EXIGENT

NOVEMBER 2022

FINAL ENVIRONMENTAL IMPACT ASSESSMENT REPORT

Establishment of the Proposed Renewable Energy (Solar Park) Generation Project on Portion 173 of the Farm Wildebeestlaagte 411-KQ, Thabazimbi Local Municipality, Waterberg District Municipality, Limpopo Province

Prepared for:

Vulpecula Energy (Pty) Ltd

A SYSTEMS APPROACH APPLIED TO YOUR REQUIREMENTS

PROJECT INFORMATION

Applicant and project information	
Contact person:	Ernst Jordaan Burger
Physical address:	No 49 14th Street, Menlo Park, Pretoria
Project title	Establishment of the Proposed Renewable Energy (Solar Park) Generation Project on Portion 173 of the Farm Wildebeestlaagte 411-KQ, Thabazimbi Local Municipality, Waterberg District Municipality, Limpopo Province.
Enterprise name:	Vulpecula Energy (Pty) Ltd.
Business registration number:	2021/534272/07

Details of the Environmental Assessment Practitioner	
Enterprise name:	Exigent Engineering Consultants CC
Contact person:	Jacolette Adam
Contact details:	jacolette@exigent.co.za
Main report contributors and roles:	Jacolette Adam (Reviewer) Salona Reddy (Reviewer) Amanda Masikane (Author)

Project information	
Project title:	
DFFE ref nr:	14/12/16/3/3/2/2159
Local Municipality:	Thabazimbi Local Municipality
District Municipality	Waterberg District Municipality
Province:	Limpopo
Date of distribution on Final Environmental Impact Assessment Report	04 November 2022

ACRONYMS AND ABBREVIATIONS

AEWA	Conservation of African-Eurasian Migratory Waterbirds, or African-Eurasian Waterbird Agreement
BID	Background Information Document
CA	Competent Authority
CARA	Conservation of Agricultural Resources Act
CBA	Critical Biodiversity Area
CRR	Comments and Response Report
DM	District Municipality
DAFF	Department of Agriculture, Forestry and Fisheries
DFFE	Department of Forestry, Fisheries and Environment
DWAF	Department of Water Affairs and Forestry
DWS	Department of Water Affairs and Sanitation
EA	Environmental Authorisation
EAP	Environmental Assessment Practitioner
ECO	Environmental Control Officer
EIA	Environmental Impact Assessment
EIAR	Environmental Impact Assessment Report
EMPr	Environmental Management Programme
ESAs	Ecological Support Areas
EXIGENT	Exigent Engineering Consultants
GN	Government Notice
I&AP	Interested and Affected Party
IDP	Integrated Development Plan
IWULA	Integrated Water Use License Application
LED	Local Economic Development
MAP	Mean Annual Precipitation
MAR	Mean Annual Runoff
NBA	National Biodiversity Authority
NBF	National Biodiversity Framework
NEMA	National Environmental Management Act
NEMBA	National Environmental Management: Biodiversity Act
NEMAQA	National Environmental Management: Air Quality Act
NEMWA	National Environmental Management: Waste Act
NFEPA	National Freshwater Ecosystem Priority Areas
NGOs	Non-Government Organizations
NHRA	National Heritage Resources Act
NWA	National Water Act, Act 36 of 1998
PPP	Public Participation Process
REIPPP	Renewable Independent Power Producer Programme
SAHRA	South African Heritage Resource Agency
SANBI	South African National Botanical Institute
TOR	Terms of References

CHANGES MADE FROM DRAFT ENVIRONMENTAL IMPACT REPORT TO FINAL ENVIRONMENTAL IMPACT REPORT

- The following sections were added, removed or changed in the Final Environmental Impact Assessment Report (DEIAR):
    - Section 1– Updated Table 1-1 with new comments from the Competent Authority.
    - Section 5: Adding Table 5.1 with the coordinates of the infrastructure and Table 5.2 the coordinates of the PV area.
    - Section 6: Addition of Provincial Gazette Notice, 2019. Limpopo Province 2966: The Waterberg Bioregional Plan
    - Section 7: Adding Table 7-6: Screening tool Sensitivity and site verified sensitivity.
    - Section 10 – The Public Participation section has been updated to include the comments on DEIAR.
    - Section 12- The Sensitivity Map has been updated, Figure 12-1
- The following appendices were updated:
    - Appendix C- addition of other layout maps
    - Appendix D – Added new I&AP who registered
    - Appendix D2.2.2- Proof of emails that was sent to I&AP's to remind the stakeholders of the ending of the commenting phase for the DEIAR.
    - Appendix D3 and D4- Includes comments that were received during the Draft EIAR phase.
    - Appendix F10- Specialist declaration was Appendix I in the DEIAR.
    - Appendix F11- Specialist SACNASP registration
    - Appendix H- The Generic Substation and Overhead Powerline EMPr have been signed by the Applicant.

EXECUTIVE SUMMARY

Vulpecula Energy (Pty) Ltd is proposing the development of renewable solar energy in key locations to the ESKOM grid and in terms of high levels of solar irradiation. The proposed site is located within the Thabazimbi Local Municipality, Waterberg District Municipality in Limpopo Province on a site approximately 316 hectares in extent, Portion 173 of the Farm Wildebeestlaagte 411 KQ.

The Maximum generation capacity at the delivery point will be 100MW, with a developable footprint of approximately 165 ha. ESKOM confirmation has been given for the connection to the 88kkV bus bay of the Spitskop HV ESKOM substation through a 1.6km powerline, within the study area. One 88kV (or 132 kV) overhead power line or underground line of 712m in length and servitude width of 36m, connecting the on-site HV switching station to the Eskom Spitskop HV Main Transmission Substation (MTS) will be constructed on remainder of the Farm Wildebeestlaagte 411 KQ. The Phufane Spruit, running through the property, will be crossed at two points. Low-level bridge crossings will be achieved using suitable corrugated iron culverts on a 1:1 year flood return period. The structures associated with the stream crossings, which will consist of (1.5m x 1.5m) culverts, will allow for the free movement of all aquatic organisms and the faunal species, amphibians and insects that might occur in the riparian zone. The vertical alignment of the roads will not present any significant challenges due to the flatness of the terrain so that no deep cuts or fills will be required, except at the stream crossing where corrugated iron culverts will be installed.

The study area is located west of the town of Northam and is surrounded by the agricultural lands. The ESKOM Spitskop Sub-station is located adjacent to the border of the study area, to the southwestern corner of the site.

The Final Environmental Impact Assessment was undertaken in line with the requirements of the National Environmental Management Act Environmental Impact Assessment Regulations of 2014 (GNR 326), as amended. The proposed development requires environmental authorisation in terms of the National Environmental Management Act Regulations 326. The information contained in this Final Environmental Impact Assessment Report provides a comprehensive description of the need and desirability of the proposed solar park development, specifically relating to sustainability in the economic, social and environmental spheres.

This impact assessment phase was undertaken in line with the approved Plan of Study for the Environmental Impact Assessment. Various specialist studies have been undertaken and measures for mitigation and management has been identified for inclusion in an Environmental Management Programme. The environmental impacts, mitigation and residual risks of the proposed activity are set out in this Environmental Impact Assessment Report. The results presented in this Final Environmental Impact Assessment Report are based on various specialist studies which were conducted by independent specialists, as well as comments received during the public participation process to date.

The non-perennial channels can be classified as a 'Floodplain River', although this drainage channel is not a wetland in the 'true' sense of the word but should rather be described as water courses as stipulated in the National Water Act. Baseline soil information, landscape profile and vegetation were used to confirm riparian and terrestrial properties within the study area.

The proposed development should avoid sensitive areas such as riverine areas, while also allowing corridors of indigenous woodland on areas outside the development footprint to be preserved. The floodline and riparian zone was identified as of high sensitivity. The proposed 32m buffer has been extended to a staggered buffer with distances of 50-200 m to be implemented along the Phufane River.

Two crossings of the riparian zone will be allocated at the most suitable location of the riparian zone which will have the least impact on the drainage line. Negative impacts can be minimised by strict enforcement and compliance with an Environmental Management Plan which considers the recommendations for managing impacts detailed above. Reprofiling of the banks of disturbed drainage areas to a maximum gradient of 1:3 to ensure bank stability.

An important part of any Environmental Impact Assessment is public participation. Stakeholder engagement was initiated from the outset of the project to ensure that all stakeholders were adequately and effectively consulted. All comments received and issues raised has been documented, addressed and responded to in the Comments and Response Report of Final Environmental Impact Assessment Report.

DECLARATION OF INDEPENDENCE FROM EAP

I, **Jacolette Adam**, declare that –

General declaration:

- I will comply with the requirements for EAPs as stipulated in Regulation 13(1) of the EIA Regulations, 2014;
- I act as the independent environmental practitioner in this application
- I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant
- I declare that there are no circumstances that may compromise my objectivity in performing such work;
- I have expertise in conducting environmental impact assessments, including knowledge of the Act, regulations and any guidelines that have relevance to the proposed activity;
- I will comply with the Act, regulations and all other applicable legislation;
- I have no, and will not engage in, conflicting interests in the undertaking of the activity;
- I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing - any decision to be taken with respect to the application by the competent authority; and - the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;
- I will ensure that information containing all relevant facts in respect of the application is distributed or made available to interested and affected parties and the public and that participation by interested and affected parties is facilitated in such a manner that all interested and affected parties have been provided with a reasonable opportunity to participate and to provide comments on documents that are produced to support the application;
- I will ensure that the comments of all interested and affected parties are considered and recorded in reports that are submitted to the competent authority in respect of the application, provided that comments that are made by interested and affected parties in respect of a final report that will be submitted to the competent authority may be attached to the report without further amendment to the report;
- I will keep a register of all interested and affected parties that participated in a public participation process; and
- I will provide the competent authority with access to all information at my disposal regarding the application, whether such information is favourable to the applicant or not
- all the particulars furnished by me in this form are true and correct;
- will perform all other obligations as expected from an environmental assessment practitioner in terms of the Regulations; and
- I am aware that a person is guilty of an offence in terms of Regulation 48 (1) of the EIA Regulations, 2014, if that person provides incorrect or misleading information. A person who is convicted of an offence in terms of sub-regulation 48(1) (a)-(e) is liable to the penalties as contemplated in section 49B(1) of the National Environmental Management Act, 1998 (Act 107 of 1998)

Disclosure of Vested Interest

- I do not have and will not have any vested interest (either business, financial, personal or other) in the proposed activity proceeding other than remuneration for work performed in terms of the Environmental Impact Assessment Regulations, 2014, as amended.

Signature of the environmental assessment practitioner:

4 November 2022

Date:

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1. MODIFICATIONS CARRIED OUT AFTER THE DRAFT ENVIRONMENTAL IMPACT ASSESSMENT REPORT

Table 1-1 included below indicates the changes from the Draft EIAR TO Final EIAR.

Table 1-1. Changes in Final EIAR from Draft EIAR

Description	Change in Final EIAR
(a) Specific comments	
• Recommendations provided by specialist reports must be considered and used to inform the layout.	Recommendation from specialist were used in the layout and they are included in the FEIAR.
• Please ensure that all mitigation recommendations are in line with applicable and most recent guidelines.	All mitigation recommendation from specialist are in line with recent guidelines
• The final EIAr must provide the technical details for the proposed facility in a table format as well as their description and/or dimensions.	Table 5.3 provides the technical details of the proposed facility
• Please ensure that all softcopy maps are clear and legible	Appendix C provides clear maps
• Corner coordinates of the proposed PV area must be provided. Coordinates of the other associated infrastructure such as substation, BESS, powerline (Start middle and end point) and access road must be provided.	Table 5.1 and Table 5.2 have all the necessary coordinated of the infrastructure and those of the PV
• Please ensure that the final EIAr complies with the requirements of Appendix 3 of the NEMA EIA Regulations, 2014, as amended, all conditions of the acceptance of the scoping report, and this letter.	
• 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.	The EA is required for 30 years and activities will conclude 30 years after the approval EA approval date
(b) Listed Activities	
• Project description provided for listed activities under listing notice 3 cannot be linked to listed activities applied. You are required to amend the project description provided for these listed activities to include the sensitivity of the site. If the listed activity is triggered due to the project being within Critical Biodiversity Areas, this must be reflected in the project description.	Additional information with regards to LN3 activities has been included in the application form. This amended application form is submitted simultaneously with the FEIAR.
• If the activities applied for in the application form differ from those mentioned in the final EIAr, an amended application form must be submitted. Please note that the Department's application form template has been amended and can be downloaded from the following link https://www.environment.gov.za/documents/forms.	

Description	Change in Final EIAR
• The relevant authorities with jurisdiction in respect of geographically designated areas in terms of GNR. 985 (Listing Notice 3) Activities must be continuously involved throughout the environmental impact assessment process. Written comments (or proof of consultation) must be obtained from the relevant authorities and submitted to this Department. In addition, a graphical representation of the proposed development within the respective geographical areas must be provided. Please also ensure that the potential impacts on the affected geographical areas are fully assessed in the EIAr.	Comments have been received from DFFE: Biodiversity Directorate. Section 7.5 of the FEIAR discusses the impact on the CBA.
(c) Public Participation • 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, LEDET, SANRAL, Local Municipality, the District Municipality, the Department of Water and Sanitation (DWS), the South African Heritage Resources Agency (SAHRA), the Endangered Wildlife Trust (EWT), BirdLife SA, the Department of Mineral Resources, the Department of Rural Development and Land Reform, and the Department of Forestry, Fisheries and the Environment: Directorate Biodiversity and Conservation.	All the listed stakeholders in c) were notified of the availability of the DEIAR, and reminded to submit comments on the 26th October 2022. Comments were received from: DFFE: Biodiversity, LEDET Appendix D2 includes the email notifications to stakeholders. And D3 include responses from I&AP
• Please ensure that all issues raised and comments received during the circulation of the draft SR 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.	Refer to the CRR as well as the issues table (Table 10.1). All the listed stakeholders in c) were notified of the availability of the DEIAR and reminded to submit comments on the 26th October 2022. Appendix D3 and D4 includes the email notifications to stakeholders.
• 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 including Department's comments included in the acceptance of scoping report as well as these comments on the draft EIAr. The C&R report must be a separate document from the main report. 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. • Comments from I&APs must not be split and arranged into categories. Comments from each submission must be responded to individually. • 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 EAP is requested to contact the Department to make the necessary arrangements to conduct a site inspection prior to the submission of the final EIAr.	Comment noted and included in this document. Appendix D4 includes the Comments and Response Report The CRR includes verbatim comments, and all copies were included in Appendix D3. Email communication with the assessing officer has been included in the CRR. The date for the site visit will be confirmed with the assessing officer.
(d) Specialist assessments	

Description	Change in Final EIAR
• Specialist studies must provide a detailed description of their methodology, as well as all other associated infrastructures that they have assessed and are recommending for the authorisation. • The specialist studies must also provide a detailed description of all limitations to their studies. All specialist studies must be conducted in the right season and providing that as a limitation, will not be accepted. • Should the appointed specialists specify contradicting recommendations, the EAP must clearly indicate the most reasonable recommendation and substantiate this with defendable reasons; and where necessary, include further expertise advice.	All specialist studies included in Appendix F have been reviewed for compliance with listed requirements. Specialist included details of the limitations of their studies.
Please include a table in the EIAr summarising the specialist studies required by the Screening Tool including the sensitivity rating of Screening Tool (very high, high, medium, low), a column indicating the sensitivity of the site after the EAP/Specialist has conducted the Site Verification Assessment and a column indicating whether these studies were conducted, or compliance statement attached.	Table 7.9 of the FEIAR includes the responses to the Screening Tool.
It is further brought to your attention that the 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, except where the applicant provides proof to the competent authority that the specialist assessment affected by these protocols had been commissioned before the date on which the protocols came into effect, in which case Appendix 6 of the Environmental impact Assessment Regulations, 2014, as amended, will apply to such applications. Please indicate in the EIAr whether the protocols were applied.	All specialist studies included in Appendix F have been reviewed for compliance with listed requirements.
Please also ensure that the specialist studies conducted as per requirements of the protocols also include the Site Verification Report that confirms the level of sensitivity from what has been identified by the screening report.	Table 7-6 includes the site verifies sensitivity
• Please note that the Protocols require the specialists to be SACNASP registered. Proof of registration in the form of valid SACNASP certificate must be submitted for each specialist conducted. • For the themes that have been identified as medium which requires compliance statements, please ensure that these compliance statements are attached to the EIAr and that they comply with the requirement of the protocols.	All SACNASP registrations have been included in the specialist folders., those who are not registered with SACNASP and/or Engineering Counsil of South Africa submitted their other professional body they are registered with.

Description	Change in Final EIAR
(e) Environmental Management Programme All recommendations and mitigation measures recorded in the EIAr and the specialist studies conducted. • Please ensure that the Generic EMPr for substation and powerline to be submitted with final report is signed by the applicant and it includes the date of the signature of the applicant.	The EMPR (Appendix H1) has been updated with the necessary information. The Generic EMPR's were signed by the applicant (Appendix H2 and H3)

2. INTRODUCTION

Vulpecula Energy (PTY) Ltd is proposing the development of renewable solar energy in key locations to the ESKOM grid and in terms of high levels of solar radiation. The proposed site is located within the Thabazimbi Local Municipality, Waterberg District Municipality in Limpopo Province. The proposed development will be located Portion 173 of the Farm Wildebeestlaagte 411 KQ (previously known as Portion 10 of the farm Wildebeestlaagte 411 KQ), which has an extent of approximately 316 hectares.

The competent authority (CA) responsible for considering of this proposal is the National Department of Forestry, Fisheries and Environment (DFFE). The application is undertaken in terms of EIA Regulations of 2014, as amended, published in terms of Government Notice Regulation (GNR). 326 of 7 April 2017 under Section 24(5), and 44 of the National Environmental Management Act (NEMA) (Act No. 107 of 1998), the intent to carry out the Environmental Impact Assessment (EIA) Process (in terms of Listing Notice 1 of 2014, as amended – GN R324 of 2017, Listing Notice 2 of 2014, as amended– GN R325 of 2017 and Listing Notice 3 of 2014, as amended – GN R327 of 2017) for various listed activities.

This Environmental Impact Assessment Report (EIAR) has been compiled in accordance with the requirements of NEMA, in particular the EIA Regulations of 2014, as amended, GNR 326, published on 7 April 2017, which outlines the requirements of the EIA Process for purposes of an Environmental Authorisation (EA) for activities listed in terms of Listing Notice 1, 2 and 3 of 2014, as amended (GNR 327, 325 and 324 of 2017, respectively). Appendix 3 of the EIA Regulations of 2014, as amended (GNR 326 of 2017) promulgated in terms of NEMA, Act 107 of 1998 stipulates the minimum requirements and issues that need to be addressed in an EIAR. This EIAR strives to address all these requirements as per regulations. Table 2-1 indicates the regulations that have been addressed and the section of the EIAR where these requirements can be found.

