background as seen from powerline level. The structures must be installed as the powerlines are being spanned. This will drastically help to increase the visibility of transmission lines especially the thinner earth line with which most collisions tend to be associated (Martin et al. 2010). • It is recommended that at least one additional 3-day pre-construction survey (preferably 2) be completed in the height of the rainy season to better establish flight path use and attendance of SCC in line with Regime 2 survey protocols (Jenkins et al (2017). • Additionally due to the significant potential for collisions on the 132 kV lines crossing the valley-bottom wetland it is recommended (in line with Regime 2 protocol), that post-construction monitoring be conducted. This should involve both general avifaunal monitoring and fatality monitoring. • General monitoring should involve two three-day site visits (peak summer and early winter) that	Developer ECO and trained staff	Install Eskom-approved flappers or coils on both new and old transmission lines (particularly the earth wire). These should be placed 1 m apart when crossing wetlands and can be further apart in non-wetland areas (Eskom guidelines specify five metres apart). Flight diverter structures should ideally alternate between light and dark shades to maximise visibility and contrast against background as seen from powerline level. The structures must be installed as the powerlines are being spanned. This will drastically help to increase the visibility of transmission lines especially the thinner earth line with which most collisions tend to be associated (Martin et al. 2010).
				Conduct post-construction monitoring. This should involve both general avifaunal monitoring and fatality monitoring. General monitoring should involve two three-day site visits (peak summer and early winter) that repeat the methodologies used here (point counts and incidental searches) per year for two years. Fatality monitoring should involve standardised carcass searches (see Jenkins et al. 2017 for details on protocol) conducted on a bi-monthly (every second month) basis during the two-year post-construction monitoring period. Progress reports should be submitted every six months and an annual report submitted yearly. Carcass searches should occur around PV infrastructure but most importantly along the wetland beneath crossing points.
				Create bird and other biodiversity awareness signs and posters (interesting species and who to call regarding incidents).
				Increase awareness and the training undertaken by staff through incorporating biodiversity aspects (e.g. sensitive areas and species and who to report an incident or carcass to) into inductions.
				Although unlikely, if a nest of a suspected priority species (e.g. African Grass Owl, African Marsh Harrier or any raptor or large-terrestrial bird) is found in the project area, halt clearing activities, mark the nest both on the ground (dropper and flag) and with a GPS, signpost and report. A relevant avifaunal specialist should be consulted for advise on the way forward regarding the nest.

Project phase	Potential impact	Mitigation	Responsible person/ entity	Management actions & performance criteria
		repeat the methodologies used here (point counts and incidental searches) per year for two years. • Fatality monitoring should involve standardised carcass searches (see Jenkins et al. 2017 for details on protocol) conducted on a bi-monthly (every second month) basis during the two-year post-construction monitoring period. Progress reports should be submitted every six months and an annual report submitted yearly. Carcass searches should occur around PV infrastructure but most importantly along the wetland beneath crossing points. • All power cables within the project area should be thoroughly insulated and preferably buried in demarcated corridors. • White strips placed along the edges of the panels appear to help to increase visibility and deter birds based on work done by Horvath et al. (2010) and are recommended as far as practically feasible. • Install bird deterrent devices around panels and on transmission line poles, pylons and / or monopoles to limit time spent around infrastructure and therefore collision and electrocution risk. • The BESS must be covered in non-reflective surfaces and protected against thermal discharge and the risk of veld fires as a result.		
Pre-construction to Construction	Direct loss of SCC nests or suitable nesting habitat	• It is recommended that a thorough walkdown of the PV areas is conducted immediately prior to the onset of the initial clearing and earthmoving activities for construction. The walkdown should be aimed at detecting nests of any birds, particularly Blue Korhaan and Melodious Lark within the area earmarked for clearing and infrastructure establishment. • If nests of are found during the walkdown the avifaunal specialist is to advise on the way forward which may involve, *inter alia*, delaying clearing activities in a particular portion of the project area to allow successful fledging. • If other nests are found during clearing activities halt construction activities and call an avifaunal	Developer ECO	It is recommended that a thorough walkdown of the PV areas is conducted immediately prior to the onset of the initial clearing and earthmoving activities for construction. The walkdown should be aimed at detecting nests of any birds, particularly Blue Korhaan and Melodious Lark within the area earmarked for clearing and infrastructure establishment. If nests are found during the walkdown the avifaunal specialist is to advise on the way forward which may involve, inter alia, delaying clearing activities in a particular portion of the project area to allow successful fledging. In the annual environmental ops report, document noise, dust and light levels recorded preferably near the floodplain wetland. Suggest what actions could be taken to minimise these disturbances wherever possible.

Project phase	Potential impact	Mitigation	Responsible person/ entity	Management actions & performance criteria
		specialist immediately for advice on the way forward. • Continue to avoid all areas of High avifaunal sensitivity, this must be enforced through on-ground demarcation and education of staff and contractors through inductions and signage.		
Construction and Operation	Sensory disturbance and extirpation of SCC	• Attempt as far as possible to conduct the majority of the high intensity construction activities during winter to minimize disturbance of avifauna during sensitive life stages such as lekking, courting, nesting and fledging). • Keep lighting to a minimum 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. • All construction and maintenance motor vehicle operators should undergo an environmental induction that includes instruction on the need to comply with speed limit (40km/h), to respect all forms of wildlife. Speed limits must still be enforced to ensure that road killings and erosion is limited. • Schedule activities and operations during least sensitive periods, to avoid migration, nesting and breeding seasons (July-September).	Developer ECO	In the annual environmental ops report, document noise, dust and light levels. Suggest what actions could be taken to minimise these disturbances wherever possible.

13.14 Agricultural

The findings from the Agricultural Impact Assessment (Gouws, 2022) follow. The specialist report is contained in **Appendix E4**.

13.14.1 Impact Description

The following was noted by the Agricultural Specialist in terms of the potential impacts:

- Loss of high potential land - There will be no loss of high potential land. No impact and no mitigation required.
- Loss of grazing land - Land proposed for the PV site is used for animal grazing. Construction will affect a maximum of 54 LSU. The impact is low. Mitigation is achieved by concentrating infrastructure and still allow grazing to take place on vacant land.
- Loss of agricultural production - No cultivated land will be lost. The land can accommodate 54 livestock with a potential annual loss in income of about R459 000. Mitigation is achieved by concentrating infrastructure and still allow grazing to take place on vacant land. The impact is low.

13.14.2 Impact Assessment

The impact ratings shown in **Table 35** below were applied in determining the agricultural impacts. Refer to **Table 36** for an assessment of the anticipated agricultural impacts.

Table 35: Impact ratings used to evaluate agricultural impacts (Gouws, 2022)

Score	Significance	Description of Rating
2 – 10	Low Significance	No specific management action required
10 – 20	Medium-low significance	Administrative management actions required
20 – 40	Medium significance	Management and monitoring action plans required
40 – 60	Medium-high significance	Specific management and monitoring plans required
>60	High significance	Detailed plans required, potential red flag impact

Table 36: Assessment of agricultural impacts (Gouws, 2022)

Impact	Extent	Probability	Reversibility	Irreplaceable	Duration	Magnitude	TOTAL (SP)	Significance	Mitigation
LOSS OF HIGH POTENTIAL AGRICULTURAL LAND									
Loss of land	0	0	0	0	0	0	0	L	There will be no loss of high potential land. No impact and no mitigation required.
LOSS OF GRAZING LAND									
Loss of grazing land	1	5	3	2	3	2	28	ML	Land proposed for PV site is used for animal grazing. At a grazing capacity of 6ha/LSU, the affected land can carry about 54 LSU. The impact is low. Mitigation is

Impact	Extent	Probability	Reversibility	Irreplaceable	Duration	Magnitude	TOTAL (SP)	Significance	Mitigation
									achieved by concentrating infrastructure and still allows grazing to take place on all vacant land.
LOSS OF AGRICULTURAL PRODUCTION									
Loss of crop production	0	0	0	0	0	0	0	L	No rainfed cultivated land will be affected. No impact.
Loss of animal production	1	5	4	2	3	2	30	M	328 ha of grazing land can potentially be lost for the duration of the project. Coupled with the stover value of the harvested fields, the land could roughly accommodate 54 LSU. Assuming a margin for livestock at R8 500/LSU. The annual loss in income is estimated at about R459 000. Mitigation is achieved by concentrating infrastructure and still allow grazing to take place on vacant land.
LOSS OF AGRICULTURAL INFRASTRUCTURE									
Direct loss	1	1	1	1	1	1	5	L	There are some watering facilities that is within the proposed fenced area. These can be moved. No impact and no mitigation required
LOSS OF JOBS FROM FARMING									
Direct loss	1	1	1	1	3	1	7	L	Normally one labourer is required per 100 livestock. The livestock that can be assigned to the PV area can be tended by one labourer. The impact is low and mitigation can be achieved by absorbing him (or her) into the PV project.

13.15 Cultural Heritage

The findings from the Phase 1 Cultural Heritage Impact Assessment (van Schalkwyk, 2022) follow. The specialist report is contained in **Appendix E5**.

13.15.1 Impact Description

Potential heritage impacts include the following:

- Direct or physical impacts, implying alteration or destruction of heritage features within the project boundaries;
- Indirect impacts, e.g. restriction of access or visual intrusion concerning the broader environment; and
- Cumulative impacts that are combinations of the above.

From a review of available databases, publications, as well as available heritage impact assessments done for the purpose of developments in the region, it was determined that the Project is located in an area with a low presence of heritage sites and features.

Heritage resources are sparsely distributed on the wider landscape with highly significant (Grade 1) sites being rare. Because of the low likelihood of finding further significant heritage resources in the area of the proposed for development and the generally low density of sites in the wider

landscape the overall impacts to heritage are expected to be of generally low significance before mitigation.

For the Project Area, the impacts to heritage sites are expected to be of medium significance. However, this can be managed by implementing mitigation measures, include isolating sites, relocating sites (e.g. burials) and excavating or sampling any significant archaeological material found to occur within the Project Area. The chances of further such material being found, however, are negligible. After mitigation, the overall impact significance would therefore be low.

13.15.2 Impact Assessment

The assessment of the Project's cultural heritage impacts is provided in **Table 37** below.

Table 37: Assessment of cultural heritage impacts (Van Schalkwyk, 2022)

Site No.	Site type	NHRA category	Field rating	Impact rating: Before/After mitigation
7.2.1	Iron Age Site	Section 35	Generally protected 4B: Medium significance	Medium (36) Low (14)
Impact Assessment: This site is located inside the project area. Due to its location on the, and adjacent to, the hill, it might not be impacted on by the proposed development activities. **Mitigation:** (1) Avoidance/Preserve: It is recommended that a buffer zone is established around the hill. This should be at least 50m from the base of the hill / outer limit of identifiable features, e.g. stone walling. These buffer zones can only finally be determined in the field after the vegetation has been cleared away to give a true extent of the size of the site. (2) Archaeological investigation: This is appropriate where development occurs in a context of heritage significance and where the impact is such that it can be mitigated. Mitigation is to document the site (map and photograph) and analyse the recovered material to acceptable standards. This option should be implemented when it is impossible to avoid impacting on an identified site or feature.				
7.3.1	Farmstead	Section 34	Generally protected 4B: Medium significance	Low (14) Low (14)
Impact Assessment: This site is located outside the project area and consequently there is little possibility of it being impacted upon by the development activities. **Mitigation:** No further action required, as this site is located outside the development areas.				
7.3.2	Burial Site	Section 36	Generally protected 4A: High/medium significance	Medium (48) Low (14)
Impact Assessment: This site is located inside the project area. Due to its location, it might be impacted on by the proposed development activities. **Mitigation:** (1) Avoidance/Preserve: If it is decided to retain the burial site, it should be fenced off permanently by means of a wire fence or brick wall, with a buffer zone of at least 20m. These buffer zones can only finally be determined in the field after the vegetation has been cleared away to give a true extent of the size of the site.				

Site No.	Site type	NHRA category	Field rating	Impact rating: Before/After mitigation
(2) Relocation: This is appropriate where development occurs in a context of heritage significance and where the impact is such that it can be mitigated. Mitigation is to document the site (map and photograph) and analyse the recovered material to acceptable standards. This option should be implemented when it is impossible to avoid impacting on an identified site or feature.				
7.3.3.1 – 7.3.3.4	Homesteads	Section 34	Generally protected 4A: Medium significance	Low (30) Low (14)
Impact Assessment: These sites are located inside the project area. Due to their location, they might be impacted on by the proposed development activities. **Mitigation:** Not all the homesteads would be impacted upon by the proposed development. In addition, little has remained of the individual homesteads. Lastly, many more such features are found on neighbouring farms in the larger region. Therefore, the following is recommended: Ideally these sites should be avoided. However, this might cause problems for the layout of the larger development. Therefore, it is recommended that a watching brief should be instituted. This implies that an archaeologist should be present on site when construction work takes place to recover any significant material that might be exposed. It is anticipated that not much significant material would be exposed. However, it is known that still-born babies and even very young children were sometimes buried inside the house or in the courtyard. This material should be recovered by an archaeologist and by following proper procedures, it should be reburied in a mutually agreed upon place, e.g. the existing burial site on the farm.				

Legal requirements:

- ❑ In the event of an impact occurring on the identified site or feature, a permit for mitigation and/or destruction must be obtained from SAHRA/PHRA prior to any work being carried out.
- ❑ If heritage features are identified during construction, as stated in the management recommendation, these finds would have to be assessed by a specialist, after which a decision will be made regarding the application for relevant permits.

13.16 Palaeontology

The findings from the Desktop Palaeontological Desktop Assessment (Butler, 2022) follow. The specialist report is contained in **Appendix E6**.

13.16.1 Impact Description

The proposed development is located in an area with a Zero Palaeontological Sensitivity and is thus unfossiliferous. It is therefore considered that the proposed development will not lead to detrimental impacts on the palaeontological resources of the area.

13.16.2 Impact Assessment

The impact significance ratings shown in **Table 38** below were applied in determining the Project's impacts on fossil heritage (see **Table 39** below).

Table 38: Impact significance ratings used to evaluate impacts on fossil heritage (Butler, 2022)

Points	Impact significance rating	Description
6 to 28	Negative low impact	The anticipated impact will have negligible negative effects and will require little to no mitigation.
6 to 28	Positive low impact	The anticipated impact will have minor positive effects.
29 to 50	Negative medium impact	The anticipated impact will have moderate negative effects and will require moderate mitigation measures.
29 to 50	Positive medium impact	The anticipated impact will have moderate positive effects.
51 to 73	Negative high impact	The anticipated impact will have significant effects and will require significant mitigation measures to achieve an acceptable level of impact.
51 to 73	Positive high impact	The anticipated impact will have significant positive effects.
74 to 96	Negative very high impact	The anticipated impact will have highly significant effects and are unlikely to be able to be mitigated adequately. These impacts could be considered "fatal flaws".
74 to 96	Positive very high impact	The anticipated impact will have highly significant positive

Table 39: Summary of impact tables (Butler, 2022)

Site	Probability	Duration	Magnitude	Reversibility	Irreplicable Loss	Cumulative Effect	Significance
1	1	4	0	4	4	0	0

13.17 Visual Quality

The findings from the Visual Impact Assessment (Naidoo, 2022) follow. The specialist report is contained in **Appendix E7**.

13.17.1 Impact Description

The following potential visual impacts were identified for the Project:

- Construction phase –
  - Visual intrusion due to the removal of vegetation, movement of construction vehicles and heavy machinery, presence of laydown areas and site clearance;
  - Light pollution due to night lighting; and
  - Dust pollution due to site clearance and movement of construction vehicles and heavy machinery.
- Operational phase –
  - Change in visual/landscape character and sense of place due to the presence of the PV Panels and ancillary infrastructure;
  - Light pollution due to night lighting, security lighting and navigational lighting; and
  - Visual impact on the identified sensitive receptors.

The proposed infrastructure will create a moderate negative visual impact on the surrounding areas during the construction and operational phases of the development. These impacts can be reduced after the recommended mitigation measures are implemented. However, the overall visual impact

will remain as a moderate negative impact during the operational phase of the Project. This is mainly due to the permanent nature of the structures.

The construction phases of the proposed project are expected to be visible from the surrounding areas however, the time of exposure to these activities will be short. Therefore, the impacts on the sensitive receptors are expected to be lower after the mitigation measures have been implemented. For the operational phase, the visual impact of the infrastructure and construction vehicles can be reduced after the recommended mitigation measures are implemented however, the visual impact will remain as moderate. This is mostly due to the time of exposure to these activities being long-term. During the closure phase of the project, all moderate visual impacts can be lowered to a low negative impact.

Overall, the potential visual impacts of the proposed project can be lowered if the recommended mitigation measures are implemented however, the proposed project will have a moderate negative impact on the surrounding area during the operational phase, mainly due to the permanent nature of the structures.

13.17.2 Impact Assessment

The following impact ratings were applied in the Visual Impact Assessment:

- Rating of 1-55 = (L) Low Risk;
- Rating of 56-169 = (M) Moderate Risk; and
- Rating of 170-300 = (H) High Risk.

Table 40: Construction phase visual impact assessment (Naidoo, 2022)

Construction Phase		Unmitigated	Mitigated
Assessment Criteria	**Severity** [Insignificant / non-harmful (1); Small / potentially harmful (2); Significant / slightly harmful (3); Great / harmful (4); Disastrous / extremely harmful / within a regulated sensitive area (5)]	**3**	**2**
	Spatial Scale [Area specific (at impact site) (1); Whole site (entire surface right) (2); Local (within 5km) (3); Regional / neighbouring areas (5 km to 50 km) (4); National (5)]	**2**	**1**
	Duration [One day to one month (immediate) (1); One month to one year (Short term) (2); One year to 10 years (medium term) (3); Life of the activity (long term) (4); Beyond life of the activity (permanent) (5)]	**2**	**2**
	Frequency of Activity [Annually or less (1); 6 monthly (2); Monthly (3); Weekly (4); Daily (5)]	**5**	**5**
	Frequency of Incident/Impact [Almost never / almost impossible / >20% (1); Very seldom / highly unlikely / >40% (2); Infrequent / unlikely / seldom / >60% (3); Often / regularly / likely / possible / >80% (4); Daily / highly likely / definitely / >100% (5)	**3**	**2**
	Legal Issues [No legislation(1); Fully covered by legislation (5)]	**1**	**1**
	Detection [Immediately(1); Without much effort (2); Need some effort (3); Remote and difficult to observe (4); Covered (5)]	**3**	**3**

Construction Phase		Unmitigated	Mitigated
Consequence	Severity + Spatial Scale + Duration	**7**	**5**
Likelihood	Frequency of Activity + Frequency of impact + Legal issues + Detection	**12**	**11**
Risk	Consequence * Likelihood	**MODERATE (84)**	**LOW (55)**
Mitigation	- Limit the construction footprint to only the development area. - Carefully plan to minimize the construction duration. - Regulate the speed of vehicles on site. - Implement dust suppression activities. - Plant indigenous vegetation surrounding the site where possible. - Choose lighting types that reduce spill light and glare. - Only focus light where it is needed.		