Table 2-1. Requirements of Appendix 3 (2) of GNR 326

GNR 326 APPENDIX 3		DESCRIPTION OF REGULATION	SECTION
3 (a)	(iii) and (iv)	Details and expertise of the EAP	2.1
3 (b)		The location of the development footprint of the activity on the approved site as contemplated in the accepted scoping report, including:	2.2
	(i)	the 21-digit Surveyor General code of each cadastral land parcel;	2.2
	(ii)	where available, the physical address and farm name; and	2.2
	(iii)	where the required information in items (i) and (ii) is not available, the coordinates of the boundary of the property or properties	2.2
3 (c)		A plan which locates the proposed activities, associated structures and infrastructure at an appropriate scale, or, if it is -	Figure 5-1
	(i)	a linear activity, a description and coordinates of the corridor in which the proposed activity or activities is to be undertaken;	Table 2-4
	(ii)	on land where the property has not been defined, the coordinates within which the activity is to be undertaken	2.2

GNR 326 APPENDIX 3		DESCRIPTION OF REGULATION	SECTION
3 (d)		Description of the scope of the proposed activity, including-	
	(i)	all listed and specified activities triggered and being applied for; and	Table 6-1
	(ii)	a description of the associated structures and infrastructure related to the development	5
3 (e)		Description of the policy and legislative context within which the development is located and an explanation of the compliance with and responds to the legislation and policy context	6
3 (f)		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
3(g)		A motivation for the preferred development footprint within the approved site as contemplated in the accepted scoping report	8
3(h)		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	8.1
	(ii)	detail of the public participation process undertaken in terms of regulation 41 of the Regulations, including copies of the supporting documents and inputs	10
	(iii)	a summary of the issues raised by interested and affected parties, and an indication of the manner in which these issues were incorporated, or reasons for not including them;	Table 10-1
	(iv)	the environmental attributes associated with the development footprint alternatives focussing on geographical, physical, biological, social, economic, heritage and cultural aspects	7
	(v)	the impacts and risks identified including nature, significance, consequence, extent, duration and probability of impacts, including the degree to which these impacts can be reversed, cause irreplaceable loss of resources and can be avoided, managed or mitigated.	11
	(vi)	methodology used in determining and ranking the nature, significance, consequence, extent, duration and probability of potential impacts and risks	11.1
	(vii)	positive and negative impacts that the proposed activity and alternatives will have on the environment and community that will be affected, focussing on geographical, physical, biological, social, economic, heritage and cultural aspects	11.2
	(viii)	possible mitigation measures that could be applied and level of residual risk	11.2
	(ix)	if no alternative development footprints for the activity were investigated, the motivation for not considering such	8.2
	(x)	a concluding statement indicating the location of the preferred alternative development footprint within the approved site as contemplated in the accepted scoping report	8
3 (i)		Description of process undertaken to identify, assess and rank the impacts of the activity and the associated structures and infrastructures on the preferred location for the life of the activity, including-	
	(i)	a description of all environmental issues and risks that were identified during the environmental impact assessment process.	11

GNR 326 APPENDIX 3		DESCRIPTION OF REGULATION	SECTION
	(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	11.2
3 (j)	(i) to (vii)	An assessment of each Identified potentially significant impact and risk including cumulative, nature, significance, extent and duration, probability and degree to which the impact can be reversed, cause irreplaceable loss or can be mitigated.	11.2
2 (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
2 (l)		An Environmental Impact Statement which contains:	
	(i)	A summary of key findings of the environmental impact assessment	11.2
	(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	Figure 5-1
	(iii)	A summary of the positive and negative impacts and risks of the proposed activity and identified alternatives	Table 11-2
2 (m)		Based on the assessment, and where applicable, recommendation from specialist reports, the recording of proposed impact management outcomes for the development for inclusion in the EMPr and as well for inclusion as conditions of authorisation	13
2 (n)		Final proposed alternative which responds to impact management measures, avoidance, and mitigation measures identified through the assessment	15
2 (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	15
2 (p)		A description of any assumptions, uncertainties and gaps in knowledge which relate to the assessment and mitigation measures proposed	14
2 (q)		Opinion on authorisation and motivation	15
2 (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	15.1
2 (s)		An undertaking under oath or affirmation by the EAP in relation to-	Page 7
	(i)	the correctness of the information provided in the reports	
	(ii)	the inclusion of comments and inputs from stakeholders and I&Aps	
	(iii)	the inclusion of inputs and recommendations from the specialist reports where relevant and	
	(iv)	any information provided by the EAP to interested and affected parties and any responses by the EAP to comments or inputs made by interested or affected parties	
2 (t)		Details of financial provision for rehabilitation, closure and ongoing post decommissioning management	12.1.4

GNR 326 APPENDIX 3		DESCRIPTION OF REGULATION	SECTION
2 (u)		Deviation from approved Scoping Report, including plan of study and motivation for deviation	N/A
2 (v)		Required information by the Competent Authority	Table 1-1
2 (w)		Any other matters required in terms of sections 24(4)(a) and (b) of the Act	N/A

2.1 Environmental Assessment Practitioner

Exigent was established in 1998 providing multidisciplinary engineering and environmental services. The Exigent Environmental Business Unit provides sustainable answers within an environmental developmental framework. Our foundations are built upon ecological principles with wide ranging expertise in environmental management and assessment processes. The qualifications and experience of the primary assessors and report compilers are listed in Table 2-2.

Table 2-2. Environmental Assessment Practitioner details

EAP	ROLE	QUALIFICATION	EXPERIENCE
Jacolette Adam	Reviewer	MSc LLM (Environmental Law)	21 years of professional experience in the environmental sector and has been a certified Professional Natural Scientist since 2002 (400088/02) and a registered Environmental Assessment Practitioner (EAPASA). She has successfully completed numerous environmental assessments throughout South Africa for a wide range of clients.
Amanda Masikane	Author	BSc Honours	Amanda has 2 years of experience in the field of environmental management. She is a member of the International Association for Impact Assessments South Africa (IAIAsa). Amanda has expertise in compiling of assessment reports, surface and groundwater monitoring, work as an Environmental Control Officer and assisting with field work and drafting wetland and ecological assessments.
Salona Reddy	Reviewer/ Mapping	BSc Honours	Salona has 6 years of work experience in the field of environmental management and ecological assessments. She obtained her BSc Hons in 2015 and is in the process of completing her MSc. She has been responsible for compilation of numerous EIA and EMPs for a wide range of clients.

2.2 Project location and land use

The development site is located approximately 2km north of the town of Northam, south of the Road D1235 (Dwaalboom Road), within the Thabazimbi Local Municipality, Waterberg District Municipality in Limpopo Province on an area 316 hectares in extent. The property is zoned agriculture and is currently used as agricultural land mostly being used for grazing purposes.

The site is located within the Quaternary Degree Grid Cell (QDGC) 2427CC, in the quaternary catchment A24E, within the Crocodile West and Groot Marico catchment, which lies within the Limpopo River Water Management Area (WMA).

Portion 10 of the Farm Wildebeestlaagte 411 K.Q. is currently being utilised as a game farm with a hunting lodge. Staff accommodation and facilities consistent with game farming and hunting can be found on the property.

Figure 2-1.Photos of the study area

Table 2-3. The extent and centre point coordinates of the proposed development site.

Portion	Geographical coordinates		Extent (ha)
	Latitude	Longitude	
Portion 173 of the farm Wildebeestlaagte 411 KQ	24°57'31.56"S	27°14'15.89"E	316.0929
Total			**316.0929**

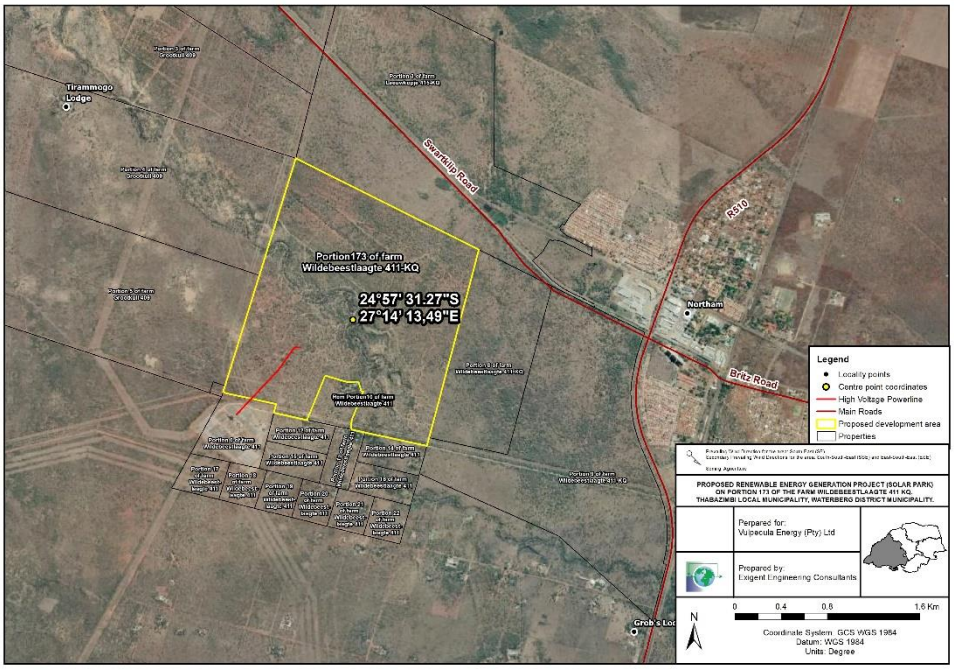

Figure 2-2.Centre point coordinates of the development area of the proposed PV Solar farm.

The proposed overhead powerline will be located on the following properties and will have the following start and end coordinates:

Table 2-4. The start and end points of the proposed overhead powerlines within the affected properties.

Portion	Geographical coordinates of start and end coordinates within the properties		Distance in property
	Start:	End:	
Portion 173 of the farm Wildebeestlaagte 411 KQ	24°57'39.04"S 27°13'58.56"E	24°57'53.38"S 27°13'45.01"E	600 m
Portion 0 of the farm Wildebeestlaagte 411 KQ	24°57'53.38"S 27°13'45.01"E	24°57'57.75"S 27°13'40.86"E	180 m
Total			**780 m**

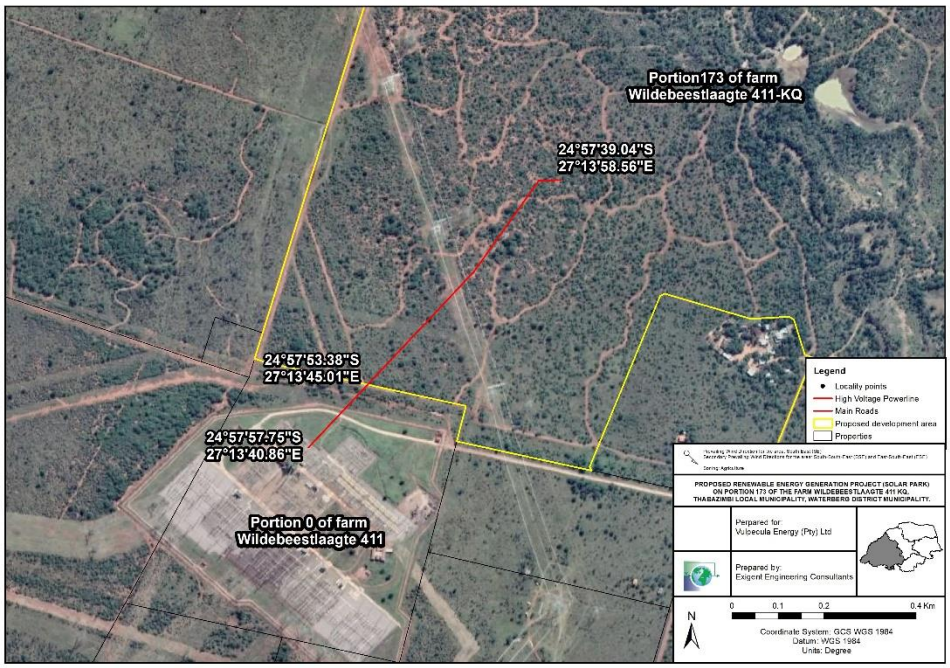

Figure 2-3. Centre point coordinates of the development area of the proposed PV Solar farm.

The study area is located west of the town of Northam and is surrounded by the agricultural lands. The ESKOM Spitskop HV Sub-station is located toward the south-western boundary of the proposed development site. Additional Eskom power lines are planned to be installed on the south-western portion of the site covering an area of approximately 50 hectares. These power lines shall run from Medupi Power Station to Dinaledi Substation near Brits. The current land use zoning of the site is 'special' (for the purposes of a renewable energy generation project) and private open space (riparian zone).

The 21-digit Surveyor General code of the cadastral land parcel upon which the proposed solar PV farm will be located is:

T	0	K	Q	0	0	0	0	0	0	0	0	0	4	1	1	0	0	1	7	3

The 21-digit Surveyor General code of the cadastral land parcels affected by the overhead powerlines are:

T	0	K	Q	0	0	0	0	0	0	0	0	0	4	1	1	0	0	1	7	3
T	0	K	Q	0	0	0	0	0	0	0	0	0	4	1	1	0	0	0	0	0

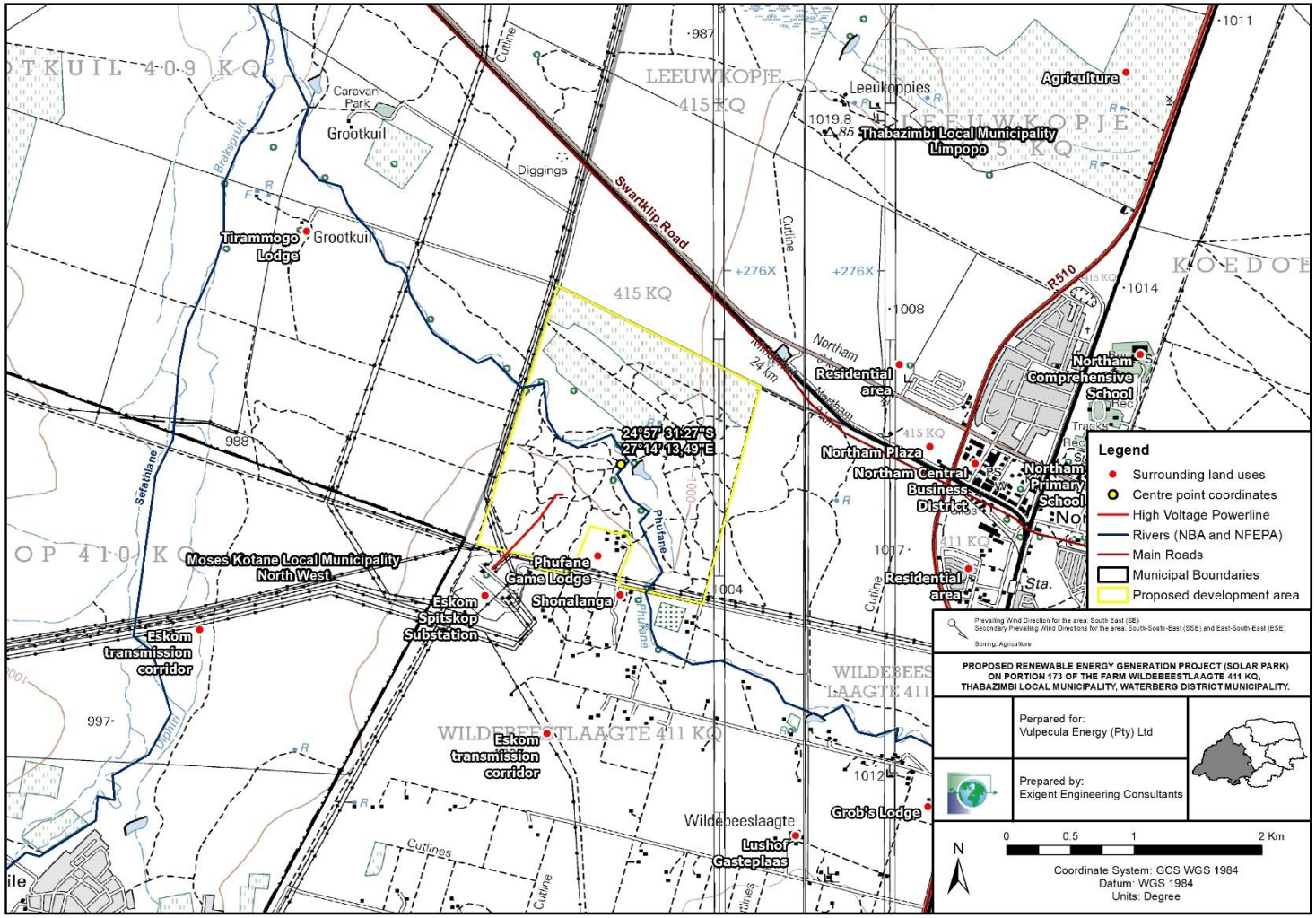

Figure 2-4. Topographic map of the study area

3. APPROACH TO EIA PHASE

3.1 EIA Process and Methodology

An EIA process is a planning and decision-making tool. It identifies potential negative and positive impacts of a proposed project and recommends ways to enhance the positive impacts and mitigate the negative impacts. The EIA will address the impacts associated with the project and provide an assessment of the project in terms of the biophysical, social and economic environments to assist the environmental authority in making decisions regarding the authorization of the proposed project. The process is largely comprised of the Environmental Scoping Phase and the EIA phase.

The aim of the EIA Phase is to provide information regarding the current environmental, social and possible economic conditions on the site that is being applied for and to provide information regarding the type and extent of the proposed project. Furthermore, the aim includes the identification of any possible impacts (environmental, social or economic). This possible impact identification is being done in conjunction with stakeholder and public interest involvement through a Public Participation Process.

The Scoping and EIA process is illustrated in Figure 3-1.

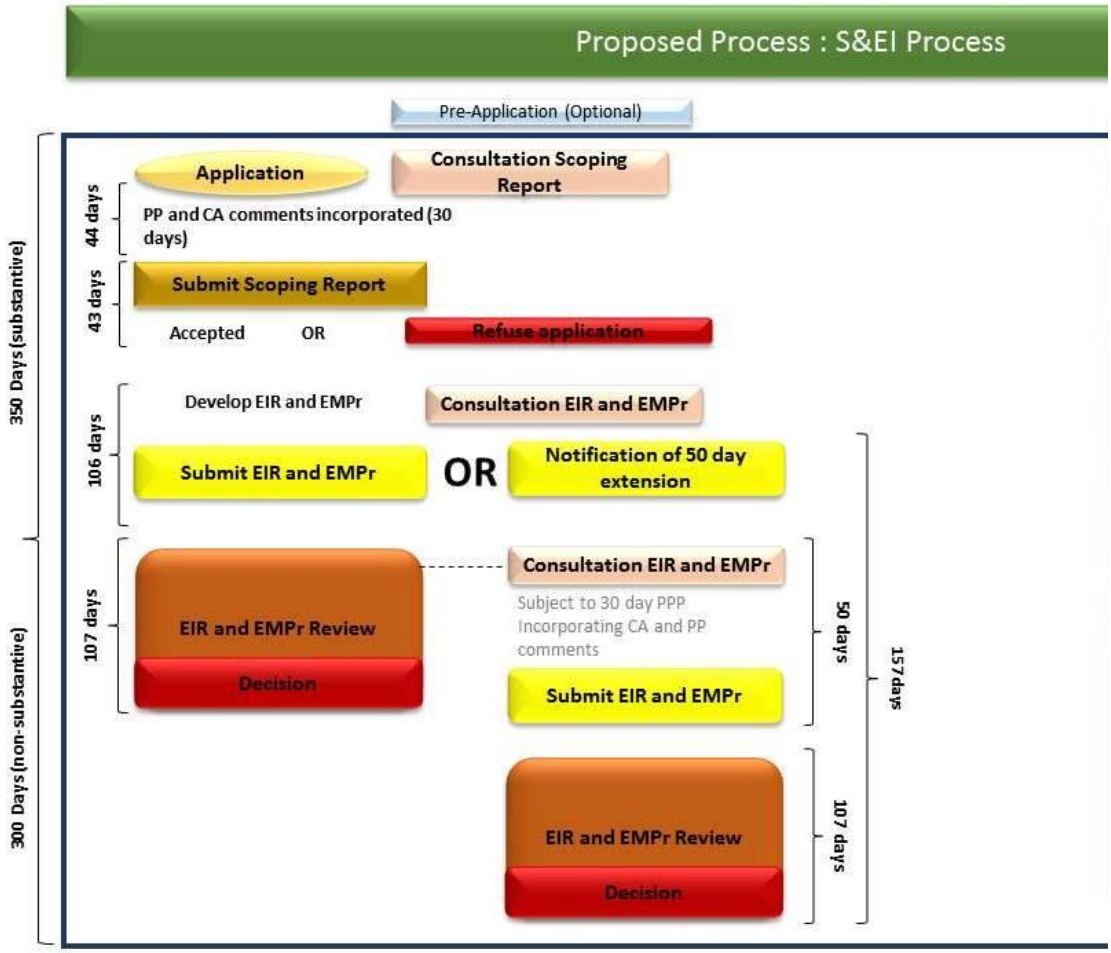

Figure 3-1. Scoping and Environmental Assessment Process

3.2 Stakeholder and Public Engagement

The NEMA EIA Regulations of 2014 (Sections 41-44) require an inclusive, transparent process of engagement. All persons who may be affected by and/or have an interest in a proposed project are entitled to be informed and submit comments.

Procedures for informing stakeholders about a project and engaging their participation have become standard practice. The stakeholder consultation process is being undertaken in English.

3.3 Specialist studies

The information that would be required to adequately assess the environmental impacts of the project were listed in the Scoping Phase and during the EIA Phase, several specialist studies were undertaken to obtain adequate information to conduct the impact assessment.

The following specialist studies have been undertaken and included in the EIA study (findings were evaluated in this report and are attached as Appendix F):

Appendix F1	Soil, land use, land capability and agricultural potential study
Appendix F2	Avifaunal Specialist Assessment
Appendix F3	Ecological and vegetation Assessment
Appendix F4	Geotechnical Assessment
Appendix F5	Heritage Impact and Palaeontological Assessment
Appendix F6	Socio-Economic Assessment
Appendix F7	Wetland & Riparian Impact Assessment
Appendix F8	Visual Impact Assessment

3.4 Alternatives

The EIA process has aimed to identify and to evaluate feasible alternatives to the project. The alternatives of the project are discussed in detail in Section 8 of this report. The proposed layout is the preferred layout which excludes the riparian zone and buffer. Mitigation measures are proposed for the preferred layout.

3.5 Identification of potential issues and impacts

Issues were identified as a result of the project team's understanding of the project and previous experience on projects of a similar nature and substantiated by the respective specialist studies. Potential environmental impacts are addressed in more detail in Section 11 of the report.

3.6 Submission of the EIA report to the competent authority

Following the review and commenting period of 30-days, comments received on the DEAIR report, are responded to on the CRR (Appendix D4).

4. SURROUNDING LAND USES

4.1 Surrounding areas

The property is located north of the Eskom Spitskop HV substation in an area that is already affected by various electrical overhead power lines. To the south of the Property there are smaller portions of the farm Wildebeestlaagte 411 KQ. To the north and east are farm portions presently used for cattle grazing but that are earmarked for urban development. Directly east adjacent to the proposed development site, on a part of Portion 9 of the farm Wildebeestlaagte 411 K.Q., the "Hlogoyatau" residential township has been approved but not yet proclaimed. The area north-east of the site is at present used for business, commercial and light industrial purposes. Anglo American, a company which applied for the granting prospecting rights, declared that it has no objection to the establishment of the proposed project. Therefore, the proposed solar power plant development is aligned with existing and future land uses in the area.

Table 4-1. Surrounding Land Use and Zoning.