Table 41: Operational phase visual impact assessment (Naidoo, 2022)

Operational Phase		Unmitigated	Mitigated
Assessment Criteria	**Severity** [Insignificant / non-harmful (1); Small / potentially harmful (2); Significant / slightly harmful (3); Great / harmful (4); Disastrous / extremely harmful / within a regulated sensitive area (5)]	**3**	**2**
	Spatial Scale [Area specific (at impact site) (1); Whole site (entire surface right) (2); Local (within 5km) (3); Regional / neighbouring areas (5 km to 50 km) (4); National (5)]	**4**	**3**
	Duration [One day to one month (immediate) (1); One month to one year (Short term) (2); One year to 10 years (medium term) (3); Life of the activity (long term) (4); Beyond life of the activity (permanent) (5)]	**4**	**4**
	Frequency of Activity [Annually or less (1); 6 monthly (2); Monthly (3); Weekly (4); Daily (5)]	**5**	**5**
	Frequency of Incident/Impact [Almost never / almost impossible / >20% (1); Very seldom / highly unlikely / >40% (2); Infrequent / unlikely / seldom / >60% (3); Often / regularly / likely / possible / >80% (4); Daily / highly likely / definitely / >100% (5)	**4**	**3**
	Legal Issues [No legislation(1); Fully covered by legislation (5)]	**1**	**1**
	Detection [Immediately(1); Without much effort (2); Need some effort (3); Remote and difficult to observe (4); Covered (5)]	**3**	**3**
Consequence	Severity + Spatial Scale + Duration	**11**	**9**
Likelihood	Frequency of Activity + Frequency of impact + Legal issues + Detection	**13**	**12**
Risk	Consequence * Likelihood	**MODERATE (143)**	**LOW (108)**
Mitigation	- Retain/maintain natural vegetation within and around the development footprint where possible. - Natural colours should be used on ancillary infrastructure so that they blend into the surrounding landscape. - Implement dust suppression activities. - All infrastructure should be always kept in a presentable condition. - Choose lighting types that reduce spill light and glare. - Only focus light where it is needed,		

13.18 Air Quality

13.18.1 Impact Description

Sensitive receptors to dust and other air quality impacts in the study area include people residing in the surrounding areas, ecological features (fauna and flora) and crops.

The Project proposes the use of a renewable resource (solar), which is a cleaner form of energy generation than using fossil fuels, with environmental benefits.

Sources of air quality impacts associated with the Project may include:

- Construction phase –
  - Dust from the use of dirt roads by construction vehicles;
  - Dust from bare areas that have been cleared for construction purposes; and
  - Emissions from construction equipment and machinery.
- Operational phase –
  - Impacts to air quality caused by the operation and maintenance of the facility include dust from the use of dirt roads and tailpipe emissions from vehicles.

Mitigation measures are included in the EMPr to ensure that the air quality impacts during the construction phase are suitably monitored and managed and that regulated thresholds are not exceeded. The EMPr also includes measures to control and minimize greenhouse gas emissions by optimising the utilisation of construction resources, as well as preventing fires related to construction activities.

During the operational phase of the Solar PV Plant, local atmospheric pollution may reduce the irradiation received or contain significant levels of airborne corrosive substances. The efficiency of the solar plants be also reduced if the modules are soiled (covered) by particulates/dust.

13.18.2 Impact Assessment

Environmental Feature	**Air Quality**
Relevant Alternatives & Activities	**Construction domain of development footprint**
Project life-cycle	**Construction phase**
Potential Aspects & Impacts	**Proposed Management Objectives / Mitigation Measures**
• Excessive dust levels as a result of construction activities. • Emissions from construction equipment and machinery.	• Appropriate dust suppression measures or temporary stabilising mechanisms to be used when dust generation is unavoidable (e.g., dampening with water, chemical soil binders, straw, brush packs, chipping), particularly during prolonged periods of dry weather. Dust suppression to be undertaken for all bare areas, including construction area and access roads. Note that all dust suppression requirements should be based on the results from the dust monitoring and the proximity of sensitive receptors. • Speed limits to be strictly adhered to.

	• Air quality to be monitored (baseline and during construction) for dust fallout and particulate matter. Sampling locations to consider major sources of dust and sensitive receptors. • All vehicles and machinery used at the site are to be in good working condition and fitted with appropriate emission controls • Plant to be operated efficiently and turned off when not in use.

	+/- Impacts	Extent	Magnitude	Duration	Probability	Significance
Before Mitigation	-	local	medium	short-term	likely	3
After Mitigation	-	local	low	short-term	unlikely	1

Environmental Feature	**Air Quality**
Relevant Alternatives & Activities	**Operation of the Solar PV Plant**
Project life-cycle	**Operational phase**
Potential Aspects & Impacts	**Proposed Management Objectives / Mitigation Measures**
• Influence of air quality and soiling on operational efficiency of Solar PV Plant.	• An appropriate maintenance and cleaning plan is to be developed for the PV panels.

	+/- Impacts	Extent	Magnitude	Duration	Probability	Significance
Before Mitigation	-	local	medium-high	long-term	likely	3
After Mitigation	-	local	low	long-term	unlikely	1

13.19 Noise

13.19.1 Impact Description

Sensitive receptors to noise impacts in the study area include people residing in the surrounding areas, ecological receptors (fauna) and livestock.

During construction, localised increases in noise will be caused by earthworks, establishment and operating of site construction laydown area, construction of proposed infrastructure, transportation of construction workers and material, activities at the construction camp, and general construction noise.

Solar PV facilities produce electricity during the daytime hours, when the sun's rays are collected by the panels. When there is little to no irradiance, noise emitted by the equipment is significantly reduced. The main sources of noise from the Project will be the rack mounted inverters and the central step-up transformer, which are only expected to be audible to operational staff who will come in close proximity to these components. Other sources of noise include operation and maintenance vehicles and activities.

During the operational phase, power lines produce an audible sound or buzz because they are producing something called a corona discharge that is interacting with the surrounding air. The corona discharge is a side-effect of the electric field the power line generates by carrying electricity. The discharge can be greater and the buzzing louder if there is increased moisture or pollutants in the air. Under normal conditions, corona-generated noise is not audible. The noise may be audible under certain wet conditions. Conductors are selected based on factors such as audible noise, corona, and electromagnetic field mitigation. In addition, corona rings can be fitted if deemed necessary. Corona is not associated with any adverse health effects in humans or livestock.

Noise that emanates from construction and operational activities are addressed through targeted best practices in the EMPr. The associated regulated standards need to be adhered to.

Project personnel working on the construction site will experience the greatest potential exposure to the highest levels of noise and vibration. Workplace noise and vibration issues will be managed as part of the Occupational Health and Safety Management System to be employed on site, which will include specific measures aimed at preventing hearing loss and other deleterious health impacts.

13.19.2 Impact Assessment

Environmental Feature	**Noise**
Relevant Alternatives & Activities	**Construction domain of development footprint**
Project life-cycle	**Construction phase**
Potential Aspects & Impacts	**Proposed Management Objectives / Mitigation Measures**
• Noise as a result of construction activities	• The provisions of SANS 10103:2008 will apply to all areas within audible distance of residents. • Working hours to be agreed upon with Project Manager, so as to minimise disturbance to landowners/occupiers and community members. • Construction activities generating output levels of 85 dB or more will be confined to normal working hours. • Noise preventative measures (e.g., screening, muffling, timing, pre-notification of affected parties) to be employed.

	+/- Impacts	**Extent**	**Magnitude**	**Duration**	**Probability**	**Significance**
Before Mitigation	-	local	medium	short-term	likely	2
After Mitigation	-	local	low	short-term	unlikely	1

13.20 Hazardous Substances & Waste

13.20.1 Impact Description

Improper management of hazardous substances and waste may pollute the biophysical environment (air, water and soil), and pose risks to humans, flora and fauna. It may also cause visual impacts.

Hazardous substances to be stored and used during the construction and operational phases of the Project include oil, fuel, solvents, pesticides, lithium-ion batteries (BESS), etc.

General construction waste will comprise of surplus or off-specification materials (e.g., concrete, wooden pallets, packaging paper or plastic, wood, metals, etc.) and construction debris. Domestic waste will include food waste, plastic, glass, aluminum cans and waste paper. A small proportion of the waste generated during construction phase will be hazardous and may include used oil, hydraulic fluids, waste fuel, grease and waste oil containing rags. Wastewater, including water adversely affected in quality through construction-related activities and human influence, will include sewage, water used for washing purposes (e.g., equipment, staff) and drainage over contaminated areas (e.g., workshop, equipment storage areas).

Waste types likely to be generated during routine operation and maintenance activities include dielectric fluids, clearing agents, oils, solvents, wastewater, defunct / damaged PV cells and substation components, as well as domestic waste.

Provision is made in the EMPr to manage impacts associated with hazardous substances and waste.

13.20.2 Impact Assessment

Environmental Feature	**Hazardous Substances & Waste**
Relevant Alternatives & Activities	**Storage and use of hazardous substances & generation of waste**
Project life-cycle	**Construction & operational phases**
Potential Aspects & Impacts	**Proposed Management Objectives / Mitigation Measures**
• Environmental pollution caused by improper management of hazardous substances and waste.	• Hazardous substances shall be stored and handled in accordance with the appropriate legislation and standards, which include the Hazardous Substances Act (Act No. 15 of 1973), Occupational Health and Safety Act (No. 85 of 1993), relevant associated Regulations and applicable SANS and international standards. • Storage and use of hazardous materials will be strictly controlled to prevent environmental contamination and will adhere to the requirements stipulated on the Material Safety Data Sheets. • In the event of spillages of hazardous substances the appropriate clean up and disposal measures shall be implemented. • BESS to have electrical and fire protection measures in the form of battery temperature monitoring, circuit breakers, fire detection and fire suppression as per regulatory requirements.

	• Waste to be disposed of at a licenced waste disposal facility. • Water used for cleaning of PV panels will not contain any harmful chemicals or additives. • Wastewater to be properly disposed of. Contaminated water should not be discharged to the environment. • Used lithium-ion batteries and PV panels are to be removed by the suppliers, who are to recycle material and recover any hazardous substances (as relevant). Provision to be made in the supply agreements between the Proponent and the selected suppliers.

	+/- Impacts	Extent	Magnitude	Duration	Probability	Significance
Before Mitigation	-	local	medium-high	long-term	likely	3
After Mitigation	-	local	low	long-term	unlikely	1

Potential risks and related control measures associated with the BESS facility are captured in **Table 42** below. A detailed risk assessment will need to be undertaken based on the type of BESS technology selected and the final design of the Solar PV Plant. The outcomes of this risk assessment will need to be incorporated into the Operational EMPr.

Table 42: Proposed management of risk to BESS (based on Arup, 2018)

No.	Risk	Possible Consequences	Control Measures
1	Risk posed by veld fires (external to site) to BESS facility	Damage to BESS	▪ Implementation of a fire break around the site ▪ Include measures to deal with veld fires in the Emergency Response Plan ▪ Coordination with local fire authorities ▪ Provide fire extinguishers on site
2	Damage caused to cells by an external event	Lithium Ion Cell leakage	▪ Lithium batteries do not contain free liquid electrolytes ▪ Individual cells are used which minimises extent of release
3	Damage to batteries from vehicle collision	▪ Damage to battery cells ▪ Electrical risks	▪ Use of perimeter fence around BESS facility ▪ Appropriately designed internal access roads ▪ Limit of speed limit within fenced facility ▪ Earthing system installed as per normal electrical facilities
4	Transformer oil leakage due to corrosion of tank base or leakage of oil tank	Leakage of transformer oil to environment, with resultant pollution	▪ Use of fully bunded oil storage for transformers ▪ Regular tank inspections
5	Collapse or fall of overhead electricity line onto BESS facility	Damage to BESS facility	▪ BESS facility to be located outside of power line servitude
6	Security breach into BESS facility for theft of components	Theft of equipment or risk to personnel	▪ Installation of security fencing around entire Solar PV Plant and around the BESS facility ▪ Installation of security system to monitor key areas ▪ Inspections to monitor for security breaches
7	Spread of fire across BESS facility between battery packs	Localised fire causing damage by spreading to BESS facility	▪ Separation distances between battery packs in accordance with manufacturer recommendations ▪ Adherence to fire management measures ▪ Provide fire extinguishers on site ▪ BESS area will have a non-flammable buffer area to prevent the spread of fire. ▪ BESS will have electrical and fire protection measures in the form of battery temperature monitoring, circuit breakers, fire detection and fire suppression
8	Electrocution due to electrical fault	Electrical fault causing personnel injury	▪ Normal electrical standards and installation of appropriate earthing system ▪ Use of appropriately qualified maintenance personnel
9	Lightning striking BESS facility	Lightning strike causing damage to facility or personnel	▪ Include lightning protection measures, if deemed necessary
10	High rainfall and flooding to site	Damage to electrical equipment	▪ BESS facility to be developed outside of the 1:100 year floodline of any watercourse
11	High wind events and seismic events	Structural damage to equipment or battery packs	▪ Appropriate design of BESS facility, taking into consideration *inter alia* climatic and geotechnical conditions

13.21 Traffic

13.21.1 Impact Description

The potential impact on the surrounding environment is expected to be generated by the development traffic, of which traffic congestion and associated noise, dust and exhaust pollution form part. The construction phase will generate traffic including transportation of people, construction materials, water and equipment. The impact is however temporary in nature with a negative low impact rating after the implementation of mitigation measures.

During the operational phase, traffic and associated noise, dust and exhaust pollution would be generated due to operational traffic trips. The traffic generated during this phase will have a nominal impact on the surrounding road network. The decommissioning phase will have similar impacts and generated trips as the construction phase.

13.21.2 Impact Assessment

Environmental Feature	**Traffic and Access**
Relevant Alternatives & Activities	**All physical infrastructure that forms part of the project**
Project life-cycle	**Construction & Decommissioning**
Potential Aspects & Impacts	**Proposed Management Objectives / Mitigation Measures**
• Increase in development trips for the duration of the construction phase. • Associated noise, dust and exhaust pollution.	• Stagger component delivery to site. • Reduce construction period where possible. • Stagger the construction phase. • The use of mobile batching plants and quarries in close proximity to the site would decrease the impact on the surrounding road network. • Staff and general trips should occur outside of peak traffic periods as much as possible. • Maintenance of haulage routes. • Design and maintenance of internal roads. • Provide two access points to the site to split construction vehicle trips and reduce the risk of congestion.

	+/- Impacts	**Extent**	**Magnitude**	**Duration**	**Probability**	**Significance**
Before Mitigation	-	regional	medium	short-term	almost certain	2
After Mitigation	-	regional	low	short-term	Almost certain	1

Relevant Alternatives & Activities	All physical infrastructure that forms part of the project
Project life-cycle	**Operation**
Potential Aspects & Impacts	**Proposed Management Objectives / Mitigation Measures**
• Slight increase in trips due to permanent staff on site. • Increase in trips around twice a year for transport of water to site for the cleaning of solar panels.	• Source on-site water supply if possible. • Utilise cleaning systems for the panels needing less vehicle trips. • Schedule trips for the provision of water for the cleaning of panels outside peak traffic times as much as possible.

	+/- Impacts	Extent	Magnitude	Duration	Probability	Significance
Before Mitigation	-	local	low	Short term	almost certain	1
After Mitigation	-	local	low	Short term	almost certain	1

13.22 Civil Aviation

13.22.1 Impact Description

Possible impacts that may be caused by a Solar PV Plant to civil aviation include potential glare and glint from *inter alia* PV panels, steel array mounting, glass windows and rooftops that might cause temporary loss of vision to pilots on arrival or departure, as well as obstacles associated with the PV facility (e.g. power lines) that may pose a risk to safe air navigation.

Glint and glare are caused by many reflective materials, whereby light from the sun is reflected off such materials with a potential to cause hazard, nuisance or unwanted visual impact. It is noted that solar panels are designed to absorb, not reflect, irradiation.

The proposed PV Site is located approximately 8km to the south of the Parys Aerodrome. According to the findings from the National Web Based Environmental Screening Tool, the PV site has a low sensitivity in terms of relative civil aviation theme with only small portions of the northern section of the site falling within medium sensitivity (see **Figure 81** below). Accordingly, no Glint and Glare Impact Assessment in terms of Obstacle Notice 4/2017, was undertaken, as there are “no major or other types of civil aviation aerodromes” in proximity to the site. The South African Civil Aviation Authority (SACAA) was engaged with as part of the EIA and the Applicant will adhere to the requirements of this authority.

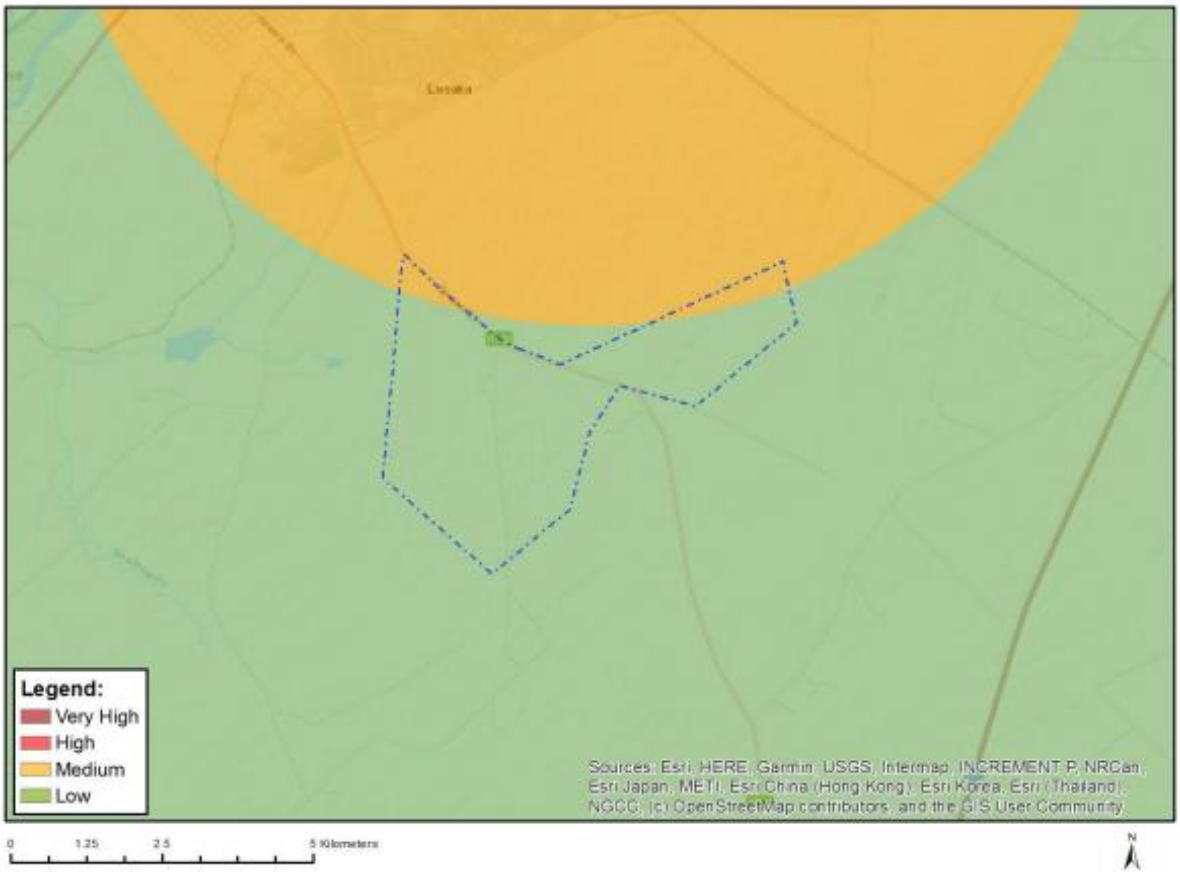


Figure 81: Map of relative civil aviation theme sensitivity for Solar PV Site

13.22.2 Impact Assessment

A quantitative impact assessment was not undertaken from a civil aviation perspective due to the reasons provided above.