Direction	Land Use	Zoning
North	Cattle grazing	Agriculture
South	Residential township, Northam town	Various
East	Vacant land, owned by mining company and ESKOM Sub-station	Agriculture
West	Small farm portions used for residential purposes	Agriculture

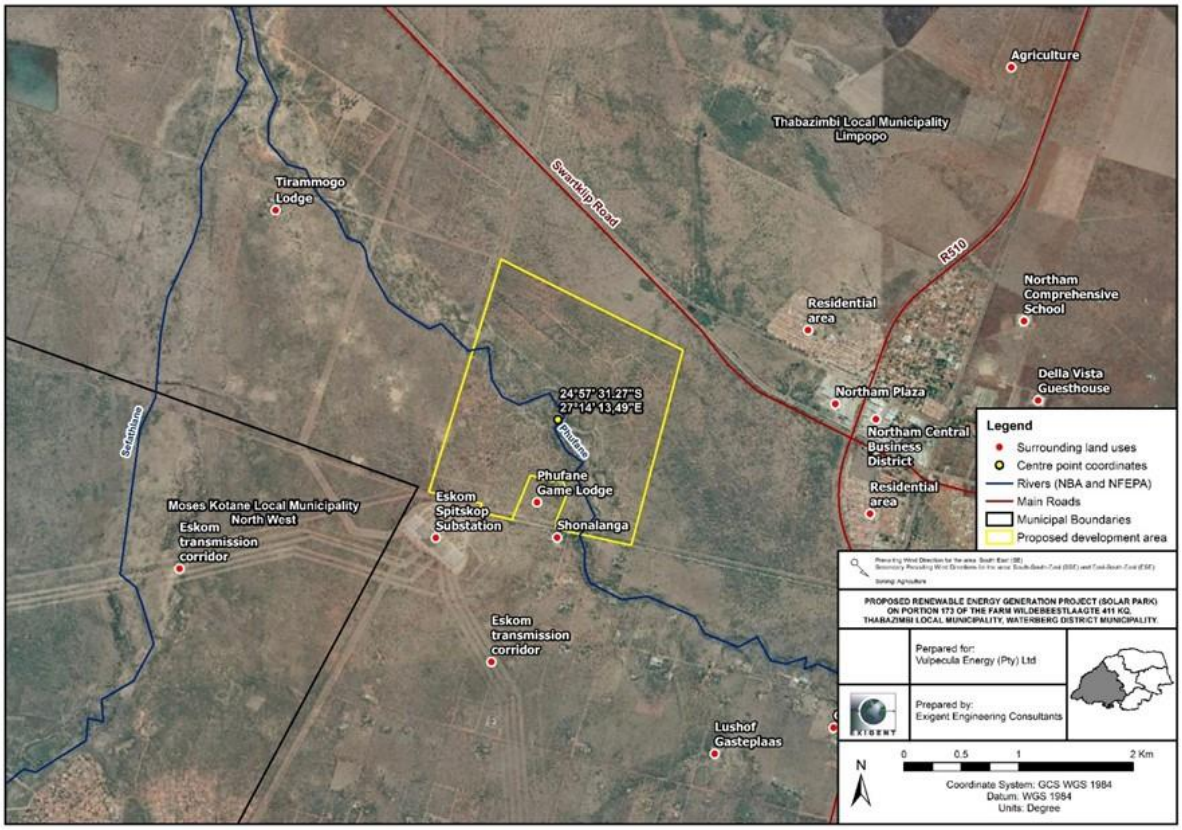

Figure 4-1. Land uses within proximity to the proposed development area.

4.2 Historical land use

Historically the site was used for agricultural practises. Based on the available Google Earth imagery, since 1985, there has been limited changes in the land use of the study site itself.

5. PROJECT DESCRIPTION

5.1 The Solar power plant

The project envisages the establishment of a solar power plant with a target installed power capacity up to 100 MWp.

The estimated annual energy production is calculated in approximately 1,950 kWh/kWp/year (load factor = 0.22). Therefore, the Spitskop Solar Park will generate approximately 78 GWh per year.

The calculation is made by the professional tool "PVSYST" and the simulation is done for 1 MWp (1 "PV field"). The site data (irradiation, temperature, etc.) charged on the database consists of hourly meteor-data registered by NASA satellites (NASA-SSE satellite data, 1983-1993, release 6) and the simulation is made for the timeframe of 1 year.

Table 5-1: Coordinated of the infrastructure

Portion		Latitude	Longitude
Substation	Centre point	24°57’39.37” S	27°13’57.91” E
BESS	NW	24°57’40.99” S	27°13’57.48” E
	SW	24°57’46.48’ S	27°13’58.95” E
	SE	24°57’46.30” S	27°14’14.69” E
	NE	24°57’40.66’ S	27°14’12.40” E
Warehouse	Centre point	24°57’40.98” S	27°13’57.52” E
Access road	Option 1	24°57'11.86" S	27°14'48.33" E
	Option 2	24°57'3.60" S	27°13'52.14" E
	Option 3	24°58'2.16" S	27°14'12.62" E

Table 5-2: Corner coordinates of the PV area

Portion	**Geographical coordinates of start and end coordinates within the properties**	
	Latitude	**Longitude**
PV Area	24°56'49.59"S	27°14'0.66"E
	24°57'12.01"S	27°14'47.10"E
	24°57'3.98"S	27°13'55.99"E
	24°58'0.36"S	27°14'35.50"E
	24°57’58.81” S	27°14’29.02”E
	24°57'32.62"S	27°14'28.01"E
	24°57'20.86"S	27°14'12.68"E
	24°57'21.93"S	27°14'10.06"E
	24°57'52.25"S	27°14'0.99"E
	24°57'52.87"S	27°14'3.43"E
	24°57'35.08"S	27°13'54.96"E
	24°57'29.01"S	27°13'57.40"E
	24°57'28.22"S	27°14'9.71"E
	24°57'34.48"S	27°14'9.59"E
	24°57'37.41"S	27°14'9.54"E
	24°57'46.22"S	27°14'14.51"E
	24°57'47.01"S	27°14'4.93"E
	24°57'21.53"S	27°13'53.84"E
	24°57'21.18"S	27°13'50.45"E

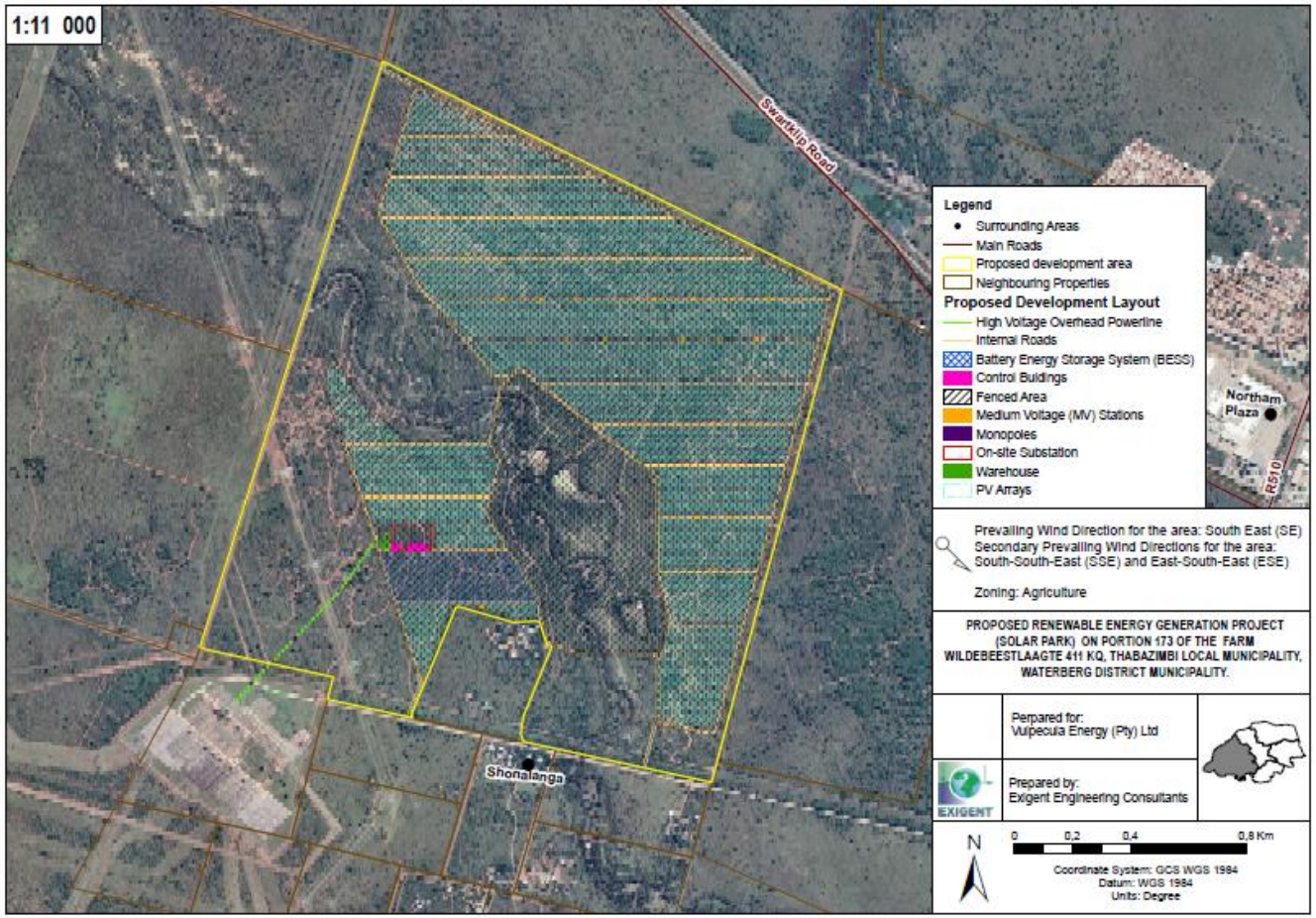

Figure 5-1. Locality map with solar infrastructure and overhead powerline.

The theoretic gross energy production from PV modules is approximately 2,400 kWh/kWp/year. The *global horizontal irradiation* of the site is 2,094 kWh/m^2/year (NASA-SSE satellite data, 1983-1993, release 6). This datum represents one of the highest irradiation values registered in the world. If compared with the global horizontal irradiation of the area of Upington in the Northern Cape, which is considered one of the best areas in the world, the location of the Spitskop Solar Park has an irradiation level only 2% lower.

The energy generated by the Spitskop Solar Park will reduce the quantity of pollutants and greenhouse gases emitted into the atmosphere. The reduced amount of CO_2 will be the emissions that would have been generated by a thermal power plant using fossil fuels to produce the same quantity of energy that it is produced by the Spitskop Solar Park. The calculation of the avoided CO2 emission is easy: the energy produced per year by the Spitskop Solar Park (78 GWh per year) is multiplied by the Eskom's average emission factor, which is 1.015 tons of CO2 / MWh (*source*: Energy Research Centre, University of Cape Town. (2009) *Carbon accounting for South Africa*). This means that, in the case of the Spitskop Solar Park, the avoided CO_2 emissions are 79,170 tons / year.

Furthermore, considering that 1 kg of coal generates approx. 3.7 kWh (supposing a caloric value of 8000 kcal/kg and a coal plant efficiency of 40%), the coal saved by the Spitskop Solar Park will be of approx. 21,000 tons of coal / year.

Table 5-3. Project components and details

Component	Descriptions/dimensions
Output capacity of the PVPP	100 MW
Height of PV panels	4.5 m
Area of the PV Array	Total area of the PV Array: 158 ha
Number of inverters required	Each Medium voltage station will be equipped with DC/AC inverters that converts Direct Current (DC) into Alternate Currents (AC) at a low voltage of 270V. There will be 75 medium voltage stations throughout the proposed development. PV technology is in constant and rapid evolution, this means that the final choice of the type (e.g. central inverters or string inverters) and model of inverter can be taken at the time of the commission date, on the basis of the availability of inverters of the worldwide market and of the cost-efficiency curve. In any case, the total installed capacity of the inverters (AC side) will be up to 125 MWac.
Area occupied by inverter/transformer stations/substations	There will be 75 medium voltage stations throughout the proposed development. Each will have an area of approximately 31.3 m^2. Therefore, the combined area of the medium voltage stations will be 2 347.5 m^2.
Control rooms	The substation will be equipped with 2 control rooms. The 2 control rooms will have a length of 60 m and 22 m, respectively and will both have a width of 14 m. Therefore, each of the control room will have an area of 1100 m^2. The control room area will share their floorspace with the Sub-station.
Workshops/Warehouses	Two warehouses / workshops will be constructed within close proximity to the On-site 132kV switching station. The warehouses will have an area of approximately 626 m^2.
Capacity of on-site substations	The on-site 100MW substation will host a 120 MVA transformer 22kV/88kV (or 22kV/132 kV), plus one as spare

Component	Descriptions/dimensions
Area occupied by both permanent and construction laydown areas	Project footprint / fenced area is up to approximately 238.2 ha. Surface area (within the project footprint) will be covered by PV modules, internal roads, MV stations and a HV substation. The construction camp (temporary) will be up to 10 ha in extent.
Areas occupied by buildings	Medium-voltage stations occupy a footprint up to 930 m^2. On-site substation, switching station and control rooms occupy a footprint of approx. 1.1 ha. Workshop & Warehouse occupy a footprint of approx. 313 m^2 each. In total, 2 warehouses are foreseen. Therefore, the total area occupied by buildings (MV stations, HV substation, Workshop & Warehouse) amounts to approx. 1.3 ha The Battery Energy Storage Systems (BESS) will be located in the area where the camp site will be for the purpose of the construction phase. This area will be approximately 10 ha in size.
Length of internal roads	Approximately 18 356 m
Width of internal roads	8 m
Access roads	The project footprint / development area will have direct access from the P16/2 road leading from the R510 providing the site with access from the southern boundary, whereas access from to the northern portion will be gained via the road D869.
Proximity to the grid connections	780 m (via the proposed infrastructure route). One 88kV (or 132 kV) overhead power line or underground line, connecting the on-site HV switching station to the Eskom Spitskop HV Main Transmission Substation (MTS).
Height of fencing	3.0 m
Type of fencing	Wire mesh fencing with video-surveillance system.
Height of overhead powerlines	88 kv (or 132kV): up to 25 m above the ground level
Length and width of servitude of 132kV powerline	The servitude will be 36 m in width and the 132kV corridor from the on-site substation to the Eskom Spitskop MTS will be 712 m long.
132kV Substation dimensions	11 001 m^2
Switching station dimensions	11 004 m^2; The on-site substation will host a 120 MVA transformer 22kV/88kV (or 22kV/132 kV), plus one as spare. This includes the area of the control rooms.
Battery Energy Storage Facility	With a Maximum Export Capacity up to 100 MW and a 6-hour storage capacity up to 600 MWh, with a footprint up to 10 ha within the proposed PV plant footprint / fenced area.

5.2 Primary Components of the proposed development

The proposed development (the PVPP and its connection infrastructure) will consist of the installation of the following equipment:

- PV modules (mono-crystalline, poly-crystalline or bi-facial modules as described below);
- Mounting systems for the PV arrays (single-axis horizontal trackers or fixed structures) and related foundations;
- Internal cabling and string boxes;
- Medium voltage stations, hosting LV/MV power transformers;
- Medium voltage receiving stations;

- One on-site 33kV/88Kv (or 33 Kv/132kV) step-up substation with high voltage power transformer, stepping up the voltage from 33kV (or 22kV) to 88kV (or 132kV) and one 88kV (or 132kV) busbar with metering and protection devices (switching station)
- One 88kV (or 132kV) overhead powerline, approximately 0.71 Km long, connecting the one-site switching station to the 88kV (or 132kV) busbar of the Eskom Spitskop substation;
- Battery Energy Storage System (BESS) with a maximum Export Capacity up to 100 MW and a 6-hour storage capacity up to 600 MWh, with a footprint up to 10 ha within the proposed PV plant footprint/fenced areas;
- Workshops and warehouses;
- Electrical system and Uninterruptible Power Supply (UPS) devices;
- Lighting system;
- Grounding system;
- Internal roads;
- Fencing of the site and alarm and video-surveillance system;
- Water access point, water supply pipelines, water treatment facilities;
- Sewage system;
- Interventions on the Eskom Spitskop Main Transmission Substation (MTS).

During the construction phase, the site may be provided with additional:

- Water access point, water supply pipelines, water treatment facilities;
- Prefabricated buildings; and
- Workshops and warehouses; which will all be removed at the end of construction.

The connection may also entail interventions on the Eskom grid, according to Eskom's connection requirements/solution.

5.3 Energy generation and avoided production of CO_2.

The project envisages the establishment of a solar power plant with a maximum generation capacity at the delivery point (Maximum Export Capacity) of up to 100 MW.

The preferred technical solutions envisage:

- mono/polycrystalline PV modules, mono or bi-facial.
- fixed mounting systems or horizontal 1-axis trackers.

The estimated annual energy production is calculated in approximately:

- **2,100 kWh/kWp/year** (load factor = 0.240), in the case of bi-facial PV modules mounted on fixed mounting systems; or

- **2,450 kWh/kWp/year** (load factor = 0.280) in the case of bi-facial PV modules mounted on trackers.

Therefore, the project will generate:

- **328.1 GWh per year** in the case of PV modules mounted on fixed mounting systems; or
- **382.8 GWh per year** in the case of PV modules mounted on trackers.

The Global Horizontal Irradiation (GHI) of the site is 2,136 kWh/m^2/year (source: https://solargis.info/imaps/).

The energy generated by the Spitskop Solar Park will reduce the quantity of pollutants and greenhouse gases emitted into the atmosphere. The reduced amount of CO_2 will be the emissions that would have been generated by a thermal power plant using fossil fuels for producing the same quantity of energy that it is produced by the Spitskop Solar Park.

The quantity of the avoided CO_2 is calculated as follows: the energy produced by the Spitskop Solar Park (up to 328.1 GWh/y) is multiplied by the Eskom's average emission factor which is 1.015 t CO^2/MWh (source: Energy Research Centre, University of Cape Town. (2009 Carbon accounting for South Africa).

This means that, in the case of Spitskop Solar Park, the avoided CO_2 emissions are approximately 323,276 tons of CO_2 per year per project in the case of PV modules mounted on fixed mounting systems, or 377,155 tons of CO_2 per year per project in the case of PV modules mounted on trackers.

Considering that 1 kg of coal generates approximately 3.7 kWh (supposing a caloric value of 8000 kcal/kg and a coal plant efficiency of 40%), the coal saved by the Spitskop Solar Parks will be approximately 88,682 tons of coal / year / project in the case of PV modules mounted on fixed mounting systems, or 103,463 tons of coal / year / project in the case of PV modules mounted on trackers.

The detailed description of the characteristic and functioning of the PV plants and their connection is given in the following paragraphs.

5.4 Detailed descriptions of the project components

5.4.1 PV technology (Project functioning

Solar energy facilities using PV technology convert sun energy to generate electricity through a process known as the Photovoltaic Effect, which consists of the generation of electrons by photons of sunlight in order to create electrical energy.

The preferred technical solutions are:

- Mono / bi-facial mono / polycrystalline modules, mounted on:

- fixed mounting systems or mounted on horizontal 1-axis trackers, which at present represent the best performing options in terms of reliability and costs/efficiency.

PV technology is in constant and rapid evolution, this means that the final choice of the type of solar modules (mono-crystalline or polycrystalline, mono or bi-facial) and mounting system (fixed or tracker) can be taken at the time of the commission date, on the basis of the availability of PV modules and mounting systems, of the worldwide market and of the cost-efficiency curve.

The maximum height of the structures (PV modules and support frames) will be approximately 4.5 m above the ground level. Therefore. the impacts and mitigation measures will not change.

PV modules will be assembled on zinced steel or aluminum frames, to form PV arrays. The metal frames that sustain PV arrays are set to the ground by fixed support poles.

A. <u>In the case of PV modules mounted on fixed mounting systems:</u>

Each mounting frame will host several PV modules along two or more parallel rows consisting of PV modules placed side by side, with the position of the PV arrays northwards and at an optimized tilt. The rows are mounted one on top of the other, with an overall mounting structure height up to 4.5 meters above ground level.

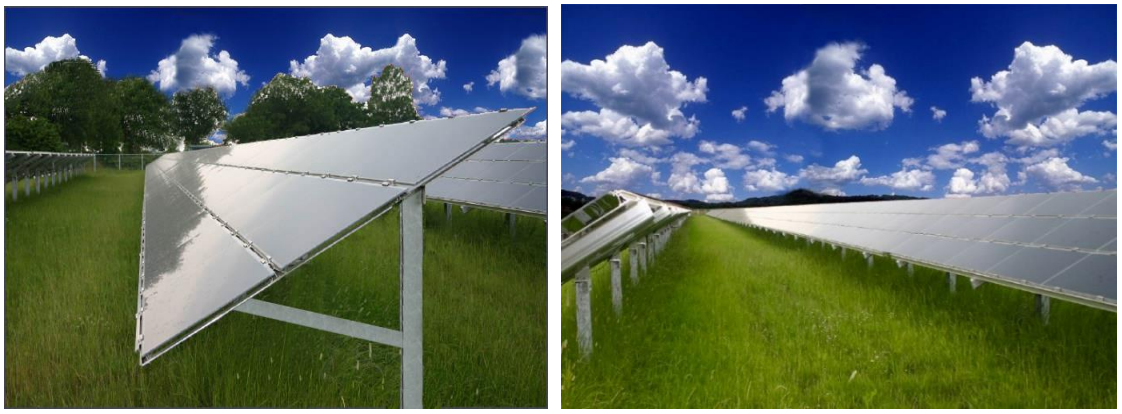

Figure 5-2. Lateral views of PV arrays mounted on fixed mounting systems.