13.23 Existing Structures and Infrastructure

13.23.1 Impact Description

Potential impacts of the Project to existing structures and infrastructure include:

- ❑ Disruptions to services or damage caused as a result of construction activities;
- ❑ Disruptions to traffic on the R723 during construction (see **Section 13.21** above); and
- ❑ Construction-related disturbances (e.g. noise, dust).

A detailed survey will be conducted to identify all physical features that are located within the final project footprint. Optimisation of the layout during the design phase will seek to avoid existing structures and infrastructure, where possible. Where avoidance is not possible, suitable compensation measures need to be established, as necessary.

During the public participation process conducted to date, infrastructure owners and custodians provided wayleave requirements and conditions when working near or closer to existing services.

13.23.2 Impact Assessment

Environmental Feature	**Existing Structures and Infrastructure**
Relevant Alternatives & Activities	**All activities that affect existing structures and infrastructure**
Project life-cycle	**Construction & operational phases**
Potential Aspects & Impacts	**Proposed Management Objectives / Mitigation Measures**
• Disruption of existing services. • Damage to existing structures and infrastructure.	• Identify and record existing services and infrastructure. • Conform to requirements of relevant service providers and infrastructure custodians (e.g. Eskom. Transnet, Telkom, FSDPRT, etc.). • Ensure access to infrastructure is available to service providers at all times. • Immediately notify service providers of disturbance to services. Rectify disturbance to services, in consultation with service providers. Maintain a record of all disturbances and remedial actions on site. • Adequate reinstatement and rehabilitation of affected environment.

	+/- Impacts	**Extent**	**Magnitude**	**Duration**	**Probability**	**Significance**
Before Mitigation	-	local	medium-high	short-term to permanent	likely	3
After Mitigation	-	local	low	short-term	unlikely	1

13.24 Health and Safety

13.24.1 Impact Description

Construction Phase

Health and safety related risks associated with the Project during the construction phase include the following:

- ❑ Hazards related to construction work;
- ❑ Increased levels of dust and particulate matter, as well as noise;
- ❑ Water (surface and ground) contamination;
- ❑ Poor water and sanitation services for construction workers;
- ❑ Communicable diseases;
- ❑ Psychosocial disorder (e.g. social disruptions);
- ❑ Safety and security to the local community; and
- ❑ Lack of suitable health services.

These risks are addressed through mitigation measures identified under other environmental features, such as socio-economic environment, surface water, air quality, noise, as well as best

practices included in the EMPr. Additional management requirements will be included in the Project's Occupational Health and Safety system.

Operational Phase

The predominant types of hazards associated with battery systems include electric shock, stored energy, chemical, flammable emission, thermal runaway, transportation, kinetic energy and manual handling (Energy Storage Council, 2016). A lithium-ion based BESS must be designed with proper disconnects, relays, thermal management, enclosures, layout, monitoring and controls to mitigate risks to the required level of safety. Operating strategies spanning proper planning, risk assessment, storage methods, maintenance protocols, and response protocols are the other important factors in mitigating lithium-ion safety risks (Butler, 2013).

Electromagnetic fields (EMFs) are produced whenever electricity is used. Research into electric and magnetic fields undertaken at utility scale PV installations in California by Chang and Jennings (1994), indicated that magnetic fields were significantly less for solar arrays than for household applications. Chang and Jennings (1994) found magnetic fields from solar arrays were not distinguishable from background levels at the site boundary, suggesting the health risk of EMFs from solar arrays is minimal.

For a transmission line, the strength of the electric field varies generally with the operating voltage of the line (measured in volts) while the magnetic field strength is related to the current flowing in the line (measured in amps) (Parsons Brinckerhoff, 2013). EMF strengths dependent on *inter alia* the height of the electrical wires above the ground and their geometric arrangements, which are supported by the transmission structures.

Even though the EMF inside a substation is high (but less than occupational limits), the fields outside the substation decrease with distance, as is the case with power lines (Wolhuter & Holtzhausen, 2015). It is documented in literature that EMF levels reduce rapidly with distance from the source. The Project's proposed substation, which contains high voltage transformers, will be enclosed by security fencing to prevent unauthorised access and the exposure to high voltage electricity. This will also provide safe distance between electrical equipment and the general public.

Other health and safety risks associated with the Project during the operational phase include the following:

- Leaching of materials from broken or fire damaged PV modules;
- Injuries to workers from operation and maintenance activities (vehicle accidents, replacement of components/parts, etc.) and;
- Emergency fire hazards; and
- Electrocution of workers.

13.24.2 Impact Assessment

Environmental Feature	Health and Safety
Relevant Alternatives & Activities	**Construction activities**
Project life-cycle	**Construction phase**
Potential Aspects & Impacts	**Proposed Management Objectives / Mitigation Measures**
• Health and safety risks during construction.	• Dedicated Occupational Health and Safety system to be implemented by the Contractor. • Undertake a hazard identification and risk assessment and identify preventive and protective measures. • Conduct basic safety awareness training with construction workers. • Provide all workers with the necessary Personal Protective Equipment (PPE). • Prevent environmental contamination. • Provide potable water and sanitation services to workers. • All workers shall be clearly identifiable and shall remain within the construction domain during working hours. • Prepare an Emergency Response Plan. • Ensure adequate control of communicable diseases. • Maintain access control to construction domain.

	+/- Impacts	Extent	Magnitude	Duration	Probability	Significance
Before Mitigation	-	local	high	short-term	likely	3
After Mitigation	-	local	low	short-term	unlikely	1

Relevant Alternatives & Activities	Operation and maintenance activities
Project life-cycle	**Operational phase**
Potential Aspects & Impacts	**Proposed Management Objectives / Mitigation Measures**
• Health and safety risks posed by operation and maintenance activities.	• Dedicated Occupational Health and Safety system to be implemented by the Operator of the PV Plant. • Conduct basic safety awareness training with all operational staff. • Temporary Contractors to adhere to Occupational Health and Safety requirements. • Provide potable water and sanitation services to operational staff. • Prepare an Emergency Response Plan. • Measures at the battery storage area to manage fire risks will include a non-flammable buffer area to prevent the spread of fire, battery temperature monitoring, circuit breakers, fire detection and fire suppression as per fire and electrical regulatory requirements. • Provide adequate access/egress for installation and maintenance at the BESS. • Maintain servitude. • Ensure EMF remain less that occupational limits within substation. • Control access to the substation.

	+/- Impacts	Extent	Magnitude	Duration	Probability	Significance
Before Mitigation	-	local	high	long-term	likely	3
After Mitigation	-	local	low	long-term	unlikely	1

13.25 Socio-Economic Environment

The findings from the Socio-Economic Impact Assessment (Chidley, 2022) follow. The specialist report is contained in **Appendix E8**

13.25.1 Impact Description

The potentially significant socio-economic impacts associated with the Project are summarised in **Table 43** below.

Table 43: Summary of potentially significant socio-economic impacts (Chidley, 2022)

Activity	Aspect	Potential Impact – Positive	Potential Impact - Negative
Land Acquisition and Servitude Rights Acquisition	Land Acquisition		Loss of agricultural production
			Loss of land (including structures and cultivated areas) through project infrastructure
	Servitude Rights		Some restrictions on use of productive land
Scheme Operations	Electricity generation	Economic growth and induced impacts.	
	Supply of goods and services to the project	Opportunity for local business	
		Opportunity for local labour force	
	Administration and Technical Input	Employment of staff locally	
		Skills development	
Construction Phase	Access onto properties		Security Concerns
	Solar Park Construction – piling, frame erection and solar panel mounting, electrical installation and rehabilitation	Employment of people locally	Noise
		Sourcing of equipment, machinery, and services locally	Dust
		Employment of local people	Influx of people seeking employment and associated impacts (e.g., cultural conflicts, squatting, demographic changes, anti-social behaviour, and incidence of HIV/AIDS)

Activity	Aspect	Potential Impact – Positive	Potential Impact - Negative
		Sourcing of equipment, machinery, and services locally	
	Transport of goods to site and employment of staff	Employment of people locally	Increased traffic
		Sourcing of equipment, machinery, and services	Noise
	Transmission Line	Sourcing of equipment, machinery, and services locally	Security concerns when contractor's access private property
	Rehabilitation		Damage or wear to access roads
			Security Concerns
			Damage to property or equipment

13.25.2 Impact Assessment

Environmental Feature	**Institutional, Legal, Political and Equity**
Project life cycle	**All Phases**
Potential Impact	**Proposed Management Objectives / Mitigation Measures**
Attitude formation towards project	Promptly deal with any raised expectations amongst communities regarding perceived benefits associated with the project, through a process of communication and consultation.
Project information queries and raised concerns	Promptly address any concerns raised by the public in a transparent manner.
	Where necessary always provide prompt and clear feedback to communities.
	Include all relevant community members in decisions affecting them.
Compliance with municipal by-laws	Ensure that all municipal by-laws are complied with.

	Nature	Extent	Magnitude	Duration	Probability	Significance
Before Mitigation	Negative	Site	Moderate	Short term	High	2
After Mitigation	Negative	Site	Low	Short term	High	1

Significance of Impact and Preferred Alternatives	The impact on project progress could be significant if grievances are not addressed. This can be effectively mitigated through the establishment of a grievance procedure and adherence to local by-laws The impact has no impact on project alternatives.

Environmental Feature	**Gender Relations**
Project life-cycle	**Construction Phase**
Potential Impact	**Proposed Management Objectives / Mitigation Measures**
Cultural resistance towards women	• Sensitise staff in respect of gender sensitive issues that are pertinent to the workplace.
Division of labour	• Ensure gender inclusivity and equity with respect to all compensation.
	• Prioritise gender inclusivity and equity in access to resources, goods, services and decision making with the aim of empowering women.
	• Promote equal job opportunities for women and men during the construction and operational processes.
	• Prioritise and articulate gender inclusivity and equity in the project documents by including specific strategies and guidelines for implementation.
	• The project documents should also include clear mechanisms through which the actual implementation of the activities and the impact on the ground can be monitored and evaluated.
	• Develop a grievance procedure to specifically address gender matters.
	• Factors such as culture should be considered when planning for gender activities since they play a great role in influencing gender relations.