Figure 5-3. Frontal views of PV arrays mounted on fixed mounting systems.

B. <u>In the case of PV modules mounted on trackers</u>

Each PV array is composed of several PV modules disposed along one or more parallel rows consisting of PV modules placed side by side. Each tracker is composed by several PV arrays North-South oriented and linked by an horizontal axis, driven by a motor. The horizontal axis allows the rotation of the PV arrays toward the West and East direction, in order to follow the daily sun path. The maximum mounting structure height will be up to 4.5 meters above ground level.

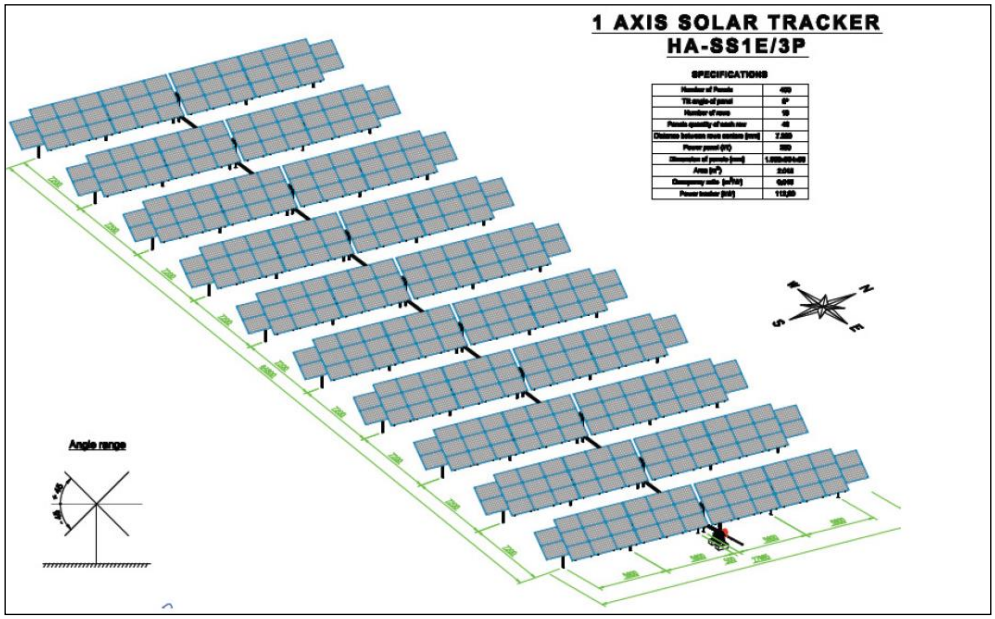

Figure 5-4. Frontal views of PV arrays mounted on fixed mounting systems.

Figure 5-5. Frontal views of PV arrays mounted on fixed mounting systems.

C. <u>In both cases (where both alternatives are used)</u>

PV modules are series-connected outlining PV strings made of several modules, so that the PV string voltage fits into the voltage range of the inverters. PV strings are set up in order to be

connected to DC-connection boxes. Each String Box allows the parallel connection of several PV strings (also called “PV sub-field”).

String Boxes monitor the currents in photovoltaic modules and can promptly diagnose faults. String boxes are also designed with a circuit breaker in order to disconnect the photovoltaic sub-fields from the inverters.

5.4.2 Medium Voltage Stations

The energy delivered from the medium voltage stations will be collected into one (or more) medium voltage receiving station(s), parallel connecting all the PV fields of the PV generator.

From the medium voltage receiving station, the energy will be delivered to one step-up transformer of 120 MVA (plus one as spare), which will step up the electric energy from the medium voltage level (22 kV or 33 kV) to 132 kV. The power transformers will be connected to an on-site 132 kV busbar (the so called “switching station”), to be equipped with protection and metering devices.

5.4.3 On-site 132kV busbar (switching station)

The new on-site 33kV/132kV substation and 132kV switching station will need to be equipped with circuit breakers upstream and downstream, in order to disconnect the PV power plant and/or the power line in case of failure or grid problems.

5.4.4 Substation and powerline

From the on-site 132kV switching station, a new 132kV power line, 0.05 deliver the energy to a new step-up transformer of 120 MVA (plus one as spare) (one per project), located in a new on-site substation. The power transformers will be connected to a busbar (the so called “switching station”), to be equipped with protection and metering devices.

5.4.5 Shared infrastructure

The proposed Spitskop Solar Park will be connected to the busbar of the Eskom HV Spitskop Main Transmission Substation (MTS) via a new 88 kV (or 132kV) power line.

The connection may entail the extension of the busbar of the Eskom Spitskop HV substation and the establishment of a new bus-bay.

The power generation capacity at the delivery point (Maximum Export Capacity) will be up to 100 MW.

5.4.6 Battery Energy Storage Systems (BESS)

A Battery Energy Storage System (BEES) with an output capacity up to 100 MW and a storage capacity up to 600 MWh (6-hour storage) will be installed next to the on-site step-up substation and switching station, within the footprint and fenced area of the Spitskop Solar Park.

Lithium-ion batteries will store energy at times of low energy demand and release the energy to the grid at times of pick demand. The battery energy storage system can also provide other grid services (if required by Eskom) aimed to improve grid stability and power quality, by turning on and off in fractions of a second, such as “Fast Frequency Response” (FFR).

Each BESS (one per project) will have a footprint of up to 10 hectares and will comprise of the following equipment:

- Up to 120 containers (each up to 40 m^2), each with a storage capacity of up to 5 MWh and on a concrete platform. These will house the batteries, management system and auxiliaries.
- Up to 50 transformer stations (up to 35 m^2 each).
- Up to an additional 10 m^2 per container for cooling units.
- Internal access roads up to 8.0 m wide between rows of containers.
- BESS will be connected:
  - to the PV plant by means of DC/DC inverters, and
  - to the 33kV bus-bay of the on-site step-up substation by means of kiosk transformers, medium-voltage overhead lines and/or underground cables;
- Temporary infrastructure including a site camp and a laydown area.

The batteries to be installed in the containers will be of the Lithium-ion type and the battery cells will be pre-assembled at the supplier factory prior to delivery to the site. No electrolytes will be transported to and handled on site.

The BESS shall be able to store electrical energy and charge and discharge electrical energy when connected to a Power Conversion Unit (PCU), which performs the current conversion from LV DC to MV AC (and vice versa). The battery is commonly connected at AC MV level to the Renewable Power Plant for HV conversion and grid interconnection.

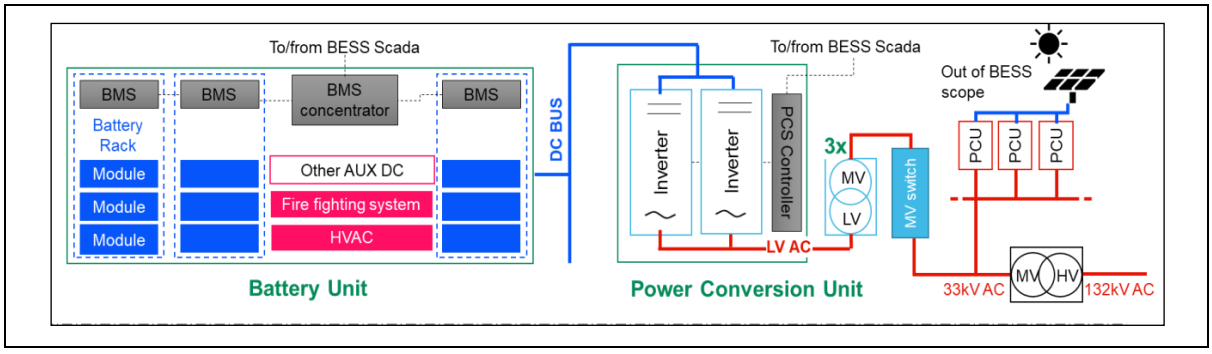

Figure 5-6. Battery Energy Storage Systems

Battery Storage in combination to solar power plants is capable to provide multiple services to the plant and to the power transmission network adding flexibility to the system. Possible applications include amongst others: renewable generation time shifting, unbalancing reduction, curtailment avoidance, frequency regulation, voltage support, spinning reserve.

5.4.7 Access road and internal roads

Access to the Spitskop Solar Park will be from a secondary road from leading from the R510 will provide access to the southern portion of the proposed development, whereas access from to the northern portion will be gained via the road D869. During construction and operation, access and internal roads will be up to 8 m wide with a road reserve up to 13.5 m.

Internal roads will consist of gravel roads designed in accordance with engineering standards. The roads will have a width up to 8.0 meters allowing for the slow-moving heavy vehicles. Once the solar farm is in operation, the internal roads will mainly be used for maintenance and inspections. The vertical alignment of the roads will not present significant challenges due to the flatness of the terrain. The entire development will be contained inside a fenced area and the roads are not intended for public use.

5.4.8 Lighting system

The lighting system will consist of the following equipment (per project):

- Floodlight-towers: maximum 10 meters high, with directional lamps (LED type) of 120 W, installed around the HV loop-in loop-out substation. Normal lighting: 15 lux; up to 40 lux in case of emergency.
- Street lighting along internal roads, for the stretch from the access point up to the HV substation inside the property: 1 streetlamp, maximum 5.5 meters high, every 20 meters, having a LED lamp of 120 W.
- 2x120 W spotlights (LED type) mounted on the top of medium-voltage stations.

The lighting of the MV stations and of the on-site HV substation will be on only in case of intrusion/emergency or necessity to reach the MV stations / HV substation during the night.

During the night, the video-surveillance system will use infra-red (or micro-wave) video-cameras, which do not need a lighting system (which could reduce the functioning).

5.4.9 Stormwater collection system

Given the low rainfall, flat topography and low flow speed of run-off, no formal storm water structures are required as the proposed gravel roads will be developed at ground level so as not to disturb the natural flow of storm water. This means that run-off will not be concentrated, and the existing drainage patterns will be left undisturbed.

5.4.10 Water requirements

This section describes the water requirements of the during the construction phase (per project). The overall and average water consumption during construction is detailed in Table 5-4.

Table 5-4. Water consumption during the construction phase of the proposed development.

WATER REQUIREMENT DURING THE CONSTRUCTION PHASE OF THE PROJECT		
DESCRIPTION	**UNIT**	**Spitskop**
Timeframe of the construction activities	*months*	15
Timeframe of the construction activities - calendar days	*days*	450
Overall water consumption for internal roads	m^3	6,850
Overall water consumption for sanitary use	m^3	1,650
Overall water consumption for concrete production	m^3	3,000
OVERALL WATER CONSUMPTION	***m^3***	**11,500**
Daily water consumption (average over 450 calendar days)	***m^3/day***	**25.5**

Storage tanks will be sized in order to provide a reserve of water approximately 200 cubic meters**.**

A. <u>Construction of internal gravel roads</u>

- Water is necessary for the construction of internal gravel roads, in order to get the gravel compacted to optimum moisture content (OMC).
- The surface of internal gravel roads will be approximately 137,000 m^2.
- 50 liters of water / m^2 of internal of roads will be required for the proposed project.

B. <u>Workers</u>

- Approximately 100 people are expected to be employed during the construction period, although this number can increase to 150 for short spaces of time during peak periods. This number can be higher in the case the Project Company - once being selected as Preferred Bidder by the Department of Energy and having finalized the Connection Agreement with Eskom, where in particular it is agreed the envisaged connection timeline - evaluates to build the proposed Solar Park in a timeframe shorter than 15 months (i.e. 330 working days). For example, in the case the construction works are planned to last only 6 months (i.e. 132 working days), the average number of workers required on site during construction is 250.
- Each worker needs 50 liters / 8 working hours for sanitary use.

- Water consumption will be:
    - 100 people x 50 l/person x 330 working days = 1650 m3 over 15 months, or:
    - 250 people x 50 l/person x 132 working days = 1650 m3 over 6 months.

C. Concrete production

- Concrete is necessary for the basements of the medium-voltage stations, the high-voltage loop-in loop-out substation, the control building and the warehouse and for the foundations of the mounting systems. The overall amount of concrete to be produced will be approximately 15,000 m^3.
- 200 litres of water are needed for 1 cubic meter of concrete.

D. Vehicle cleaning

As mitigation measure, the cleaning of vehicles like excavators, mechanical diggers and pile rammers will be done once or twice per month and not during working days, also in order to limit the water requirement during the construction activities. In order not to waste a large amount of water, high pressure cleaners will be used. Overall, the water requirement for cleaning activity is very low.

This section describes the water requirements of the during the **operational phase** (per project). During operation, water is only required for the operational team on site (sanitary use), as well as for the cleaning of the solar panels. Further water consumption may be only for routine washing of vehicles and other similar uses. The overall and average water consumption during construction is detailed in Table 5-5.

Table 5-5. Water consumption during the operational phase of the proposed development.

WATER REQUIREMENT DURING THE OPERATIONAL PHASE		
DESCRIPTION	**UNIT**	**TOTAL**
Average daily water consumption for sanitary use	*l/day*	3,000
Average daily water consumption during cleaning activity (over 12 working days, twice per year)	*l/day*	74,000
Average monthly water consumption for sanitary use (over 30 days)	*l/month*	90,000
Annual water consumption for sanitary use	***m^3/year***	**1,095**
Annual water consumption for PV modules cleaning activities (twice/year)	***m^3/year***	**1,700**
ANNUAL WATER CONSUMPTION DURING OPERATION	***m^3/year***	**2,795**
DAILY WATER CONSUMPTION DURING OPERATION (average over 365 day)	***m^3/day***	**7.66**

A. Water consumption to clean the PV modules

The cleaning activities of the solar panels will take place twice per year. It is assumed that up to 1.0 liters per m^2 of PV panel surface will be needed. Therefore, the amount of water for cleaning is up to 850 m^3 per cleaning cycle and 1,700 m^3 per year.

PV modules cleaning activity can last less than 1 month. If the cleaning activity lasts approximately 2 weeks (12 working days), the daily water consumption will be approximately 71,000 liters/day, over 12 days

B. Conclusion

The daily water requirement will be approximately 3,000 liters/day over 12 months for sanitary use (i.e. 90,000 l/month and 1,095 m^3/year).

The water consumption will increase up to 74,000 liters/day during the cleaning of the solar modules (71,000 liters/day for cleaning activity and 3,000 for sanitary use), which will last less than a month and will occur twice per year during the dry period. It is further proposed that 90,000 litres of water will be stored in storage tanks for fire, emergency and washing of panels twice a year.

Water needs for the construction phase (11,500 m^3 over approximately 15 months) and the operational phase (2795 m^3/year) can be obtained from the Thabazimbi Local Municipality and/or from on-site boreholes. The Thabazimbi Local Municipality will be consulted in this respect.

Sewerage

Considering that the proposed development will not include formal residential properties there is no need to connect the municipal sewer reticulation system. Sewer reticulation will be handled by a suitable patented and commercially available wastewater treatment system.

The sewer system will consist of an installation to serve the offices of the control building. The system will be installed in line with the requirements of the manufacturer. Typical systems consist of a conservancy tank (built underground on site), and a patented digester. Most systems require electricity to power the pumps and fans used in aeration process, although some systems use wind power (whirlybird). The system could require chlorine tablets available commercially. The effluent from the wastewater treatment system will be suitable for irrigation of lawns, or re-use in the dwellings as water for the flushing of toilets, or for fire-fighting purposes. This could reduce the overall water requirement of the development substantially.

5.4.11 Refuse removal

During the construction phase, solid waste will mainly consist of vegetation material as a result of the clearance of vegetation. Other type of solid waste will include, amongst others, wood from packaging, boxboards, expanded polystyrene and household waste. Vegetation material from clearing activity can be recycled to be re-used as organic fertilizer. Other solid wastes will be recycled as much as possible. Non-recyclable waste will be delivered to the closest legal landfill site.

During the operational phase (approx. 30 years), solid waste will mainly consist of household waste from the operational team. Other type of solid waste will come from the maintenance activity in case of failure of some components.

At the end of the project lifetime, the PV plant will be decommissioned. Silicon of the PV modules and cables (copper and/or aluminium conductor) will be recycled, as well as the aluminium (or zinced steel) frames and piles of the mounting systems.

The project company will enter into an agreement with the Local Municipality for the PV plant's refuse at the nearby municipal refuse site. No refuse will be buried or incinerated on site. Measures to manage waste has been included in the EMPr.

5.4.12 Temporary Construction Camps

The construction camp (approximately 10 ha) will be located within the planned development area, close to the new on-site substation, at the planned location of the BESS. Consequently, the construction site area will be gradually reduced at the completion of the BESS. The optimal location of the construction site is important during the planning phase in order to minimize impacts on the surrounding environment. The site's location has been dictated by the nature of the works to be undertaken, specialist studies, site restrictions, town planning intended uses and access.

The area identified for the construction site had to meet the following requirements:

- sufficient size;
- proximity to existing roads;
- availability of water and energy;
- low environmental and landscape value;
- sufficient distance from residential areas; and
- proximity to the worksite.

In addition, to ensure environmental compatibility, the following factors have been considered:

- restrictions on land use (landscape, archaeological, natural, hydrological, etc.);
- terrain morphology;
- presence of high environmental value areas (e.g. wetlands); and
- sand & stone supply.

5.5 Project phasing

5.5.1 Pre-construction phase

The pre-construction phase of the proposed project includes the planning of the project, by considering the best strategic approach for layout and component design, construction and operation of the proposed development. This is done in order to minimize the risks during the construction phase on the environment.

Based on the environmental impacts, e.g. natural vegetation, potential graves and natural water resources, as well as engineering design considerations and existing servitudes, various alternative layout options were considered.

5.5.2 Construction phase

The project will be located within close proximity to Northam, with the grid connection powerline leading from the proposed PVPP to the existing Eskom Spitskop HV substation located towards the south of the proposed PVPP project.

The construction phase for the proposed development will be separated into two phases, namely the 1) site preparation phase, and the 2) construction and installation phase.

The construction phase of the proposed development is expected to take 15 months. It is estimated that between 100 and 150 laborers will be employed.

5.5.3 Site preparation phase

The proposed development site is accessible via a secondary (P16/2) road (East to West) leading from the R510 as well as from the road D869. The following preparations will take place:

- PV modules and all steel structures will be transported to the proposed development site.
- The main transformers, graders, drill rigs, 10 m3 tipper truck, tractors, trailers, water tanker truck, track-loader backhoes (TLBs) and trenching machines will be delivered to site.
- Vegetation clearance will take place.
- The area will be graded and levelled according to the required specifications, using the 20-ton roller.
- Throughout the entirety of the construction phase, water spray (using the water tanker truck) will be used to control excessive dust blow off.
- Internal access roads, as indicated on the layout plans, will be established on site. These access roads will allow for easy vehicular access to each panel system within the proposed development. All roads will be gravel roads with a width of up to 8 m. (Once the proposed PVPPs are operational, the roads will mainly be used for maintenance and inspections.)
- For the purpose of the construction phase of the proposed development, water access point, water supply pipelines, water treatment facilities, pre-fabricated building, workshops and warehouses will be installed during the site preparation phase.

Construction and installation phase

- As part of the construction and installation phase, concrete transformer pads for each row of solar panels and a switch panel for connection to the power grid and control sheds will be constructed on site.
- Electrical systems development will take place in conjunction with the installation of the rest of structures on site (such as the sewer wastewater treatment works (WWTW) and all supporting infrastructure). The electrical systems installations will include electrical cabling and trenching (field trenching in and around the site where the units will be installed). These structures connect the solar units, collects the energy from them and then routes the energy to a point within the utility infrastructure system.

- A sewer reticulation system will also be installed on site. This will be done to service the offices of the control building and will be done in accordance with the specifications of the SABS. The systems will consist of an underground conservancy tank and a patented digester. These systems require electricity to power the pumps and fans used as part of the aeration process.
- During the construction phase, solid waste will mainly consist of vegetation material from the clearance of vegetation which will be recycled to be re-used as organic fertilizer. Other type of solid waste will include, amongst others, wood from packaging, boxboards, expanded polystyrene and household waste, which will be recycled as much as possible. Non-recyclable waste will be delivered to the closest permitted landfill site.

Water needs for the construction and operational phases will be obtained from the local municipality. The TLM will be consulted in this respect.

5.5.4 Connection to the ESKOM grid

The Spitskop Solar Park will be linked to the available 88kV busbay of the adjacent Eskom Spitskop HV substation through a new 88kV powerline, as foreseen in the drawings of Appendix C and as per the Eskom connection solution. The available 88kV busbay in the adjacent Eskom Spitskop HV substation will be equipped. The planned powerline corridor of 750m in length and 27 000m^2 (18m + 18m servitude width on both side of the powerline) in extent, is inside the property for the overall length.

Part of the infrastructure required for the connection may be owned and/or operated by Eskom. This will depend on the Eskom grid code in relation to the IPPs (Independent Power Producers) and on the connection agreement to be finalized prior to or simultaneously with the conclusion of the PPA (Power Purchase Agreement) in respect of the options of retaining ownership of the connection works once completed.

5.5.5 Project layout

The layout of the proposed development (the PV Solar Park and its connection) is the result of a comparative study of various layout alternatives.

The PV plant is designed and conceived in order to minimize visual and noise impacts, as well as to operate safely and assuring a high level of reliability with low water consumption.

The proposed development envisages a layout aimed to preserve the Phufane Spruit which cuts across the site. The Phufane Spruit flood line and adjacent riparian areas have been excluded from the layout.

The second element which characterized the layout of the Spitskop Solar Park is the necessity to avoid the existing and planned Eskom power lines present on the west, south and southwestern side of the site.

The initial layout has been slightly moved in the easterly direction, in order to comply with the request of Eskom Distribution regarding a possible future servitude (100 m wide) for new planned Distribution power

lines, which will run along the western and southern side of the property. The corridor of the new 88kV power line linking the PV power plant to the Eskom Spitskop HV substation has been consequently modified in order to do not interfere with the new corridor required by Eskom Distribution.

The previous and revised layout of the Spitskop Solar Park for both Phase I and Phase II as well as the phases and sub-phases of the project are described below.

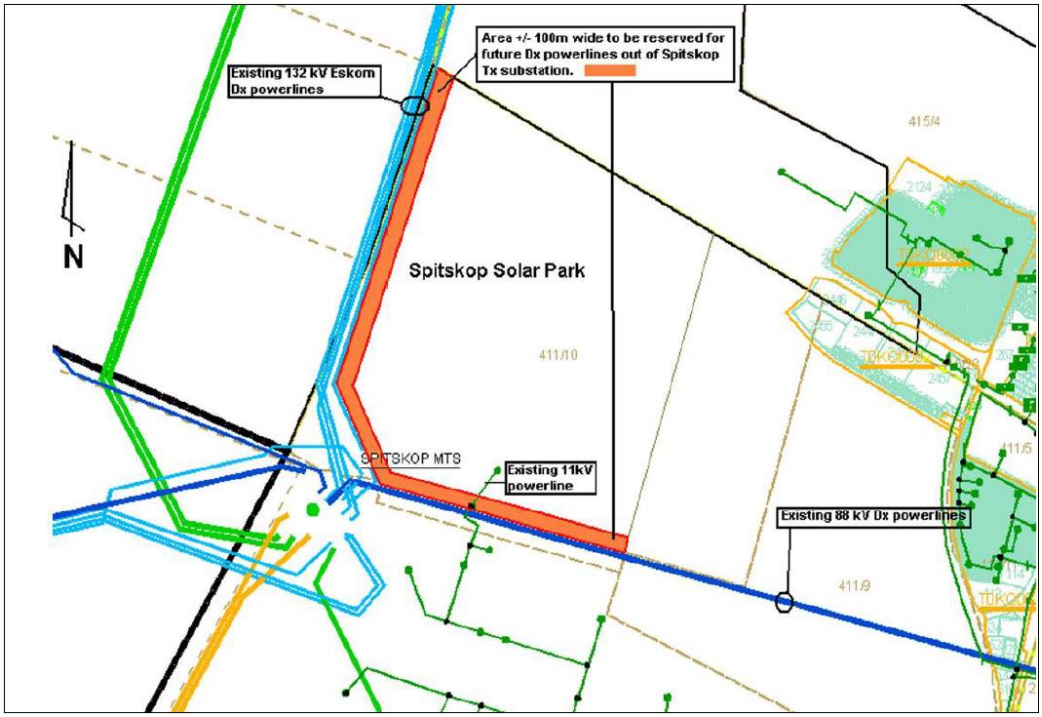

Figure 5-7. Map provided by Eskom Distribution, showing existing powerlines and the corridor for new powerlines

5.5.6 Project operational

The chosen technology for the PV modules is an evolution of the thin-film type, called "*Tandem thin-film*". This technology consists of an amorphous and a microcrystalline silicon layer (*micro-amorphous tandem*), with a solar conversion efficiency of 9.0%.

This technology offers, at this stage, the best cost-effective solution for very hot climatic conditions as in South Africa.

The PV technology, though, is in constant and rapid evolution, this means that also other kind of PV technologies have been considered such as monocrystalline and polycrystalline silicone cells and all them are deemed as possible alternatives with minimum project modifications and no additional environmental impacts. The following description is referred to the present favoured option (thin-film technology).

The PV generator will contain 316,368 thin-film PV modules of 128 Wp each, with a total peak power of 40, 495, 104 Wp.

The total surface required for the phase I will be of approximately 100 hectares. The project provides the assembling of the modules on steel or aluminium frames, with a positioning of the panels northwards and a 26° tilt angle.

The metal frames that sustain the photovoltaic modules are set to the ground by fixed support poles. Each mounting frame will host 39 modules along three parallel rows each consisting of 13 modules placed side by side. The 3 rows are mounted horizontally one on top of the other, with an overall mounting structure height of approximately 2.5 meters above ground level.

The 316,368 thin-film PV modules are series-connected outlining a string made of 13 modules. There will be 24,336 strings in order that the string voltage fits into the voltage range of the inverters.

Branch cables are designed in order to connect in parallel groups of 3 strings, to form 8,112 branch strings. Branch strings are set up in order to be connected to DC-connection boxes. Each String Box allows the parallel connection of 13 branch strings (also called “PV sub-field”).

String Boxes monitor the currents in photovoltaic modules and can promptly diagnose faults. String boxes are also designed with a circuit breaker in order to disconnect the photovoltaic sub-fields from the inverters.

The 624 PV sub-fields (64.896 kWp each) are thought to be linked to central inverters, located in 39 prefabricate medium voltage stations. Each station is composed by two adjacent prefabricate buildings designed to host two inverters, with a total nominal input DC power of 1,038.336 kWp (16 parallel sub-fields), and two medium voltage power transformers of 500 MVA.

The inverters are deemed to convert direct current (DC) into alternate current (AC) at low voltage (270 V). Subsequently, the AC will pass through medium-voltage power transformers in order to increase the voltage up to 20 kV (or 22 kV).

The energy delivered from the 39 medium voltage stations will be collected into four medium voltage receiving and delivering stations, parallel connecting all the 39 PV fields of the PV generator.

The medium-voltage stations, the receiving and delivering medium-voltage stations and the cabling for 1 MWp PV field are detailed in the drawings of Appendix C.

From these medium-voltage receiving and delivering stations, electric energy is delivered to a high-voltage substation, where three high-voltage power transformers (25 MVA each, one as spare) will convert the medium voltage (20 kV or 22 kV) to the connecting line voltage (88 kV).

In the substation layout, it is foreseen that the parallel connection between the HV step-up transformers is allowed by an on-site 88kV busbar, equipped with circuit breakers upstream and downstream (in order to disconnect the PV power plant and the power line if necessary). Two metering devices and related kiosks (one for Eskom, close to the busbar, and one for Vulpecula Energy, close to the power transformers) are also foreseen**.**

The kiosks, one in Vulpecula Energy side and one in Eskom side (2.4 x 4.8 x 3.2 m), contain the peripheral protection and control cabinets and the metering devices.

The on-site HV substation, composed by the power transformers, the 88 kV busbar with protection and metering devices, the control building and the kiosks (also called "*switching station*"), will have a footprint of approximately 5,000 m^2.

Eskom may decide to own and operate the busbar of the on-site HV substation and the new 88kV power line, according to the Eskom grid code.

The layout of the 88 kV high-voltage substation as well as of the control building and the subdivision between Eskom and Vulpecula Energy is detailed in the drawings included in the Appendix C:

- SSP_10_DE_ Rev.00/EIA *High-voltage substation - plan view and sections*
- SSP_11_DE_ Rev.00/EIA *Control building*

Eskom has indicated that the connection at 88 kV is possible and that a spare busbay is already available in the 88kV yard of the adjacent Eskom Spitskop HV substation.

The connection into the available busbay of the Eskom Spitskop HV substation will be made through a power line which will run inside the property from the 88kV busbar of the HV substation to the high voltage busbar of the HV Eskom substation. The corridor of the 1600 m power line has been optimised in compliance with Eskom requirements in order not to interfere with the present and future Eskom's power lines.

The available bus bay of the Eskom Spitskop HV substation will also need to be equipped.

The new 88kV power line coming from the on-site HV substation and delivering the energy to the Eskom Spitskop HV substation will have an overall length of approximately 1605 m; the proposed technical solution for the support of the cables is the so called "*steel monopile structure*" showed in the drawing of Appendix C:

- SSP_12_DE_ Rev.00/EIA *88kV overhead power line*

As showed in the drawing the height of the steel monopile structures will be approximately 20 m above the ground level; the distance between adjacent structures will be approximately 260 m. It is foreseen that 7 structures will be required.

5.5.7 Access road

The following three access options are considered:

Option 1: Use of the existing "ESKOM-road" as main access during both construction and operation

It is proposed that access to the proposed development during construction will be from Provincial Road P16/2 (R510) which is currently a SANRAL road. This road is currently being upgraded by SANRAL. The current ESKOM access road has a Hyson Cell surfacing which will remain as is. The total length of the road is 3.14km, 1.95km of which is required to provide access to the project site.
During the operational phase the access will move to the north and will be from provincial road D869.

Option 2: Access from the existing "ESKOM-road" during construction and from the Dwaalboom Road, Road D1235 during operation

The second option entails access from the north of the Spitskop Solar Park, from Road 1235, crossing over a small portion of Portion 3 of the farm Leeukopje, 415-KQ where the present level crossing over the railway line is situated, in order to gain access to an existing road that is situated on the Remainder, Portion 3 and Portion 4 of the farm Grootkuil, 409-KQ owned by Anglo American. At least half of the road has already been constructed on the Anglo American side up to the north-western corner of the proposed development area.

A formal access according to the standards set by RAL will be built for the benefit of all property owners in the area.

In the event Option 2 may be preferred, the "ESKOM-road" will be used as main access throughout the construction period, whereas, during the operational period, the northern access road will be used instead as formal access to the township.

Option 3: Access from the Rustenburg tar road, over the farm Wildebeestlaagte, during both construction and operation

This third option entails access from the Rustenburg tar road (P16-2), over Portion 47 of the farm Wildebeestlaagte 411-KQ up to Portion 29 of the farm Wildebeestlaagte 411-KQ by means of a public servitude road running over the northern boundaries of Portions 29 to 47, Wildebeestlaagte 411-KQ and the southern boundaries of Portions 17 to 28, Wildebeestlaagte 411-KQ.

The road turns in a northern direction over the farm Spitskop, 410 KQ and continues along the western and the northern boundary of the Eskom Spitskop HV substation, joining the existing "ESKOM-road" situated on Portion 12 and Portion 13, Wildebeestlaagte 411-KQ.

New servitudes are being negotiated over the following portions:

- Portion 17 of the farm Wildebeestlaagte 411 KQ;
- Remainder of the farm Spitskop 410 KQ;
- Remainder of the farm Wildebeestlaagte 411 KQ (where the Eskom substation is located)
- Portion 12 of the farm Wildebeestlaagte 411 KQ.
- Portion 13 of the farm Wildebeestlaagte 411 KQ

In respect of the proposed access options, the relevant servitudes will be registered over the affected properties in favour of the Spitskop Solar Park development.

Main internal roads

Main internal roads will consist of gravel roads which provide access to all the erven in the township (See Appendix C). The roads will be constructed up to a width of 8 meters. The internal gravel roads once the solar farm will be in operation will mainly be used for maintenance and inspections since traffic will be minimal. The Phufane Spruit, running through the property, will be crossed at two points. Low-level bridge crossings will be achieved using suitable corrugated iron culverts on a 1:1 year flood return period. The structures associated with the stream crossings, which will consist of (1.5m x 1.5m) culverts, will allow for the free movement of all aquatic organisms and the faunal species, amphibians and insects that might occur in the riparian zone. The vertical alignment of the roads will not present any significant challenges due to the flatness of the terrain so that no deep cuts or fills will be required, except at the stream crossing where corrugated iron culverts will be installed. The entire development will be contained inside a fenced area and the roads are not intended for public use.

Secondary internal roads

Secondary internal roads will be formal gravel roads and will be used only in case of maintenance or PV panels cleaning purposes. It is proposed that these roads be constructed to a width up to 8.0 m.

Existing roads

All existing roads consist of basic game farm tracks traversing the windblown sands covering the area. These roads are fit for hunting purposes but will in some cases be replaced with more formal gravel roads, while new formal gravel roads will be developed to suit the PV plant layout.

5.5.8 Lighting system

- Lighting system will consist of the following equipment:
- floodlight-towers, 10 meters high, with 6x400W directional lamps, installed around the HV substation. Normal lighting: 15 lux; up to 40 lux in case of emergency.
- Street lighting from the main access up to the HV substation: 1 streetlamp, 5,5 meters high, every 20 meters of street, having a metal-haloids lamp of 400 W.
- 2x400 W spotlights (SAP type) mounted on the top of medium-voltage stations.

The lighting of the MV stations and HV substation will be switched on only in case of intrusion / emergency or necessity to reach MV stations during the night.

During the night the video-surveillance system will use infra-red (or micro-waves) video-cameras that do not need a lighting system (which could reduce the functioning).

Only streetlamps along the main internal road, from the main access up to the HV substation, may be switched on at night.

5.5.9 Stormwater collection system

Very little is required in terms of stormwater. The area where the photovoltaic power plant is to be developed is reasonably flat and covered in windblown sands. There is no visible erosion anywhere and the flood line of the water course crossing the property is not affected. Storm water system will consist of open grass lined channels and nominal concrete culverts where required. Water will not unreasonably be concentrated and the natural flow of the existing water course will be maintained.

5.5.10 Water requirements

Water requirements during the construction phase

The construction phase will last approximately 8 months.

The property is served by an existing connection to a Magalies Water pipeline. This connection serves the hunting lodge on the property. This water will be suitable for the long-term water needs of the development. The water consumption of the development is fairly modest, as is demonstrated below.

The water required during the projected eight months construction phase can be summarised as follows:

Compaction water is required for the earthworks relating to the project. The surface area of the proposed gravel roads come to 230 000m2. The average number of workers expected to be employed on site is 100, each of which is expected to require 50 litres of water per day. Water will also be required for the production of concrete. The overall volume of concrete to be cast is some 10 000m3, which will require 200 l of water per m3. The water requirement for the cleaning of vehicles and plant is expected to be negligible.

- **Construction of internal gravel roads**
    - Water is necessary for the construction of internal gravel roads, in order to get the gravel being compacted to optimum moisture content (OMC)
    - The surface of internal gravel roads will be of approx. 152,650 m^2

- **Workers**
    - Each worker needs 50 litres / 8 working hours for sanitary use.
    - Daily average number of workers on site is 100.

- **Concrete production**

- Concrete is necessary for basements of: medium-voltage stations, medium-voltage receiving stations, high-voltage substation and control building, warehouses. The overall amount of concrete to be produced will be of approx. 6,840 m^3
- 200 litres of water are needed for 1 cubic meter of concrete

- **Vehicle cleaning**

As mitigation measure, the cleaning of vehicles like excavators, mechanical diggers and pile rammers will be done one or two times per month and during no working days, also in order to not increase the water requirement during the construction activities.

Furthermore, in order not to waste a large amount of water, high-pressure cleaners will be used. On the whole, the water requirement for cleaning activity is very low and can be considered negligible. The overall and average water consumption during construction is detailed in the Table 5-6.

The peaks of water consumption will be during the construction of internal roads, planned between the second and the end of the 5th month, when the average monthly water requirement will be of approximately 2900 m^3/month (corresponding to a water flow of 1.5 l/s over 22 working days).

Storage tanks will be sized in order to provide three-days reserve of approximately 450 m^3.

Table 5-6. Water consumption during the construction phase

WATER REQUIREMENT DURING THE CONSTRUCTION PHASE		
DESCRIPTION	UNIT	TOTAL
Working days (over 8 months)	days	176
Overall water consumption for internal roads	m3	15 100
Overall water consumption for sanitary use	m3	880
Overall water consumption for concrete production	m3	2 055
TOTAL WATER CONSUMPTION (8 Months)	m3	18 035
DESCRIPTION		
Daily water consumption during working days	m3/day	102
Equivalent water flow over 22 working days	l/s	1.19
Equivalent flow over 30 days (1 month)	l/s	0.87

Water requirements during the operational phase

During operation, water is only required for the permanent team on site (sanitary use), as well as for the yearly cleaning of the solar panels. Further water consumption may be only for routine washing of vehicles and other similar uses.

Water for sanitary use

A maximum of 25 people will be employed during the operation phase of the PV power plant, which will have a lifetime of 25 - 30 years. The Spitskop Solar Park will be in operation 7 days per week; therefore personnel will operate according to shifts. The surveillance team will be ensured during day-time, night-time and weekends. The average number of people working at the site on the same time will be of 12 people daytime and 4 people at night. The average daily water consumption for sanitary use is estimated

in 250 litres / day / person per 16 people, then the daily water consumption will be of approximately 4,000 litres/day.

Water consumption to clean the PV modules

The cleaning activities of the solar panels will take place only one time per year. It is assumed that 2 litres of water are needed for the cleaning of 1 m_2 of PV panel surface. The 40 MWp PV power plant will consist in 316,368 PV modules of 1.4 m_2 each: the total surface to be cleaned is of 442,915 m^2.

Therefore, the amount of water for cleaning is of 885,830 litres (886 m^3). PV modules cleaning activity can last less than 1 month. If the cleaning activity lasts 3 weeks (15 working days), the daily water consumption will be less than 60,000 litres/day, over 15 days.

Conclusion

The daily water requirement will be approximately 4,000 litres/day over 11 months. The water consumption will increase up to 64,000 litres/day during the yearly cleaning of the solar panels (60,000 litres/day for cleaning activity), which will last less than a month and will occur only, if necessary, in case of long dry period. PV modules are conceived as self-cleaning with the rain. It is further proposed that 90,000 l of water will be stored in storage tanks for fire, emergency and washing of panels (once a year).

The overall and average water consumption during operation is detailed in the table below:

Table 5-7. Water consumption during the operational phase

DESCRIPTION	UNIT	TOTAL
Average water consumption over 11 months	l/day	4 000
Average water consumption during cleaning cycle	l/day	90 000
Average monthly water consumption from sanitary use	l/month	120 000
DESCRIPTION		
Daily water consumption during normal working days	m3/day	4
Daily water consumption during cleaning cycle	m3/day	90
Equivalent flow over 30 days (1 month) sanitary use only	l/s	0.046

Water provision

The water needed during both the construction and operational phases will be provided from the Magalies Water Board along the access road running to the Eskom Spitskop HV substation. At present, this connection serves the game lodge on the property.

An application was submitted to Magalies Water Board for a new water connection. This connection point will be near the most eastern access point of the approved township along the ESKOM access road. A separate meter will be installed for the Solar Park development. Eskom declared that they have no objection to the provision of a separate water connection point on the “ESKOM water line” of Magalies Water.

The existing connection to the existing lodge will remain in place.

5.5.11 Sewerage

Considering the fact that the proposed development will not include residential units, there is no need to connect the municipal sewer reticulation system. Presently the municipal system is over extended and cannot accommodate further developments. In view hereof, the sewer reticulation will be handled by the patented and commercially available Lilliput sewer treatment system.

The sewer system will therefore consist of an installation to serve the offices in the control building. It is foreseen that the system will be installed in line with the requirements of the manufacturer. Typical systems consist of a conservancy tank (built underground on site) and a patented digester. Most systems require electricity to power the pumps and fans used in aeration process although some systems use wind power (whirlybird). The system could require chlorine tablets available commercially. The effluent from the Lilliput system will be suitable for irrigation or re-use in the dwellings as water for the flushing of toilets or for firefighting purposes. This could reduce the overall water requirement of the development substantially.

The volume to be treated by the system will be maximum 4000 litres/day. In this respect, a Water Use License Application was submitted on 5 April 2011 to the Department of Water Affairs by Vulpecula Energy.

5.5.12 Refuse removal

Vulpecula Energy will enter into an agreement with the Thabazimbi Municipality for the disposal of refuse at the nearby municipal refuse site.

5.5.13 Construction site

The construction site will be located in the southeast corner of the site as showed in the drawing included in Appendix C. The optimal location of the construction site is an important element of the planning phase also in order to minimize impacts on the surrounding environment.

The area individuated for the construction site of the Spitskop Solar Park must meet the following requirements:

- sufficient size;
- proximity to the existing roads;
- availability of water and energy;
- low environmental and landscape value;
- sufficient distance from residential areas;
- closeness to the worksite.

In addition, to ensure environmental compatibility the following factors have been considered:

- restrictions on land use (landscape, archaeological, natural, hydrological, etc.);

- terrain morphology;
- presence of high environmental value areas;
- soil aggregate supply and disposal possibilities.

The establishment of the construction site will be divided into four distinct phases. The steps individuated hereinafter do not follow a time sequence, but it should be considered as overlapping and simultaneous events.

Phase I

The area will be fenced to prevent intrusion of animals and to protect against materials theft within the site. A video surveillance system will be provided.

Phase II

During the fencing operation as described in Phase I, the most valuable trees, if any, will be removed and placed temporarily in a safe location for future planting at the end of work. This procedure is required for environmental mitigation. The other low value tree species will be cut and transferred to facilities for wood processing.

Phase III

At completion of the works defined in Phases I and II, the following step will be the site clearing and the construction of the internal roads. The internal road network should ensure a two-way traffic of heavy goods vehicles in order to minimize trips. The road system is planned for a width of 8 meters. Roads will be of dry and compacted materials. The facility will require constant access control, a weigh-house for heavy trucks, removable structures for the storage of yard tools and temporary storage areas. During Phase III, the installation of MV/LV transformers connected to the Eskom grid is also planned, as well as the laying of underground electrical cables.