	Nature	Extent	Magnitude	Duration	Probability	Significance
Before Mitigation	Negative	Site	Moderate	Short term	High	2
After Mitigation	Negative	Site	Low	Short term	High	1
Significance of Impact and Preferred Alternatives	The impact on project equity promotion would be moderate if this impact were not addressed. This can be effectively mitigated through policy and implementation of policy. The impact has no impact on alternative route selection.					

Environmental Feature	Economic opportunities arising from the construction phase
Project life-cycle	**Construction phase**
Potential Impact	**Proposed Management Objectives / Mitigation Measures**
SMME Participation	• Local SMMEs should be given an opportunity to participate in the construction of the project through the supply of services, material or equipment.
Job Creation and Skills Development	• The main contractor should employ non-core labour from the regional study area as far as possible during the construction phase.
Indirect Employment Impacts	• Spaza/informal trader shops may open next to the site because of construction. These should be controlled by the contractor to limit their footprint and to ensure that the MMM By-laws are complied with.

	Nature	Extent	Magnitude	Duration	Probability	Significance
Before Mitigation	Positive	Regional	Medium	Short Term	Likely	1
After Mitigation	Positive	Regional	Large	Short Term	Likely	3
Significance of Impact and Preferred Alternatives	Individuals who will benefit during the construction are limited to those who actively participate in the construction activity through employment, sub-contracting or other economic opportunities. Active participation should be encouraged. The benefits on such a construction will take place irrespective of which power line routing alternative is preferred.					

Environmental Feature	Disturbance arising from the construction phase
Project life-cycle	**Construction phase**
Potential Impact	**Proposed Management Objectives / Mitigation Measures**
Increase in Dust	• Dust and disturbance can be mitigated through the use of appropriate dust suppression mechanisms; • Adherence to road signage can be added as an advantage and a measure to manage the increase in dust levels; • Mitigation measures management should be adhered to according to the relevant specialist studies.
Influx of workers	• All employment of locally sourced labour should be controlled and formalised. No employment should take place from the project gate and contracts of employment should be entered into taking into account the Labour Relations Act; • If possible, and if the relevant Ward Councillors deems it necessary, the employment process should include the affected Ward Councillors and their ward committee. • To limit the growth of informal settlements in the project area, labour should be sourced from existing labour sending areas, from people who resided in the area prior to appointment. This process should include the Ward Councillor to ensure that only local residents are employed, rather than labour migrants. • No staff accommodation should be allowed on site; • Influx of workers could may lead to increased diseases and HIV/AIDSs & STI as well as STD infections, therefore awareness programmes should be implemented through the local educational institutions and for the workers as well.
Worker Health and Safety	• The provisions of the OHS Act 85 of 1993 and the Construction Regulations of 2014 should be implemented on all sites; • Account should be taken of the safety impacts on the local community when carrying out the longitudinal aspects of the project, such as the powerline; • Contractors should establish HIV/AIDS awareness programmes at their site camp. • Gender sensitive workplace practises should be planned for and adopted on site. Employment practises should be demonstrated free of coercion or harassment.
Security	• The camp site for the project and the longitudinal construction sub-site laid down areas should be fenced for the duration of construction; • All contractors' staff should be easily identifiable through the wearing of uniforms; • A project policy on management of workers should be developed. This would include education and awareness to be conducted with regards crime, trespassing and not gathering outside the site could be conducted. • Security staff should only be allowed to reside at contractor camps and no other employees.
Noise impacts	• Prior notice should be given to surrounding communities of noisy event such as blasting. • Construction work should take place during working hours – defined as 07h00 to 17h00 on weekdays and 07h00 to 14h00 on Saturdays. Should overtime work be required, that will generate noise, consultation with the affected community or landowner should take place.

Damage to property	• If a risk existing of damage taking place on a property as a result of construction, a condition survey should be undertaken prior to construction; • The contractor is to make good and acknowledge any damage that occurs on any property as a result of construction work; • Where crops and agricultural machinery are damaged, compensation is to be paid to the farmer for the proven loss of these crops; • The farmer should be compensated for any loss of income experienced at the account of the contractor.

	Nature	Extent	Magnitude	Duration	Probability	Significance
Before Mitigation	Negative	Local	Medium	Short Term	Likely	2
After Mitigation	Negative	Local	Low	Short Term	Moderate	1
Significance of Impact and Preferred Alternatives	Disturbances and irritation during construction is to be expected. These can then be successfully mitigated through contractor specifications that are issued at a tender stage and through the continuous monitoring of contractor proceedings and performance during construction phase. Negative impacts owing to the construction will unfortunately be experienced irrespective of the site and routing alternative that is most preferred and chosen.					

Environmental Feature	**Economic Impacts (positive)**
Project life-cycle	**Operational Phase**
Potential Impact	**Proposed Management Objectives / Mitigation Measures**
Economic	• The solar park will stimulate the local economy through the provision of jobs and through local procurement. • It will contribute to the improvement of the national electricity supply at a price that has been set by a competitive bidding process
Local Procurement	• Local SMMEs should be given an opportunity to participate in the operation of the project through the supply of services, material or equipment.
	• A procurement policy promoting the use of local business where possible, should be put in place and applied throughout the operational phases of the project.
Job Creation and Skills Development	• Women should be given equal employment opportunities and encouraged to apply for positions.
	• A skills transfer plan should be put in place at an early stage and workers should be given the opportunity to develop skills whilst in employment.

	Nature	Extent	Magnitude	Duration	Probability	Significance
Before Mitigation	Positive	Regional	High	Long Term	Likely	3
After Mitigation	Positive	Regional	High	Long Term	Likely	3

Significance of Impact and Preferred Alternatives	The solar park in the regional study area will provide economic stimulus to the regional study area for the long-term. The solar park should adopt policies that are supportive of local procurement and support for local enterprises. Economic impact considerations require that the most cost-effective transmission power line route be adopted to service the project.

Environmental Feature		Economic and material well-being (negative)				
Project life-cycle		Operational Phase				
Potential Impact		**Proposed Management Objectives / Mitigation Measures**				
Loss of productive land		• A very low impact that does not require mitigation.				
	Nature	**Extent**	**Magnitude**	**Duration**	**Probability**	**Significance**
Before Mitigation	Negative	Local	Low	Short Term	Low	1
After Mitigation	Negative	Local	Low	Short Term	Low	1
Significance of Impact and Preferred Alternatives	This impact is not considered significant. It should be noted that this study defers to the agricultural specialists with regards the impact of the project on regional production.					

13.26 "No-Go" Impacts

The "no-go option" is the alternative of not implementing the activity/development. The "no-go option" also provides the baseline against which the impacts of other alternatives are compared.

The "no go option" needs to be considered in light of the motivation (see **Section 3** above) as well as the need and desirability of the Project (see **Section 8** above).

SA has identified the need to supply diversified power generation that includes renewable energy technologies, such as proposed by the Project. This is in light of the country's endeavour and commitment to reduce the carbon footprint created by the current heavy reliance on coal to produce electricity.

In contrast, should the proposed Project not go ahead, any potentially significant environmental issues associated with the Project (refer to **Section 13.9** to **Section 13.26** above) would be irrelevant and the status quo of the local receiving environment would not be affected by the Project-related activities. The prerogative will lie with the landowner to determine an alternative future desired use of the land where the Solar PV Plant is proposed. It is noted that the site is currently used for agricultural purposes. With the "no-go option" the objectives of the Project would not be met. This will *inter alia* mean that the Project's intended benefits will not materialise. The "no go option" is thus not preferred.

13.27 Cumulative Impacts

13.27.1 Introduction

A cumulative impact, 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.

13.27.2 Other Renewable Energy Projects in Proximity to the Proposed PV Site

Cumulative impacts can be identified by combining the potential environmental implications of the Project with the impacts of projects and activities that have occurred in the past, are currently occurring, or are proposed in the future within the Project Area.

It is noted that the accurate characterisation of the future state of the Project area is inherently speculative to an extent, due to the dynamic nature of future decisions related to land use and growth, protection of terrestrial and aquatic biological resources, water use (consumptive, waste-related and encroachments), etc.

According to the REEA Database (quarter 3, 2022), no renewable energy applications have been made for properties that are located within 30km radius of the PV site (refer to **Figure 6** in **Section 6.8**). The cumulative impact of renewable energy applications within 30 km were thus not considered further.

Cumulative impacts identified during the specialist studies include the following:

- Visual Impact Assessment (Naidoo, 2022) –
  - Given the presence of existing powerlines, an Eskom substation and agricultural/farming activities within the study area, the proposed project is expected to increase the cumulative visual impact experienced by the identified sensitive receptors.
  - The proposed solar plant is expected to alter the sense of place of the study area and may set a precedent for future renewable energy plants. Although the development of new infrastructure to ensure sustainable electricity to the region forms part of the municipality's 5-year goal and the expected visual exposure of the proposed project is low, the proposed solar plant, in conjunction with any further renewable energy plants, will have a negative visual impact on the surrounding study area mainly due to the areas high scenic quality attributed to the presence of the Vredefort Dome and tourism along the Vaal River.
- Avifaunal Baseline and Impact Assessment (Clark, 2022b) –
  - As many solar PV developments are planned for the Free State Province, the project has the potential to add to the cumulative loss of wetland habitat for grassland species of conservation concern. This impact is, however, likely to be minimised by avoiding all areas of High avifaunal sensitivity. This impact is considered to have a Low residual impact, on the premise that extensive grasslands still occur in the region.
- Phase 1 Cultural Heritage Impact Assessment (Van Schalkwyk, 2022) –
  - Loss of a singular feature in the larger landscape (Iron Age Sites).
  - Loss of a limited number of similar features in the larger landscape (Burial sites).
  - Limited loss of similar features in the larger landscape (Homesteads).
  - Impact rating (after mitigation) – Low.