Phase IV

Temporary storage areas of materials and workshops will be constructed and used for:

- temporary storage of photovoltaic modules (covered with compacted dry material to avoid direct contact with the ground);
- temporary storage for frames and piles of the mounting systems of the PV arrays;
- storage and processing of building material for construction (sand, gravel, concrete batching and mixing plant, steel, etc.);
- drinking water storage for human consumption;
- worker care facilities and site management buildings, prefabricated housing modules for workers who may require accommodation inside the site (it is foreseen that only key personnel should be allowed to stay overnight);
- technical cabins and management offices;
- medical care unit in a prefabricated module, to allow immediate first aid and minor surgical emergency;

- recreation area and canteen (prefabricated modules);
- parking lots for employees (located close to the staff housing), for visiting staff (located close to the offices area), and for trucks and work vehicles during inactivity;
- workshop and storage facilities on the site for contractors;
- electrical network for living units, offices and service structures;
- water supply for living units through polyethylene pipes connected to storage;
- Lilliput or similar sewer treatment system. The treated water will be used to moisten dusty areas and reduce dust gathering due to windy actions;
- solid waste collection area.

All facilities present in the construction site will be covered with dry material in order to avoid mud formation in case of rain.

Earthworks will be required during the construction of internal roads. The vertical alignment of the roads will not present any significant challenges due to the flatness of the terrain so that no deep cuts or fills will be required. Considering a road pavement thickness of 300 mm and an overall road surface of approx. 152,650 m^2, the amount of cut or fill is estimated to be approx. 45,800 m^3.

Further items of earthworks would be required where temporary storage areas will be prepared for the storage of the photovoltaic modules and other equipment during construction of the solar park. Small earthworks will be required for the installation of the PV modules and of the medium-voltage stations. None of these activities should require earthworks in excess of 500 mm cut or fill.

Only the foundation plate for the small high-voltage substation may require earthworks in excess of 500 mm cut or fill (the footprint will be up to 5000 m^2).

The topsoil stripping will result in temporary spoil heaps which must be spread over the site upon completion of the project. Concrete necessary for the basements of the medium-voltage stations, the medium-voltage receiving stations, the high-voltage substation, the control building and the warehouse will be manufactured using aggregate and sand from commercial sources or will be supplied by a Readymix Company. Gravel necessary for the construction of internal roads may be provided from one borrow pit on site. The material from this borrow pit will only be utilized for work on this particular site only. It appears from the Geotechnical investigation that suitable material will be available in the north-western corner of the site where shallow ferricrete is available. The required area will be of approx. 4 hectares. Alternatively, the gravel can be provided from the commercial sources in the vicinity of the development.

5.5.14 Management of the solar park during operations

A maximum of 25 people will be employed during the operation phase of the PV power plant, which will have a lifetime of 25 - 30 years. The Spitskop Solar Park will be in operation 7 days per week; therefore,

personnel will operate according to shifts. The surveillance team will be ensured during day-time, night-time and weekends.

The operational team will be composed by the following figures:

- 1 person as plant manager
- 1 person for administration
- 3 people as technicians / plant operators
- 6 people for electric and generic maintenance
- 14 people as guards

The "fire team" will be composed by the people for generic maintenance, who will attend a comprehensive firefighting training program. After this training programme, the fire team will be able to drive/use/manage properly the fire extinguishers and the fire fighting vehicle, that will be available on the site.

5.5.15 Decommissioning phase

Decommissioning activities of the PV plant mainly include removal of project infrastructure and restoring of the sites status quo ante. This phase will start at the end of the PV power plant lifetime (25 ÷ 30 years) and will last approximately 5 months, involving a team of 50 workers. Decommission will be subject to a decommissioning plan once the project is nearing its operational life (25-30 years). Decommissioning will also be subject to an environmental authorization.

Site Preparation

In order to ensure a correct decommissioning of the site, the first step of the process will include adequate site preparation. Integrity of access points and of laydown areas will be confirmed and eventually re-established in order to accommodate equipment and to load vehicles.

Disassemble and replacement of existing components

All components will be disassembled. Silicon of the PV modules will be recycled, as well as mounting structures (aluminium or zinced steel frames and piles) and cables (copper and/or aluminium conductor). Non-recyclable components of inverter, transformers and electrical devices will be disposed in appropriate way, in compliance with applicable laws and international standards.

Restoration of the site

Adequate measures will be undertaken in order to restore the site by re-planting of indigenous species.

Alternative option: upgrading the solar park

As an alternative option for decommissioning, at the end of the PV power plant lifetime (25 - 30 years), it will be evaluated the feasibility of upgrading the solar park with the most appropriate technology/infrastructure available at that time.

6. LEGAL FRAMEWORK

6.1 The Constitution and framework environmental legislation

6.1.1 Constitution of the Republic of South Africa Act (No 108 of 1996)

The Constitution of the Republic of South Africa Act places a duty on the State and citizens to protect the environment. Section 24 provides that:

"*Everyone has the right –*

(b) to have the environment protected, for the benefit of present and future generations through reasonable legislative and other measures that

i) prevent pollution and ecological degradation.

ii) promote conservation.

iii) secure ecologically sustainable development and use of natural resources while promoting

iv) justifiable economic and social development".

6.1.2 National Environmental Management Act (NEMA), Act 107 of 1998

The National Environmental Management Act (NEMA) (Act 107 of 1998) is an all-encompassing act regulating various aspects of natural resource use, integrated environmental management and pollution control. The Act provides for:

1. the right to an environment that is not harmful to the health and well-being of the South African people;
2. sustainable development, environmental protection, equitable distribution of natural resources; and;
3. the formulation of environmental management frameworks.

6.1.3 NEMA listing notices

Environmental regulations were promulgated in terms of NEMA in 2014 to guide environmental management. These regulations include:

- GNR. 326. The Minister of Environmental Affairs, hereby make the regulations pertaining to environmental impact assessments, under sections 24(5) and 44 of the National Environmental Management Act,1998 (Act No.107 of 1998).
- GNR. 327. The purpose of this Notice is to identify activities that would require environmental authorizations prior to commencement of that activity and to identify CAs in terms of section 24(2) and 24(D) of the Act.
- GNR. 325.The purpose of this notice is to identify activities that would require an environmental authorization prior to the commencement of that activity and to identify CAs in terms of sections 24(2) and 24(D) of this Act.
- GNR. 324. The purpose of this notice is to list activities and identify CAs under sections 24(2) and 24(D) of the Act, where environmental authorisation is required prior to commencement of that activity in specific identified geographical area only.

Listed activities from these Regulations which will be triggered by the proposed project are provided in the Table 6-1.

Table 6-1. List of R327, 325 and R324, as amended activities applicable to the proposed solar park development.

RELEVANT GOVERNMENT NOTICE	ACTIVITY	LISTED ACTIVITY	APPLICABILITY TO THE PROJECT
Listing Notice 1: No. R. 327 of 2017			
	1	*The development of facilities or infrastructure for the transmission and distribution of electricity—* *(i) within an urban area*	One on-site high-voltage substation with high- One on-site high-voltage substation with high-voltage power transformers, stepping up the voltage to 132kV, and one high-voltage busbar with metering and protection devices Up to two (2) 132 kV power lines, approximately 100m for the connection of the on-site substation to Eskom's "Thabazimbi Combined - Waterberg 1" 132 kV power line crossing the site. The BESS for each of the PV Power Plants, with a Maximum Export Capacity up to 100 MW and a 5-hour storage capacity up to 1250 MWh, with a footprint up to 10 ha, next to the on-site high-voltage substation, within the PV plant footprint / fenced areas.
	12	*The development of –* *(xii) infrastructure or structures with a physical footprint of 100m^2. or more* *(c) within 32m of a watercourse, measured from the edge of a watercourse*	The Phufane Spruit running through the property will be crossed at two points. It is provisionally proposed that the stream crossings will be achieved using suitable corrugated iron culverts on a 1:1 year flood return period, as shown in the attached Schematic view of the proposed river crossing and Culvert details. It is proposed that the internal roads be constructed to a width of 8.0m, and a road reserve width of 16m.
	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-* *(i) a watercourse*	The Phufane Spruit running through the property will be crossed at two points. It is provisionally proposed that the stream crossings will be achieved using suitable corrugated iron culverts on a 1:1 year flood return period, as shown in the attached Schematic view of the proposed river crossing and Culvert details. It is proposed that the internal roads be constructed to a width of 8.0m, and a road reserve width of 16m.
	24	*The development of a road—* *(ii) with a reserve wider than 13,5 meters, or where no reserve exists where the road is wider than 8 metres*	It is proposed that these roads be constructed to a width of 8.0m, which will allow slow moving heavy vehicles to pass each other. With reference to the main internal roads, a road reserve width of 16m will be adhered to. Total length of roads: 16,850 km
Listing Notice 2: No. R. 325 of 2017			
	1	*The development of facilities or infrastructure for the generation of electricity from a renewable*	The project will consist of construction, operation and maintenance of a Photovoltaic (PV) Power Plant with a generation capacity maximum up to 100 MW

RELEVANT GOVERNMENT NOTICE	ACTIVITY	LISTED ACTIVITY	APPLICABILITY TO THE PROJECT
		resource where the electricity output is 20 megawatts or more. *(a) within an urban area*	
	15	*The clearance of an area of 20 hectares or more of indigenous vegetation*	The proposed PV Power Plant is located within the quarter degree grid cell 2427CC and has geographic coordinates at 24°57' 31.27"S and 27°14' 13,49"E and an approximate extent of 170 Ha. The required footprint should be cleared from the existing trees and bushes.
Listing Notice 3: No. R. 324 of 2017			
	4	*The development of a road wider than 4 metres with a reserve less than 13,5 metres.* *e. Limpopo; iii). In urban areas:* *(bb) Areas designated for conservation use in Spatial Development Frameworks adopted by the competent authority or zoned for a conservation purpose*	In order to provide access to the various sections of the proposed development, the construction of numerous internal roads will be required. It is expected that these roads will exceed a width of 4 m It is proposed that the internal roads be constructed to a width of 8.0m, and a road reserve width of 16m.
	12	*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.* *e. Limpopo; ii). Within critical biodiversity areas identified in bioregional plans;*	The proposed development will see to the clearance of more than 300m^2 for the purpose of constructing the Solar Park and associated infrastructure. The proposed development footprint area is in Critical Biodiversity Area 2 (CBA2), although after the initial surveys it can be concluded that it should be classified as an ESA2.
	14	*The development of— (xii) infrastructure or structures with a physical footprint of 10 square metres or more; where such development occurs—(a) within a watercourse;* *a. Limpopo; iii) In urban areas; (bb). Within critical biodiversity areas identified in bioregional plans;*	The proposed developments will intercept wetlands that have been identified as per the National Freshwater Priority Areas (NFEPA) database. The interception of these watercourses will exceed an area of 10 m^2. The Phufane Spruit running through the property will be crossed at two points. It is provisionally proposed that the stream crossings will be achieved using suitable corrugated iron culverts on a 1:1 year flood return period, as shown in the attached Schematic view of the proposed river crossing and Culvert details. The proposed development footprint area is in Critical Biodiversity Area 2 (CBA2), although after the initial surveys it can be concluded that it should be classified as an ESA2.

6.2 Other applicable legislation

6.2.1 National Water Act, Act 36 of 1998

The National Water Act ([NWA] Act 36, 1998) identifies consumptive and non-consumptive water uses which must be authorised under a tiered authorisation system. Section 27 of the NWA specifies that the following factors regarding water use authorisation must be taken into consideration:

- The efficient and beneficial use of water in the public interest;
- The socio-economic impact of the decision whether or not to issue a licence;
- Alignment with the catchment management strategy;
- The impact of the water use, resource directed measures; and
- Investments made by the applicant in respect of the water use in question.

Section 21 of the NWA identifies water uses for which a Water use License should be obtained. The applicable Section 21 water uses include:

- Impeding or diverting the flow of water in a water course;
- Discharging waste or water containing waste into a water resource through a pipe, canal, sewer, sea outfall or other conduit;
- Disposing of waste in a manner which may detrimentally impact on a water resource;
- Altering the bed, banks, course or characteristics of a watercourse;

Authorisation of these water uses will form part of a separate process to the DWS.

6.2.2 National Heritage Resources Act, Act 25 of 1999

In terms of Section 38 of the Heritage Resources Act (Act No 25 of 1999), a Heritage Impact Assessment has to be undertaken for the following developments:

- 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 even or subdivisions thereof; or
  - Involving three or more even or divisions thereof which have been consolidated within the past five years; or
  - The costs of which will exceed a sum set in terms of regulations by the South African Heritage Resource Agency (SAHRA) or a provincial heritage resources authority;
- The re-zoning of a site exceeding 10 000 m^2 in extent; or
- Any other category of development provided for in regulations by SAHRA or a provincial heritage resources authority, must at the very earliest stages of initiating such a development, notify the responsible heritage resources authority and furnish it with details regarding the location, nature and extent of the proposed development.

6.2.3 National Environmental Management: Waste Act, Act 59 of 2008

The National Environmental Management: Waste Act, Act 59 of 2008 (NEMWA, Act 59 of 2008) was implemented on 1 July 2009 and section 20 of the Environment Conservation Act 73 of 1989, under which waste management was previously governed, was repealed.

The objectives of NEMWA, Act 59 of 2008 involve the protection of health, well-being and the environment by providing reasonable measures for the minimization of natural resource consumption, avoiding and minimizing the generation of waste, reducing, recycling and recovering waste, and treating and safely disposal of waste as a last resort.

In general, the act seeks to ensure that people are aware of the impact of waste on their health well-being and the environment, and in the process giving effect to section 24 of the constitution, in ensuring an environment that is not harmful to health and well-being.

Government Notice 718 lists the waste management activities that require licensing. A distinction is made between Category A waste management activities, which require a Basic Assessment (BA), and Category B activities, which require a full EIA (Scoping followed by Impact Assessment). EIA Regulation GNR 326 defines the process requirements that must be followed for Basic Assessment and full EIA.

The NEMWA has no sections of relevance to the proposed solar park development.

6.2.4 National Environmental Management: Air quality Act, Act 39 of 2004

The National Environmental Management Air Quality Act (NEMAQA) was a landmark act which focused on the ambient air quality and the receptor as opposed to the previous act which defined air quality by regulating the emissions which impact air quality. As a result of the NEMAQA, standards for ambient air quality have been developed which are managed through the local municipalities or provincial municipalities.

The NEMAQA enabled the publication of the Listed Activities and Minimum Emission Requirements, which require emitters to apply for and obtain an Atmospheric Emissions License (AEL) related to installations such as combustion installations in various industries.

The NEMAQA has no sections of relevance to the proposed solar park development.

6.2.5 National Environmental Management: Biodiversity Act (NEMBA) (Act 10 of 2004)

The NEMBA (Act 10 of 2004) (NEMBA) addresses, amongst others:

- Biodiversity planning and monitoring;
- Protection of threatened or protected ecosystems;
- Protection of threatened or protected species; and
- The control of alien species, invasive species and genetically modified organisms.

6.2.6 Conservation of Agricultural Resources Act, Act 43 of 1983

The Conservation of Agricultural Resources Act ([CARA] Act 43, 1983) provides for the:

- Protection of wetlands; and
- Requires the removal of listed alien invasive species.

The National Department of Agriculture, Fisheries and Forestry (DAFF) is the responsible authority for enforcing the CARA. This Act also requires that any declared invader species on the proposed site must be controlled according to their declared invader status.

The EMPr, which will be included within the EIAR, will include the compulsory removal of invader plants from the study area. Regulation 2 of CARA deals with the cultivation of virgin soils. It is required that an application be submitted to the extension office of Department of Agriculture, Forestry and Fisheries (DAFF) in terms of Section 4A of the Forest Act (Act No 68 of 1972) at least three months prior to initiating the cultivation of virgin soil.

6.2.7 National Forest Act, 1998 (Act 84 of 1998)

The National Forest Act, 1998 (Act 84 of 1998), aims to reform the laws on forest protection and relating matters. The Act provides principle guidelines for sustainable forestry management, special measures used to protect forests and trees within natural forests and protected areas. The Act also provides uses for forests. Failure to comply with the Act may result in prosecution under the National Forest Act, 1998 (Act 84 of 1998).

6.2.8 Limpopo Environmental Management Act (LEMA) (Act 7 of 2003)

The LEMA (No. 7 of 2003) deals with the conservation of wild animals, freshwater fish and the conservation and protection of flora in the Limpopo Province. Animals and plants are both listed in the schedules with different degrees of protection afforded to each.

6.3 Other applicable environmental guidelines

The following additional guidelines will be considered during the impact assessment phase.

- DEAT, 2002. Integrated Environmental Management, Information series 2: Scoping;
- DEAT, 2002. Integrated Environmental Management, Information series 3: Stakeholder Engagement;
- DEAT, 2002. Integrated Environmental Management, Information series 4: Specialist Studies;
- DEAT, 2002. Integrated Environmental Management, Information series 12: Environmental Management Plans;
- DWAF, 2008. Updated manual for the identification and delineation of wetlands and riparian areas. Department of Water affairs and Forestry. Pretoria. South Africa.

- DEAT, 2004. Integrated Environmental Management Information Series, Department of Environmental Affairs and Tourism (DEAT), Pretoria.
- Invasive alien species (NEMA GNR 599, 2014)
- DEAT, 2010. NEMA Draft Implementation guideline. Public participation.
- DEAT, 2010. NEMA Draft Implementation guideline. Companion Document on the Environmental Impact Assessments Regulations
- Subdivision Of Agricultural Land Act, 1970 (Act No. 70 OF 1970)
- Conservation of African-Eurasian Migratory Waterbirds, or African-Eurasian Waterbird Agreement
- 2022 Integrated Development Plan (IDP) for Thabazimbi Local Municipality
- Provincial Gazette Notice, 2019. Limpopo Province 2966: The Waterberg Bioregional Plan

7. DESCRIPTION OF RECEIVING ENVIRONMENT

The Proposed solar park development is located within the Savannah Biome within the Dwaalboom Thornveld vegetation type (Mucina & Rutherford, 2006). The following sections are a description of the characteristics of the study area that may be affected by the proposed solar park development.

7.1 Climate

Climate in the broad sense is a major determinant of the geographical distribution of species and vegetation types. However, on a smaller scale, the microclimate, which is greatly influenced by local topography, is also important. Within areas, the local conditions of temperature, light, humidity and moisture vary greatly, and it is these factors which play an important role in the production and survival of plants (Tainton, 1981). In terrestrial environments, limitations related to water availability are always important to plants and plant communities. The spatial and temporal distribution of rainfall is very complex and has great effects on the productivity, distribution and life forms of the major terrestrial biomes (Barbour et al. 1987). Furthermore, aspects like topography, slope and altitude may further result in differences in precipitation and water availability to plants within the study area.

The area in general is characterized by dry sunshine days and hot summer afternoons in the summer months (October to March) averaging 27ºC. The mean monthly maximum and minimum temperatures for the Thabazimbi area is 36.0°C and -3.7°C for February and June respectively.

The proposed development site falls within the Dwaalboom Thornveld vegetation type, where summer rainfall and dry winters occur. The region normally receives about 500-600 mm per year, with most rainfall occurring mainly during mid-summer.

7.2 Topography

The project area is characterised by slightly undulating plains, with the Phufane River bisecting the site from south to north. The topography across the site is slightly undulating with the average elevation of 1000 mamsl.

7.3 Geology

Geology is directly related to soil types and plant communities that may occur in a specific area (Van Rooyen & Theron, 1996). A Land type unit is a unique combination of soil pattern, terrain and macroclimate, the classification of which is used to determine the potential agricultural value of soils in an area. The land type unit represented within the study area include the Ea70 land type (Land Type Survey Staff, 1987) (ENPAT, 2001). The land type, geology and associated soil types is presented in Table 7-1 below as classified by the Environmental Potential Atlas, South Africa (ENPAT, 2000).

Table 7-1 Land types, geology and dominant soil types of the proposed development site

Land type Soils Geology	Land type Soils Geology	Land type Soils Geology
Ea70 One or more of: vertic, melanic, red	One or more of: vertic, melanic, red structured diagnostic horizons, undifferentiated	Predominantly norite and pyroxenite of the Bushveld Complex; red syenite of the Pilanesberg Complex in places

The Agricultural Research Institute uses specific soil characteristics to indicate the suitability of soils for arable agriculture. These characteristics for the site are as follows:

Structurally favourable soils: Soils with structure favouring arable land use if climate permits
Soil association: Red, massive or weakly structured soils with high base status (association of well drained Lixisols, Cambisols, Luvisols).
Soil pH: 6.5-7.4
Prime agricultural activity for the area: Cattle.

7.4 Soil

7.4.1 Soil types and potential

Based on Part 1 of the Regulation of Conservation of Agricultural Resources Act 43 of 1983, the proposed area, can be classified as having Moderate potential soils due to the soil texture and depth being suitable for arable agriculture, however the climatic conditions render the soils unsuitable for arable agriculture.

The site should subsequently be considered as moderate potential grazing land with Moderate potential for arable agriculture considering the climatic conditions, soil physical characteristics and size of land potentially available.

Considering that re-growth of grass will take place under the panels as the mounting systems are at least 1m above ground level, the grazing value of the land will still be available to small livestock such as game,

goats and sheep. At the end of the lifetime of the solar plant, structures will be removed, and natural vegetation will re-establish naturally. The grazing value of the land can therefore be increased by using planted pasture underneath the solar panel mounts. The nature of the vegetation at the farm is therefore marginal for extensive livestock production. Using planted pasture to supplement livestock production is however possible but this could be constrained by high demand for irrigation water due to the shallow and often sandy nature of the soil and relatively higher day temperatures in summer.