13.27.3 The Proposed Project's contribution towards Cumulative Impacts

The following is noted in terms of the Project's contribution towards cumulative impacts:

- The construction period may cause traffic-related impacts in terms of the local road network, which will be associated with heavy vehicle construction traffic for the delivery of material, transportation of construction workers and general construction-related traffic. This may compound traffic impacts if other large-scale projects are planned during the same period. The EMPr includes mitigation measures to manage traffic-related impacts.
- The clearance of the vegetative cover over large areas associated with the Project's development footprint will exacerbate erosion, which is already encountered in the greater

area as a result of other land use disturbances. Mitigation measures to control erosion are included in the EMPr.

- ❑ There will be an increase in the dust levels during the construction phase, as a result of earthworks, use of haul roads and other gravel roads, stockpiles, material crushing, etc. Sensitive receptors to dust and other air quality impacts in the study area are discussed in **Section 13.18** above. Measures to manage dust are included in the EMPr.
- ❑ Construction of the proposed facilities along with construction activities of other developments in the Project Area could potentially increase noise impacts on surrounding land uses. This impact will be temporary in nature. It is further noted that noise is a localised issue that diminishes in intensity with distance from the source. Sensitive receptors to noise in the study area are discussed in **Section 13.19** above. The Project's contribution to cumulative noise impacts is thus not anticipated to be significant. Measures are included in the EMPr to manage noise impacts that may be caused by the Project.
- ❑ Changes in demographics in the region due to the influx of employment seekers may cause problems such as crime, STDs, conflicts with local communities, etc. This was assessed as part of the Socio-Economic Impact Assessment and mitigation measures are included in the EMPr.
- ❑ There is a potential for positive cumulative economic effects from the construction of multiple developments in the area. The increased creation of jobs and economic input into local businesses would provide a benefit to local communities.

13.27.4 Cumulative Environmental Impact Statement

From a cumulative impact perspective, there are no known approved renewable energy applications within a 30km radius of the Project's PV Sites (refer to **Section 13.28.2** above) according to the REEA Database (quarter 3, 2022). Cumulative impacts in relation to the Project were assessed individually in **Section 13.9** to **Section 13.26** above and mitigation measures were developed for each of the impact categories.

14 ANALYSIS OF ALTERNATIVES

14.1 General

Alternatives are the different ways in which a project can be executed to ultimately achieve its objectives. Examples could include carrying out a different type of action, choosing an alternative location or adopting a different technology or design for the project.

By conducting the comparative analysis, the Best Practicable Environmental Option (BPEO) can be selected with technical and environmental justification. Münster (2005) defines BPEO as the alternative that "*provides the most benefit or causes the least damage to the environment as a whole, at a cost acceptable to society, in the long term as well as in the short term*".

14.2 "No-Go" Option

The implications of the "no-go" option are discussed in **Section 13.26** above. The "no go option" is not preferred, as the objectives of the Project will not be met, and the associated benefits will not materialise. Although not proceeding with the Project would avoid the adverse environmental impacts, these impacts are considered to be manageable through the provisions contained in the EIA Report and EMPr.

14.3 Layout Alternatives

As explained in **Section 10.3** above, an initial layout was proposed by the Applicant (see **Figure 22** above). The layout was subsequently refined to take the sensitive environmental features identified through the environmental screening process and specialist input into consideration (see **Figure 22** above). The revised layout is currently the only layout alternative presented for inclusion in the study.

14.4 Technology Alternatives

14.4.1 PV Technology

The preferred option in terms of solar PV technology, as explained in **Section 10.4.1** above, includes a single axis tracker system and bifacial solar panels. This technology will optimise the Project's yield output.

14.4.2 BESS Technology

The BESS can be broken into solid state and flow battery systems. A single battery technology, or a combination of two or more technology alternatives, may be implemented for the Project. The preferred BESS technology will only be identified during the design phase.

15 PUBLIC PARTICIPATION

15.1 Introduction

The purpose of public participation includes the following:

- To provide I&APs with an opportunity to obtain information about the Project;
- To allow I&APs to express their views, issues, and concerns with regard to the Project;
- To grant I&APs an opportunity to recommend measures to avoid or reduce adverse impacts and enhance positive impacts associated with the Project; and
- To enable the Applicant to incorporate the needs, concerns, and recommendations of I&APs into the Project, where feasible.

The public participation process that is being undertaken is governed by NEMA and the EIA Regulations. **Figure 82** below outlines the public participation process for the upfront Announcement Phase (completed), Scoping Phase (completed) and EIA Phase (current).

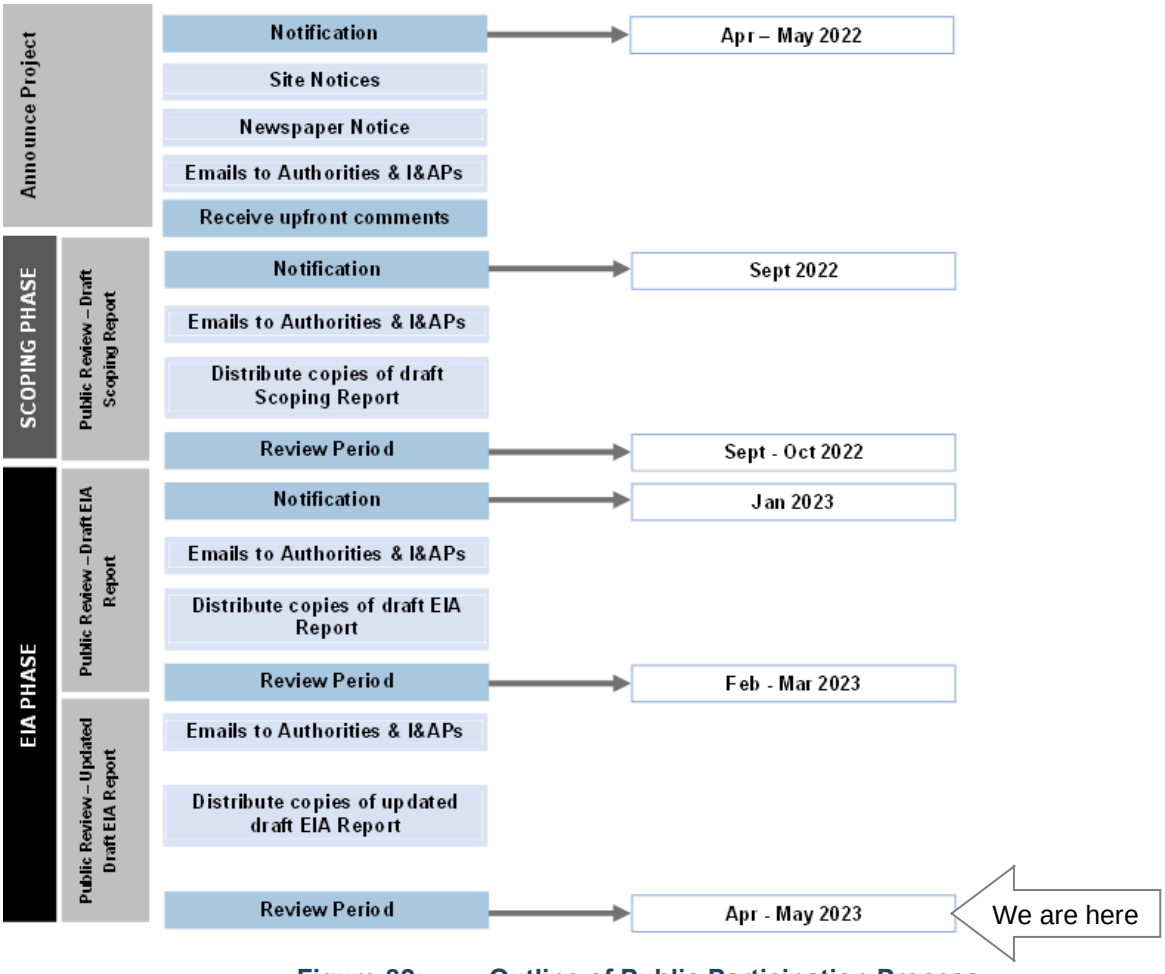


Figure 82: Outline of Public Participation Process

15.2 Public Participation during the Announcement & Scoping Phases

The primary tasks undertaken as part of public participation during the Announcement and Scoping Phases included the following (details provided in the Scoping Report):

- ❑ Compiling a database of organs of state and I&APs;
- ❑ Announcing the Project by placing notices in newspapers, erecting site notices and circulating a Background Information Document and Reply Form to organs of state and I&APs;
- ❑ Lodging the draft Scoping Report for public review and notifying organs of state and I&APs; and
- ❑ Compiling and maintaining a CRR (contained in **Appendix G**).

15.3 Public Participation during the EIA Phase

15.3.1 Maintenance of the Stakeholders' Database

The database of stakeholders (contained in **Appendix F**), which includes authorities, different spheres of government (national, provincial and local), parastatals, stakeholders, landowners, interest groups, members of the general public and I&APs, was maintained during the EIA phase.

15.3.2 Period to Review the Draft EIA Report

In accordance with Regulation 43(1) of the EIA Regulations, organs of state and I&APs were granted an opportunity to review and comment on the draft EIA Report from Monday, 20 February 2023 until Thursday, 23 March 2023. The Updated draft EIA Report will be made available for public review and comment from 21 April 2023 to 22 May 2023.

15.3.3 Notification of Review of Draft EIA Report

Organs of state and I&APs contained in the database (refer to **Appendix F**) will be notified via email of the review of the Updated draft EIA Report. Proof of notification will be included in the final EIA Report.