From the databases of Department of Agriculture, the site has the following land capability: Class IV: Marginal potential arable land.

The dominant soil types of the site are as follows:

- Soils associated with the low-lying valleys and plains vary from being red, apedal soils of the Hutton soil or Shortlands soil forms to dark, clayey soils of the Arcadia soil form.
- Soil forms of the drainage channels and floodplains are dark and clayey (Valsrivier, Rensburg or Cartref soil forms).

The soils were classified into broad classes according to the dominant soil form and family as follows:

- Deep, red apedal soils of the Hutton soil form.
    - **Moderate potential soils**: soils deep and often sandy loam structure that causes a medium water holding capacity, although the clay content of the soils is sufficient. Under the climatic conditions these soils would not sustain arable crop production. The most viable option for crop production on the soil form is under irrigation considering the variable rainfall and moisture availability due to higher day temperatures. Irrigation is not a common practice in the study area though and for any irrigation to be undertaken in the area, it will require the installation of several surface water impoundments as storage during the dry months. The limited water availability, high evaporation rates and high water demands by crops would therefore render crop cultivation not sustainable in the study area. The many old, cultivated fields in the larger area confirm that crop cultivation over the longer term is not a financially viable option under the prevailing climatic conditions.
    - **Land capability**: Livestock and / or game grazing are viable due to the slightly higher nutrient and organic content of the topsoil in woodland areas that support a mixture of palatable and unpalatable species.

- Vertic Black clayey soils of the Arcadia soil form.
    - **Medium potential arable soils**, due to the depth and clay content being suitable for crop cultivation. The limiting factor is not the soil characteristics, but rather the prevailing climatic conditions.
    - **Land capability**: The grazing potential of these areas is medium to high. The most suitable and optimal utilization of the area would be grazing by livestock or wildlife. The soils are however susceptible to erosion and over grazing is a distinct and widespread risk.

- Black or dark grey clayey soils associated with the drainage channels and floodplains of the Katspruit / Rensburg soil forms.
    - The grazing potential of these low-lying areas is high due to the palatable grasses growing throughout the year on these soils. The only limiting factor may be that livestock movement is limited during the wet season when the clay expands, causing livestock to get stuck in the muddy conditions. Soils are very sensitive and prone to erosion. A specific strategy is needed to prevent damage to these soils considering that overgrazing and trampling has already caused some degradation of the floodplains.

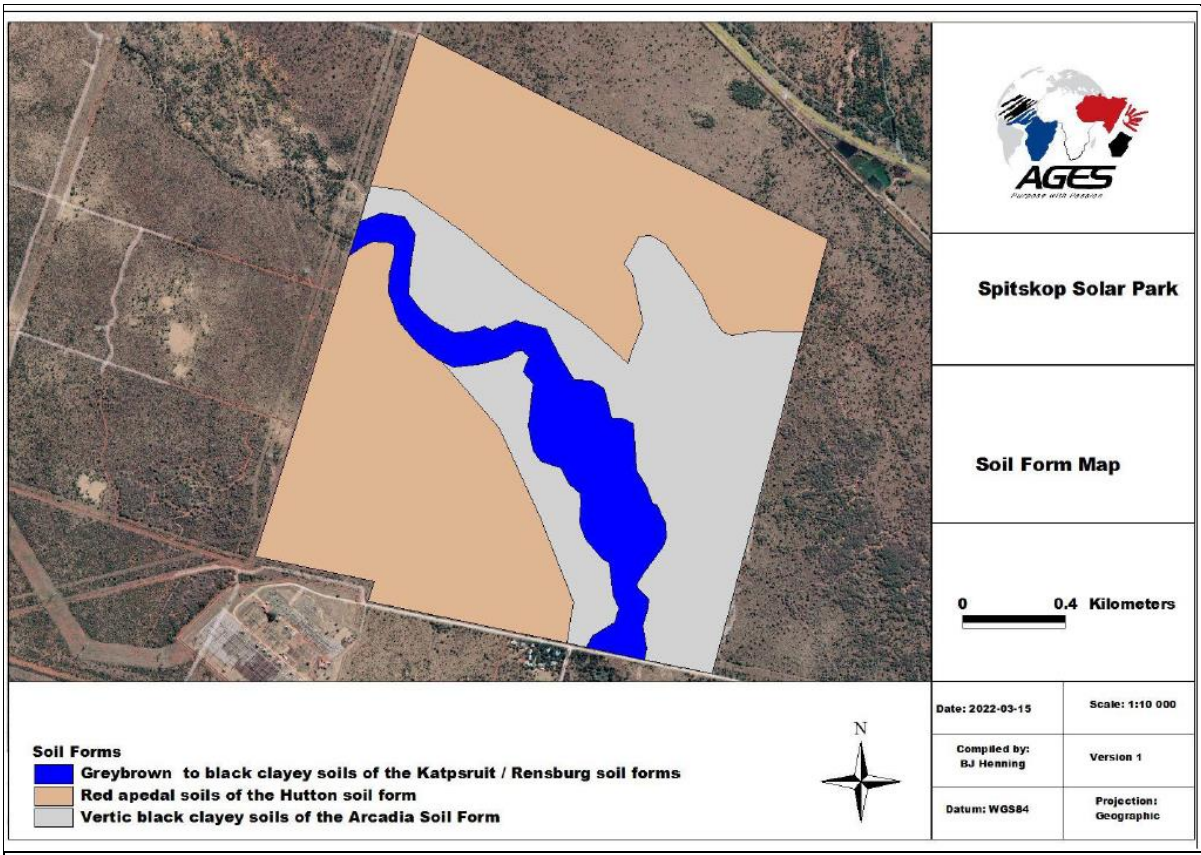

Figure 7-1. Soil form map (Source: AGES, Appendix F1)

7.4.2 Moisture availability

The moisture availability of soils is another aspect which recently has become an important factor to consider when cultivating crops under dry-land conditions.

Moisture and water availability will be affected by a temperature increase, regardless of any change in rainfall. Higher temperatures increase the evaporation rate, thus reducing the level of moisture available for plant growth, although other climatic elements are involved. A warming of 1°C, with no change in precipitation, may decrease yields of wheat and maize in the core cropping regions such as the US by

about 5%. A very large decrease in moisture availability in the drier regions of the world would be of great concern to the subsistence farmers that farm these lands. Reduced moisture availability would only exacerbate the existing problems of infertile soils, soil erosion and poor crop yields.

There are 6 classes of moisture availability in South Africa and the soils on the proposed development site are classified as class 4, which suggest that climatic conditions are marginal for rain-fed arable agriculture.

7.4.3 Grazing potential

The current vegetation at the proposed site of development consists mainly of areas of native woody perennial species and unpalatable grasses (low quality grazing grass species) on the shallow, to gravelly soils. Mixed quality grazing (highly palatable and unpalatable grasses) occurs throughout the site and these areas can support limited grazing by livestock and game species. The nature of the vegetation and size of the properties make the area marginal for extensive livestock production. Using planted pasture to supplement livestock production is also not an option considering the limited water availability for extensive irrigation.

The nature of the vegetation at the farm is therefore marginal for extensive livestock production. The low agricultural potential of the soils and the low to moderate grazing capacity is further confirmed by the Agricultural Maps below:

- **Agricultural Potential Map** - indicating that the project site is mostly classified as Moderate Potential Agricultural Potential.
- **Land Capability Map** - site is classified as Marginally arable – Moderate potential grazing land. Classes V and VI.

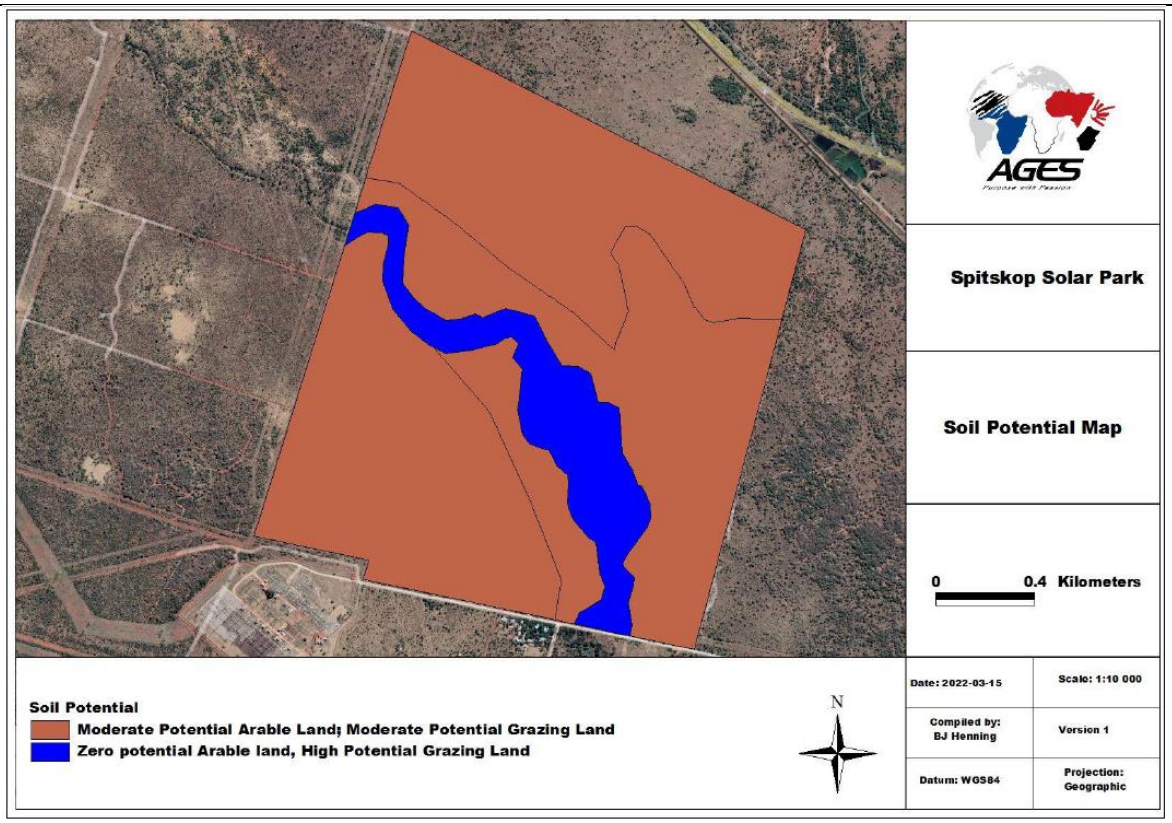

Figure 7-2. Agricultural Potential Map (Source: AGES 2022)

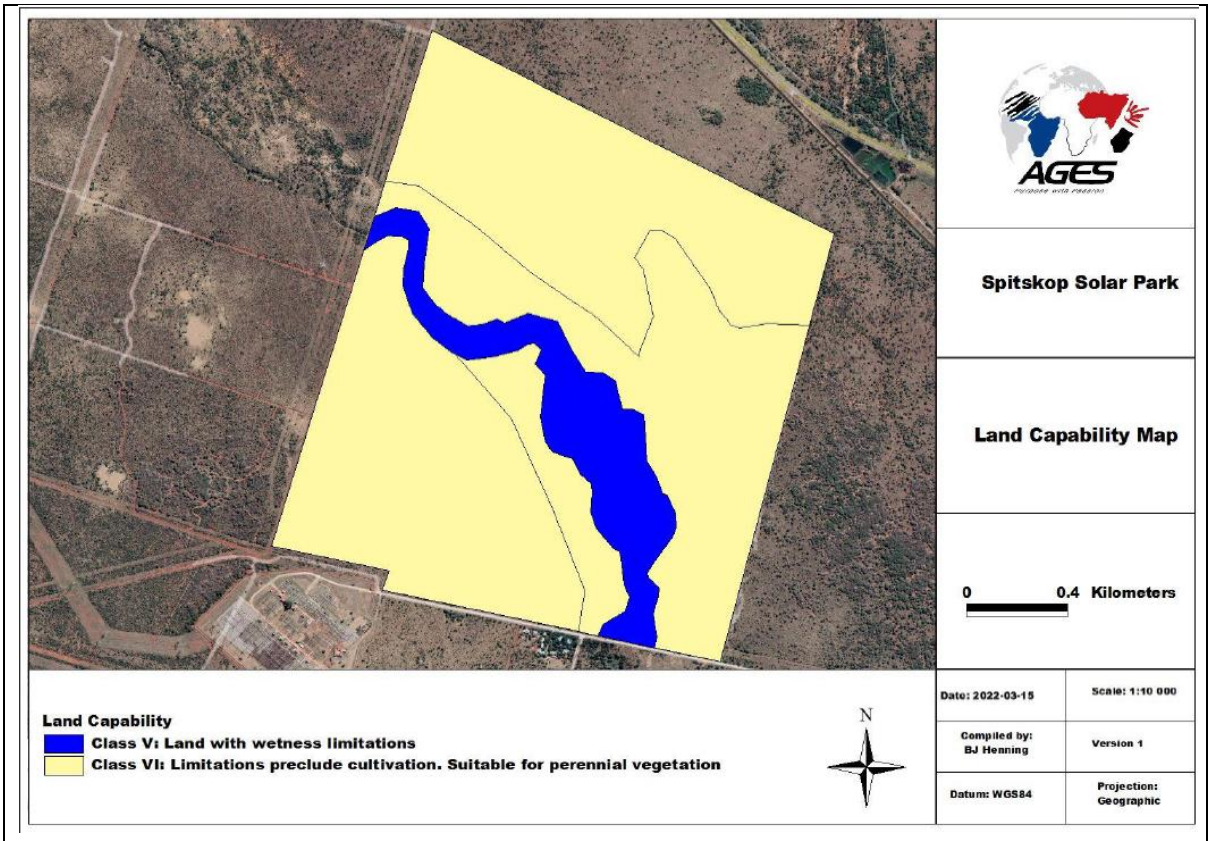

Figure 7-3. Land capability Map (Source: AGES 2022)

7.5 Terrestrial Biodiversity, Plant and Animal Species Impact Assessment

All aspects of the environment, especially living organisms, are vulnerable to disturbance of their habitat. If we can bring about a more integrated approach to living within our ecosystems, we are much more likely to save the fundamental structure of biodiversity. Positive contributions can be made even on a small scale such as within the proposed solar development. All stakeholders, such as business, government and environmental groups need to be involved to the impacts associated with the development from causing a significant loss.

7.5.1 Sensitivity Analysis and Conservation Analysis Tools

There are several assessments for South Africa as a whole, as well as on provincial levels that allow for detailed conservation planning as well as meeting biodiversity targets for the country's variety of ecosystems. These guides are essential to consult for development projects and will form an important part of the sensitivity analysis. Areas earmarked for conservation in the future, or that are essential to meet biodiversity and conservation targets should not be developed and have a high sensitivity as they are necessary for overall functioning. In addition, sensitivity analysis in the field based in much finer scale data can be used to ground truth the larger scale assessments and put it into a more localised context.

- Limpopo Biodiversity Conservation Plan

The purpose of the Limpopo Conservation Plan version 2 (LCPv2) is to develop the spatial component of a bioregional plan (i.e., map of Critical Biodiversity Areas (CBA) and associated land-use guidelines).

The proposed development footprint area is in Critical Biodiversity Area 2 (CBA2), although after the initial surveys it can be concluded that it should be classified as an ESA2. The management objective for this area is to maintain ecosystem functionality and connectivity allowing for limited loss of biodiversity pattern.

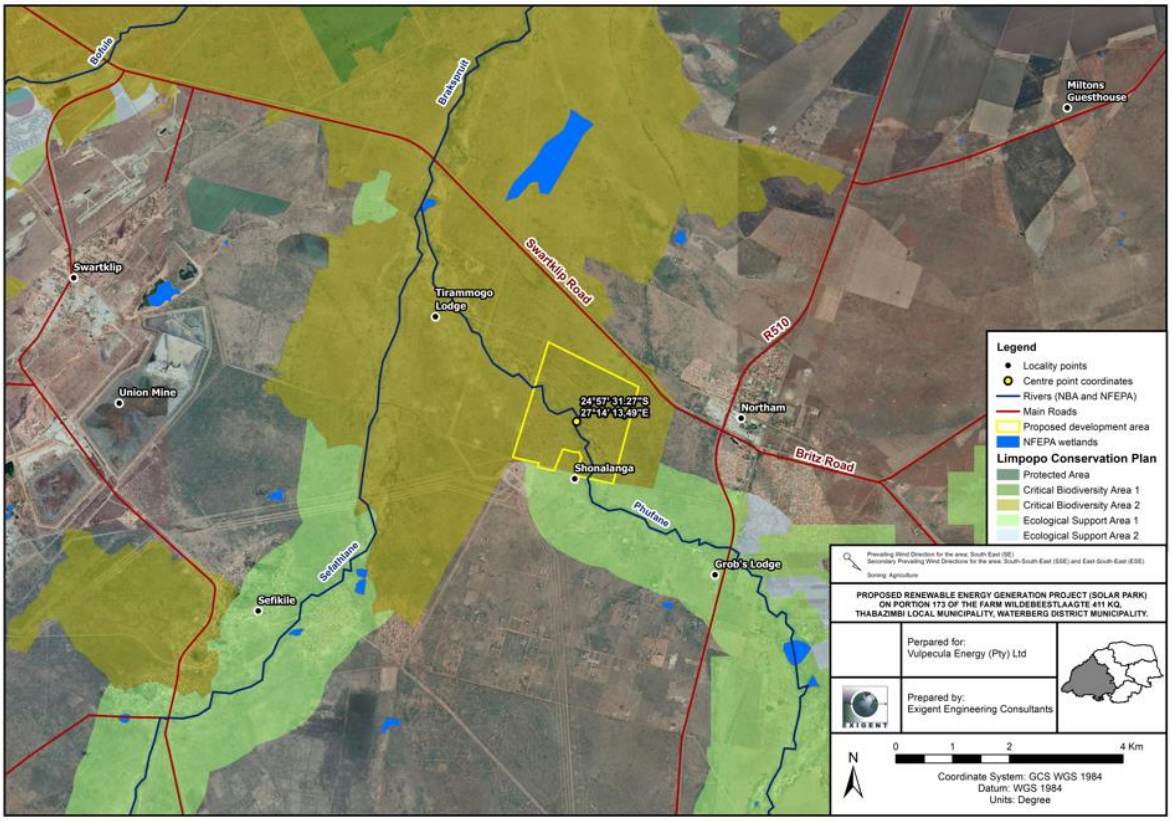

Figure 7-4. Critical Biodiversity Area and Ecological Support Area

- Protected Areas Network and National Protected Areas Expansion Strategy (NPAES)

Officially protected areas, either Provincially or Nationally that occur close to a project site could have consequences as far as impacts on these areas are concerned. For the proposed development and associated infrastructure no protected areas occur in proximity, with the closest being the Pilanesberg Provincial Nature Reserve to the southwest.

The NPAES are areas designated for future incorporation into existing protected areas (both National and informal protected areas). These areas are large, mostly intact areas required to meet biodiversity targets, and suitable for protection. They may not necessarily be proclaimed as protected areas in the future and are a broad scale planning tool allowing for better development and conservation planning. The Northwest / Gauteng Bushveld NPAES occur near the project area.

- Important Bird Areas

An Important Bird Area (IBA) is an area recognized as being globally important habitat for the conservation of bird populations. Currently there are about 10,000 IBAs worldwide. At present, South Africa has 124 IBA's, covering over 14 million hectares of habitat for our threatened, endemic and congregatory birds. Yet only million hectares of the total land surface covered by our IBA's legally protected. The BirdLife SA IBA programme continues a programme of stewardship which will ultimately achieve formal protection (Birdlife, 2013). The project area is not located within an IBA with the Northern Turf Thornveld located directly north of the project area.

- Nationally Threatened Ecosystems

The list of national Threatened Ecosystems has been gazetted (NEM:BA: National list of ecosystems that are threatened and in need of protection) and result in several implications in terms of development within these areas. Four basic principles were established for the identification of threatened ecosystems. These include:

- The approach must be explicit and repeatable.
- The approach must be target driven and systematic, especially for threatened ecosystems.
- The approach must follow the same logic as the IUCN approach to listing threatened species, whereby a few criteria are developed, and an ecosystem is listed based on its highest-ranking criterion: and
- The identification of ecosystems to be listed must be based on scientifically credible, practical, and simple criteria, which must translate into spatially explicit identification of ecosystems.

Areas were delineated based on as fine a scale as possible and are defined by one of several assessments: These areas are essential for conservation of the country's ecosystems as well as meeting conservation targets. The project area is not located within a Listed Threatened Ecosystem or located near any other listed threatened ecosystems.

- Strategic Water Source Areas (SWSA), National Freshwater Ecosystem Priority Aeas (NFEPA) Status of Rivers And Wetlands On Site

NFEPA maps provide strategic spatial priorities for conserving South Africa's freshwater ecosystems and supporting sustainable use of water resources. These strategic spatial priorities are known as Freshwater Ecosystem Priority Areas, or 'FEPAs'. NFEPA maps were developed using the principles of systematic biodiversity planning, also known as systematic conservation planning (Margules and Pressey 2000). Systematic biodiversity planning is a well-established field of science in which South Africa is considered a world leader (Balmford 2003). The NFEPA maps and supporting information form part of a comprehensive approach to sustainable and equitable development of South Africa's scarce water resources. For integrated water resources planning, NFEPA provides guidance on how many rivers, wetlands and estuaries, and which ones, should remain in a natural or near-natural condition to support the water resource protection goals of the National Water Act (Act 36 of 1998). NFEPA products are therefore directly applicable to the National Water Act, feeding into Catchment Management Strategies, water resource classification, reserve determination, and the setting and monitoring of resource quality objectives. NFEPA products are also directly relevant to the National Environmental Management: Biodiversity Act (Act 10 of 2004), informing both the listing of threatened freshwater ecosystems and the

process of bioregional planning provided for by this Act. NFEPA products support the implementation of the National Environmental Management: Protected Areas Act (Act 57 of 2003) by informing the expansion of the protected area network.