15.3.4 I&APs' Access to the Draft EIA Report

A hardcopy of the Updated draft EIA Report will be placed at the Parys Municipal Library (41 Phillip St, Parys). The Updated draft EIA Report will also uploaded to the following website, for downloading purposes - https://nemai.co.za/downloads/.

Copies of the Updated draft EIA Report will be provided to the following parties, which include key regulatory and commenting authorities with jurisdiction over the receiving environment:

- ❑ DFFE (including Biodiversity Conservation Unit);

- ❑ DESTEA;
- ❑ DWS: Free State Region;
- ❑ DMRE;
- ❑ FSDPRT;
- ❑ FSHRA;
- ❑ Ngwathe LM; and
- ❑ Fezile Dabi DM.

15.3.5 Public Meeting to Present the Draft EIA Report

Anyone that has an interest in attending a public meeting will need to inform Nemai Green in writing by 27 April 2023. Only preregistered parties that confirmed interest will receive an invitation to the public meeting.

15.3.6 Comments Received on the Draft EIA Report

The CRR will be updated with all comments received from organs of state and I&APs during the review period of the Updated draft EIA Report. The updated CRR will be appended to the final EIA Report that will be submitted to DFFE.

15.4 Notification of DFFE Decision

Registered I&APs will be notified after having received written notice from DFFE (in terms of NEMA) on the final decision for the Project. The notification will include the appeal procedure to the decision and key reasons for the decision.

16 CONCLUSIONS

16.1 Outcomes of the EIA Phase

The following key tasks were undertaken during the EIA phase for the proposed Project:

- ❑ The specialist studies identified in the Plan of Study for the EIA were undertaken and the findings were incorporated into the EIA Report in terms of understanding the environmental status quo and sensitive features, assessing the potential impacts and establishing concomitant mitigation measures, as well as identifying the preferred alternatives;
- ❑ Potentially significant impacts pertaining to the pre-construction, construction and operational phases of the Project were identified and assessed, and mitigation measures were provided; and
- ❑ Alternatives for achieving the objectives of the proposed activity were considered, and the BPEO was identified. The “no-go” option is not supported when considering the implications of not implementing the Project.

The outcomes of these tasks are captured below.

16.2 Sensitive Environmental Features

The following sensitive and significant environmental features and aspects that are associated with the Project and its receiving environment are highlighted, for which mitigation measures are included in the EIA Report and EMPr:

- ❑ Six wetland HGM units were identified and delineated within the 500 m regulated area and the project area. The most prominent wetland feature is a wide channelled valley-bottom that flows east to west across the central portion of the project area.
- ❑ According to the Free State Biodiversity Conservation Plan, the proposed project footprint encroaches into an area classified as CBA2.
- ❑ Flora SCC are present within the project area which are listed as protected under Schedule 6 of the Free State Nature Conservation Ordinance 8 of 1969.
- ❑ A single avifauna SCC was identified in the project area namely Blue Korhaan (*Eupodotis caerulescens*). An additional 11 SCC are considered highly likely to occur within the project area based on habitat availability and suitability. The large east-west flowing valley-bottom wetland that bisects the project area was designated high sensitivity avifaunal habitat.
- ❑ Soils potentially sensitive erosion have been identified in the study area.
- ❑ Existing infrastructure that is in close proximity of the PV Sites (e.g. R723).
- ❑ From a cultural heritage perspective, a burial site, iron age site and structures older than 60 years were identified in the study area.

A combined sensitivity map of the BPEO for the proposed development is shown in **Figure 83** below. Key environmental features that contributed towards the sensitive areas shown in these maps include wetlands, terrestrial ecological habitats and avifauna habitats, as determined by the respective specialist studies.

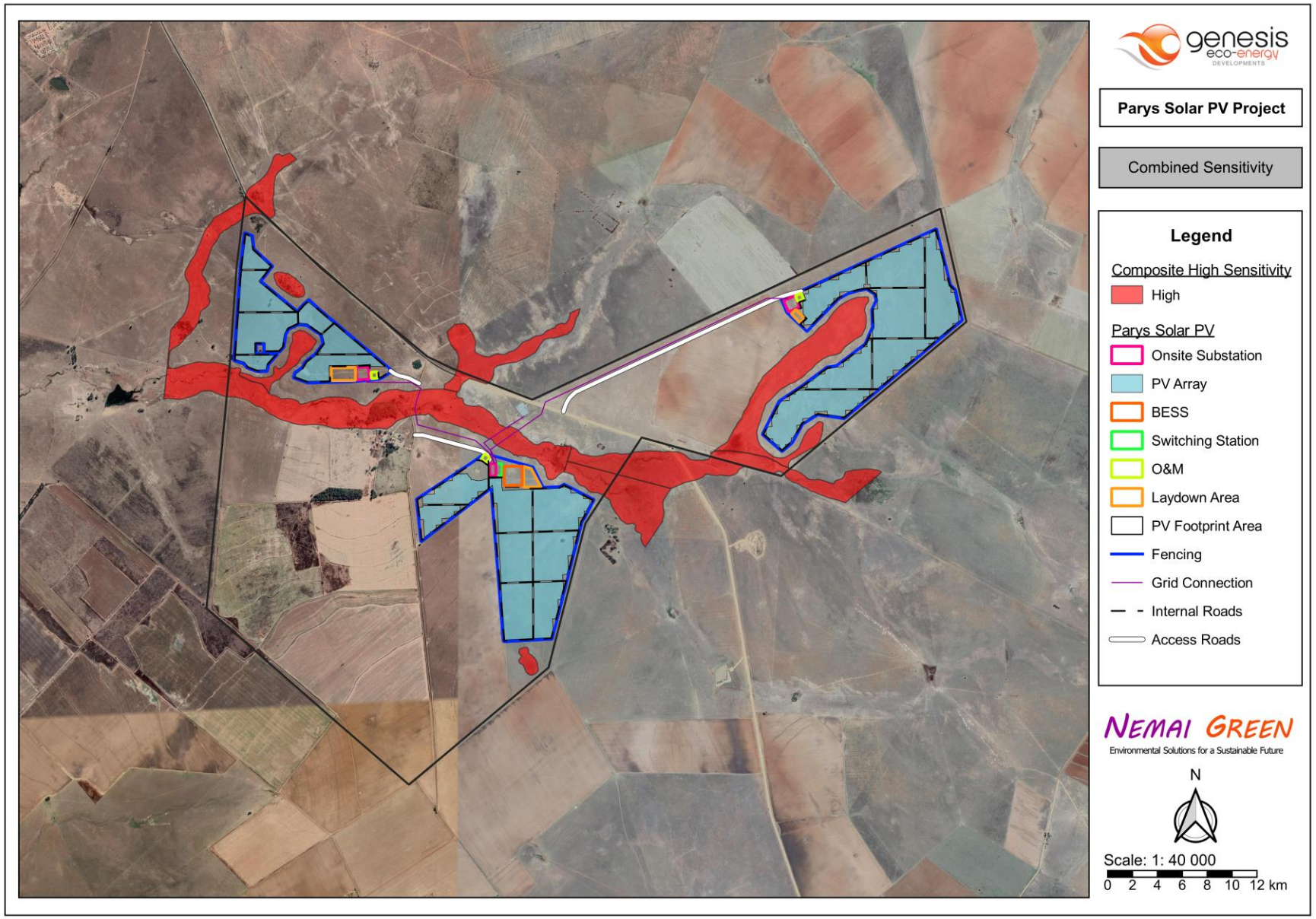


Figure 83: Combined sensitivity map

16.3 Environmental Impact Statement

The Project's strategic intent is linked to the South African Government's pursuit of promoting the country's renewable energy development imperatives, which encourages the role of Independent Power Producers (IPPs) to feed into the national grid.

The rationale for the siting of the Project is based on its suitable geographic location, including the area's high solar yield area, flat topography, sparsely populated land, grid connection, water supply and good transport infrastructure as well as the intended value that the Project will provide to the Ngwathe LM and users of electricity/energy.

The potentially significant environmental impacts were investigated through relevant specialist studies. Key findings from the EIA, apart from the sensitive environmental features and aspects listed in **Section 16.2** above, which may also influence of the Environmental Authorisation (if granted), include the following:

- It was recommended by the Avifauna Specialist that at least one additional 3-day pre-construction survey be completed to better establish flight path use and attendance of SCC in line with Regime 2 survey protocols. The specialist indicated that the survey should be undertaken in May 2023 or June 2023 to provide for seasonal variance.
- The necessary permits will need to be obtained from SAHRA or the PHRA should sites, features and objects of heritage significance be impacted upon.
- Should archaeological sites or graves be exposed in other areas during construction work, it must immediately be reported to a heritage practitioner so that an investigation and evaluation of the finds can be made.
- A detailed risk assessment will need to be undertaken based on the type of BESS technology selected and the final design of the Solar PV Plant. The outcomes of this risk assessment will need to be incorporated into the Operational EMPr.
- Suitable measures need to be implemented to prevent erosion, manage site drainage and rehabilitate cleared areas during the project life-cycle.

The Project is considered to be compatible with existing land uses encountered in the area. The impacts and risks assessed as part of the EIA process that was undertaken for the Project are considered manageable with the effective implementation of the measures stipulated in this EIA Report and EMPr.

With the selection of the BPEO, the adoption of the mitigation measures included in the EIA Report and the dedicated implementation of the EMPr, it is believed that the significant environmental aspects and impacts associated with this Project can be suitably mitigated. With the aforementioned in mind, it can be concluded that there are no fatal flaws associated with the Project and that authorisation can be issued, based on the findings of the specialists and the impact assessment, through the compliance with the identified environmental management provisions.

It is further the opinion of the EAP and EIA team that the EIA was executed in an objective manner and that the process and EIA Report conform to the requirements stipulated in the EIA Regulations.

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APPENDICES