The project area is bisected by the Phufane River being a NFEPA river. No natural NFEPA wetlands occur near the proposed development site.

Strategic Water Source Areas (SWSAs) are now defined as areas of land that either:

- Supply a disproportionate (i.e., relatively large) quantity of mean annual surface water runoff in relation to their size and so are considered nationally important; or
- Have high groundwater recharge and where the groundwater forms a nationally important resource; or
- Areas that meet both criteria (a) and (b).

They include transboundary Water Source Areas that extend into Lesotho and Swaziland. All surface water SWSAs are in high rainfall areas where baseflow is at least 11 25 mm/a, which is evidence of a strong link between groundwater and surface water in the SWSAs. The aquifers sustain baseflow, contribute to runoff and, especially, contribute to dry season flows. Sustained river flows are important as they support people and communities who depend directly on rivers for their water, especially during the dry season and droughts.

The 2018 national and transboundary surface-water SWSAs cover about 124 075 km^2 (10% of the region) and provide a MAR of 24 954 million m^3 (50% of the total). The greatest volume of MAR is generated by the Southern Drakensberg (9% of national and transboundary MAR), followed by the Eastern Cape, Northern Drakensberg and Maloti Drakensberg, and the Boland. The Boland has the highest MAR per unit area (3588 m^3/ha/year), followed by Table Mountain, the Northern Drakensberg and the Mpumalanga Drakensberg.

Seven of these SWSAs are transboundary areas because Lesotho and Swaziland include portions of important SWSAs for South Africa. The portions of the SWSAs that fall within Lesotho (Eastern Cape, and the Southern, Northern and Maloti Drakensberg) cover 18 570 km2 and generate a MAR of about 3522 million m3. This MAR sustains the Orange and Caledon Rivers and supplies water to Gauteng via the Lesotho Highlands water supply system. In the case of Swaziland, the portions of the SWSAs falling in this country (Ekangala Drakensberg, Mbabane Hills, Upper Usutu) total 9376 km2 and produce a MAR of about 2053 million m3. In total, the SWSAs in these two countries produce about 11% of the total MAR, which is a substantial contribution that needs to be protected.

The project area is not located within any SWSA as indicated in Figure 7.4.

7.5.2 Vegetation classification

The development site lies within the Savannah biome, which is the largest biome in Southern Africa. It is characterized by a grassy ground layer and a distinct upper layer of woody plants (trees and shrubs).

The environmental factors delimiting the biome are complex and include altitude, rainfall, geology and soil types, with rainfall being the major delimiting factor. Fire and grazing also keeps the grassy layer dominant. The most recent classification of the area by Mucina & Rutherford (2006) is the microphyllous woodland to be part of the Dwaalboom Thornveld vegetation type.

The Dwaalboom Thornveld vegetation type has a least threatened conservation status, with 14% transformed and 6% statutorily conserved. This vegetation type in its pristine state is characterized by plains with layer of scattered, low to medium high deciduous microphyllous trees and shrubs with a few broadleaved tree species, and an almost continuous herbaceous layer dominated by grass species.

The study site overlaps with the Least threatened ecosystem as Section 52 of NEMBA (Act No. 10 of 2004).

7.5.3 Vegetation communities

The proposed development site occurs on a landscape that varies from slightly undulating to flat plains bisected by a drainage channel. The importance to survey the area to have a better understanding of the ecosystem and the potential impact of the solar development on the natural environment was identified as a key factor, and subsequently the footprint areas was completely surveyed. The site forms part of a larger farm used for livestock farming. The vegetation units on the site vary according to soil characteristics, topography, and land-use. Vegetation units were identified on the footprint development sites and can be divided into 4 distinct vegetation units according to soil types and topography.

The vegetation communities identified on the proposed development site are classified as physiographic physiognomic units, where physiognomic refers to the outer appearance of the vegetation, and physiographic refers to the position of the plant communities in the landscape. The physiographic-physiognomic units will be referred to as vegetation units in the following sections. These vegetation units are divided in terms of the land-use, plant species composition, topographical and soil differences that had the most definitive influence on the vegetation units.

The following vegetation units were identified during the survey.

- Mixed *Vachellia tortilis – Grewia – Ziziphus microphyllous* woodland
- *Vachellia tortilis – Grewia flava* shrubveld
- Degraded grassland / woodland associated with old fields
- River channel with riparian woodland & floodplains

- **Mixed *Vachellia tortilis – Grewia flava– Ziziphus microphyllous* woodland**
  This vegetation unit occurs on slightly undulating to flat low plains and is characterized by *Ziziphus microphyllous* woodland varying in density. The characteristics of the vegetation unit are discussed below in table 2. The state of the herbaceous layer is in a climax state and the shrub layer is well developed. Typical woody species occurring in this vegetation unit include *Vachellia tortilis*, *Ziziphus mucronata* and *Grewia flava*. No red data species occurs; probably

because of the habitat being different compared to the potential red data species that could occur.

- ***Vachellia tortilis – Grewia flava* shrubveld**
  This vegetation unit is characterized by a clear difference in the height of the woody stratum compared to other woodland types in the study area. The woody layer is mostly dominated by a low shrub stratum with only scattered trees occurring in the clayey soils, causing the woody layer to be stunted. The shrub *Grewia flava* dominate the shrub layer, while medium tall tree species such as *Ziziphus mucronata* and *Vachellia tortilis* occur at medium densities within the unit.

- **Degraded grassland / woodland associated with old fields**
  The old fields occur on a large section of the northern and central section of the property. When cultivated fields are left fallow, it results in a landscape mosaic of patches of secondary vegetation varying in age and dominated by various grass species (Moll, 1965). Different stages of succession occur in the old fields, and Wildi (2002) described how dynamic these systems are over time and space. The most common old fields in the Savanna Biome and surroundings are the young old fields of 1-5 years old (Smits et al. 1999) dominated by the pioneer grass species of disturbed areas, *Cynodon dactylon* (Van Oudtshoorn, 1999). Secondary grassland communities may develop from this old field variation as shown by Smits et al. (1999) in the old fields of the Transkei, dominated by the

  secondary grassland species directly related to man-made disturbances, *Hyparrhenia hirta*. These fields are still in an early successional state, although somewhat older (older than 5 years) with several grass species like *Hyperthelia dissoluta, Aristida junciformis, Aristida congesta s. congesta* and *Eragrostis rigidior*. The landscape and vegetation features of the primary old fields on the proposed energy development site include slightly undulating plains with a low tree cover (< 1%) and dense (60%) grass layer. The dominant species include *Cynodon dactylon* and Aristida spp. indicating previous agricultural/utilizing activities within these areas, while typical herbs/weeds include *Tagetes minuta* and *Bidens bipinnata*. The shrub layer (1 - 1,5m.) on the primary old fields covers 2-10%, while the forb layer covers 30% of the area. The soil in the area is red Hutton soils or black clayey soils.

  The outer successional stage of old fields only starts after several years of abandonment when woody species start to invade. These secondary old fields are usually dominated by species such as *Dichrostachys cinerea, Vachellia tortilis* and *Ziziphus mucronata*. Where overgrazing occurs the encroacher *Dichrostachys cinerea* becomes dominant as is evident on certain areas of the site. The landscape and vegetation features of this unit include slightly undulating plains with Hutton or Arcadia soils. The tree layer (> 3m.) covers 5 -10%, while the shrub layer covers 10-15% (different variants) of the area. The grass layer is well developed with a 60 -70% cover, while the forb layer (0.2m.) covers 1 – 2 % of the area. The dominant tree species in the area include *Vachellia tortilis* and *Dichrostachys cinerea*. This vegetation unit is defined as a

secondary old field variant/modified land which is evident from the higher tree cover/diversity as well as the higher shrub cover/diversity.

No red data species were found on the old fields because of the degraded state of the vegetation.

- **Drainage features**
  All rivers, wetlands, and streams with their associated riparian vegetation in the project area are ecologically sensitive, forming important, limited and specialised habitats for several plant and fauna species. The species composition is unique and relatively limited in distribution and coverage. These habitats also form linear corridors linking different open spaces.

  These features will be discussed in detail in the Wetland Impact Assessment (Section 7.6.4).

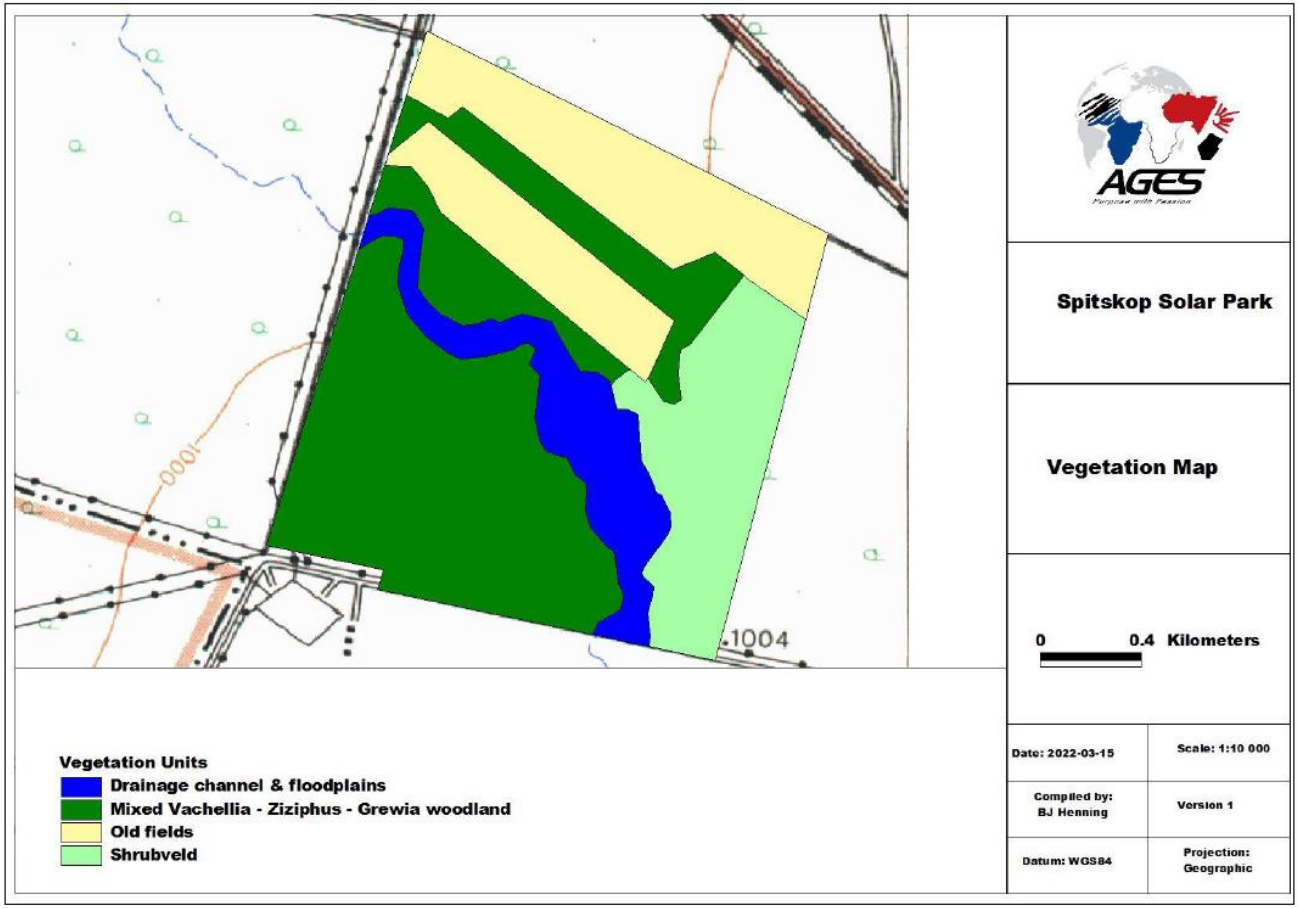

Figure 7-5. Vegetation Unit Map of the proposed development area (Source: AGES 2022)

7.5.4 Flora Species of special concern

There is a high likelihood that many of the species listed as species of conservation concern will occur within the Spitskop Solar Park area, however they are listed as Least Concerned, or Data Deficient.

According to the SANBI POSA database for the area, the following red listed species occur in the project area. After the surveys it was concluded that none of the listed species or potential habitat occur in the project area.

Table 7-2.Red listed species potentially occurring in the project area

Family	Species	IUCN
Myrothamnaceae	*Myrothamnus flabellifolius*	Data deficient
Apocynaceae	*Stenostelma umbelluliferum*	Near Threatened

7.5.5 Protected Plants (LEMA)

Plant species are also protected in the Limpopo Province according to the Limpopo Environmental Management Act. According to this ordinance, no person may pick, import, export, transport, possess, cultivate or trade in a specimen of a specially protected or protected plant species. The Appendices to the ordinance provide an extensive list of species that are protected, comprising a significant component of the flora expected to occur on site. Communication with Provincial authorities indicates that a permit is required for all these species if they are expected to be affected by the proposed project.

After a detailed survey, none of the listed protected species were documented on site.

7.5.6 Protected tree species

The National Forest Act, 1998 (Act No. 84 of 1998) provides a list of tree species that are considered important in a South African perspective because of scarcity, high utilization, common value, etc. In terms of the National Forest Act of 1998, these tree species may not be cut, disturbed, damaged, destroyed and their products may not be possessed, collected, removed, transported, exported, donated, purchased or sold – except under license granted by DFFE (or a delegated authority). Obtaining relevant permits are therefore required prior to any impact on these individuals. Taking cognizance of the data obtained from the field surveys, the following protected tree species occur within the study area (Table 7-3).

Table 7-3. Protected tree species of the study area

Species	National Conservation status	Status on study site	Habitat of species
Combretum imberbe	Protected (NFA)	Localized	Riparian woodland
Vachellia erioloba	Protected (NFA)	Widespread	Natural woodland
Boscia albitrunca	Protected (NFA)	Widespread	Natural woodland

The Spitskop Solar Park area therefore does not contain any plant species which is significantly endangered or rare. The *Mehelya capensis* the Cape File Snake has a moderate to high occurrence however is classified as protected (AGES, 2022: Ecological Report). The Final Ecological Report (2022) has identified three (3) tree species that are protected within the study area *Combretum imberbe, Acacia erioloba and Boscia albitrunca* by the National Forest Act (No 84 of 1998).

The screening tool has identified areas which are essential to meeting conservation targets for specific vegetation types, i.e. Critical Biodiversity Areas (CBA), and other elements of high conservation importance. The screening tool has identified the site as a CBA 2, an Ecological Support Area and is in close proximity to the Arzona Private Nature Reserve within close proximity to the solar park site.

7.5.7 Faunal assessment

Three major fauna habitats were observed in the area namely:

- Mixed *Vachellia tortilis – Grewia – Ziziphus microphyllous* woodland
- *Vachellia tortilis* – Grewia flava shrubveld
- Degraded grassland / woodland associated with old fields
- River channel with riparian woodland & floodplains

The surrounding habitat will still be utilized by mammals such as antelopes, small predators, small mammals and rodents. Therefore, the expected mammalian richness is considered High.

Antelope species such as kudu, duiker and steenbok still roam this area (dung, spoor identified). Smaller mammal species such as honey badgers and serval can become habituated to anthropogenic influences, while other species will rather move away from the township areas and will seldom use the area. Predators that still roam freely in the area include smaller predators such as black backed jackal, while predators such as brown hyena, caracal, serval and honey badger are rare in the area. The dominant species composition therefore comprises of widespread taxa with unspecialised life history traits.

Reptile species such as the southern rock python, puff adder, boomslang, vine snake, spotted bush snake and several members of the green snakes (*Philothamnus* spp.) are expected to occur in the habitats of the project area, although the presence of these snakes is dependent on the presence of their prey species (rodents, frogs etc.). The general habitat type for reptiles consists of open to very dense bushveld, with limited available habitat for diurnally active and sit-and-wait predators, such as terrestrial skinks and other reptiles. Arboreal species are the more prominent components of the local herpetofauna.

Insects and spiders are very good indicators of the plant diversity and ecological sensitivity of an area. Butterflies can be used in the field as indicators of biodiversity. An insect and spider desktop survey were done in addition to the field observations.

All the potential invertebrate habitats are well represented by a high family richness of insects and spiders. Spiders occur throughout all the habitats, and both web builders and active hunters find their ways in trapping and actively hunt around for potential food.

Table 7-4. Red data list of potential fauna for the study area

English Name	Conservation status	Probable habitat in area
BIRDS (SABAP 2 LIST SPECIES)		
Tawny Eagle	Endangered	Medium
Abdim's Stork	Near Threatened	Medium
European Roller	Near Threatened	Medium
Lanner Falcon	Vulnerable	Low
Cape Vulture	Endangered	Low – dependant on carcasses
Marabou Stork	Near Threatened	Medium
Yellow-billed Stork	Endangered	Medium
Martial Eagle	Endangered	Medium
MAMMALS		
Brown Hyena	Near Threatened (2015)	Low
Leopard	Vulnerable (2016)	Low
HERPETOFAUNA		
Southern African Python	Vulnerable	Low

7.6 Avifauna Impact Assessment

The Savanna biome in Southern Africa supports the highest diversity of bird species of all the biomes in the sub region. This includes such characteristic and colourful woodland birds as rollers, bee eaters and waxbills, as well as large birds of prey such as vultures and eagles. The Golden breasted Bunting is apparently unique in being found throughout the entire woodland biome.

In the project area, where some of the natural vegetation is still intact, a description of the micro-habitats available to birds is useful to describe potential areas where birds can occur. These micro-habitats do not always correspond to vegetation types and are determined by a combination of vegetation type, topography, land use, food sources and other factors. Species that are likely to make use of the various micro-habitats are included in Appendix A of the Avian specialist study (Appendix F2). The position of some of these micro-habitats in the study area can be seen in the broad habitat map of the area (Figure 7-6). Investigation of this study area revealed the following bird micro-habitats:

4.2.1 Microphyllous woodland

Microphyllous woodland usually support a much higher bird numbers compared to other woodland types. All areas on the site represent microphyllous woodland, except the old fields. The microphyllous woodlands support many smaller bird species such as Ashy Tit, Pied Babbler, Kalahari Robin, Burntnecked Eremomela, Desert Barred Warbler, Marico Flycatcher, Pririt Batis, Crimsonbreasted Shrike, Longtailed Shrike, Threestreaked Tchagra, Great Sparrow, Whitebrowed Sparrowweaver, Scalyfeathered Finch, Violeteared Waxbill and Blackcheeked Waxbill.

7.6.1 Broadleaf woodland habitat

The broadleaved woodland occurring in the eastern sections of the proposed development area has quite a higher diversity of birds because of the crossover of habitats, although this habitat will only be minimally impacted on by the proposed developments. Birds that occur in this habitat type include White-bellied Korhaan and Meyer's Parrot.

7.6.2 Riparian / wetland habitat

The drainage channel on site is non-perennial although it holds water for extended periods of time. Rivers represent important habitat for many species, including Black Stork, Yellow-billed Stork, Saddle-billed Stork, Ducks, Geese and a variety of other water birds. The wooded riparian habitat alongside a river may provide habitat for various species such as the Hamerkop, African Darter, various cormorants, kingfishers, bee-eaters, robinchats and numerous smaller species.

In this area, the seasonal water in the drainage channels are extremely important sources of water for most bird species and will be regularly utilised not only as a source of drinking water and food, but also for bathing. The drainage channels in this study area could be used as flight paths for certain species.
Likely impacts within the riparian environment are regarded as less significant since physical damage does not constitute a significant part of the likely impacts. Bird species associated with riparian environments are generally tolerable to impacts associated with this development.

7.6.3 Farmland / cultivated land

The agricultural habitats of Southern Africa range from pastures for grazing of livestock, through ploughed lands for the growing of crops such as maize, wheat and sugarcane, to the planting of commercial timber. These agricultural habitats sometimes cover extensive areas and have become an artificial habitat that attracts a wide range of generalist species. Herons, storks, ibises, francolins, cranes, korhaans, plovers, pigeons and doves, larks, chats, pipits and starlings are attracted to the more open cultivated areas, while smaller species such as cuckoos, robins, sparrows, widows, finches, canaries and buntings are attracted to secondary growth around cultivation. Young crops attract gamebirds, especially guineafowl and quail, and grazing waterfowl like Spurwinged Goose and Egyptian Goose. Ploughed fields with recently sown grain crops also attract storks and cranes, which feed on the grain and thereby come into conflict with farmers. On the other hand, timber plantations support an impoverished avifauna, limited mainly to buzzards, doves, cuckoos, bulbuls and smaller seed eaters. However, crop farming in Southern Africa has had a profound influence in radically transforming vast areas of land originally under natural vegetation. The changes to the bird communities in these areas have also been profound, with some species benefitting and advancing, and others decreasing and retreating, in the face of these transformations.

In the larger project area, isolated pockets of arable lands exist. Although these areas attract some birds, the impact of the anthropogenic influences on the birds will cause most birds to rather move away from the area, although some birds associated with built-up land can be found here.

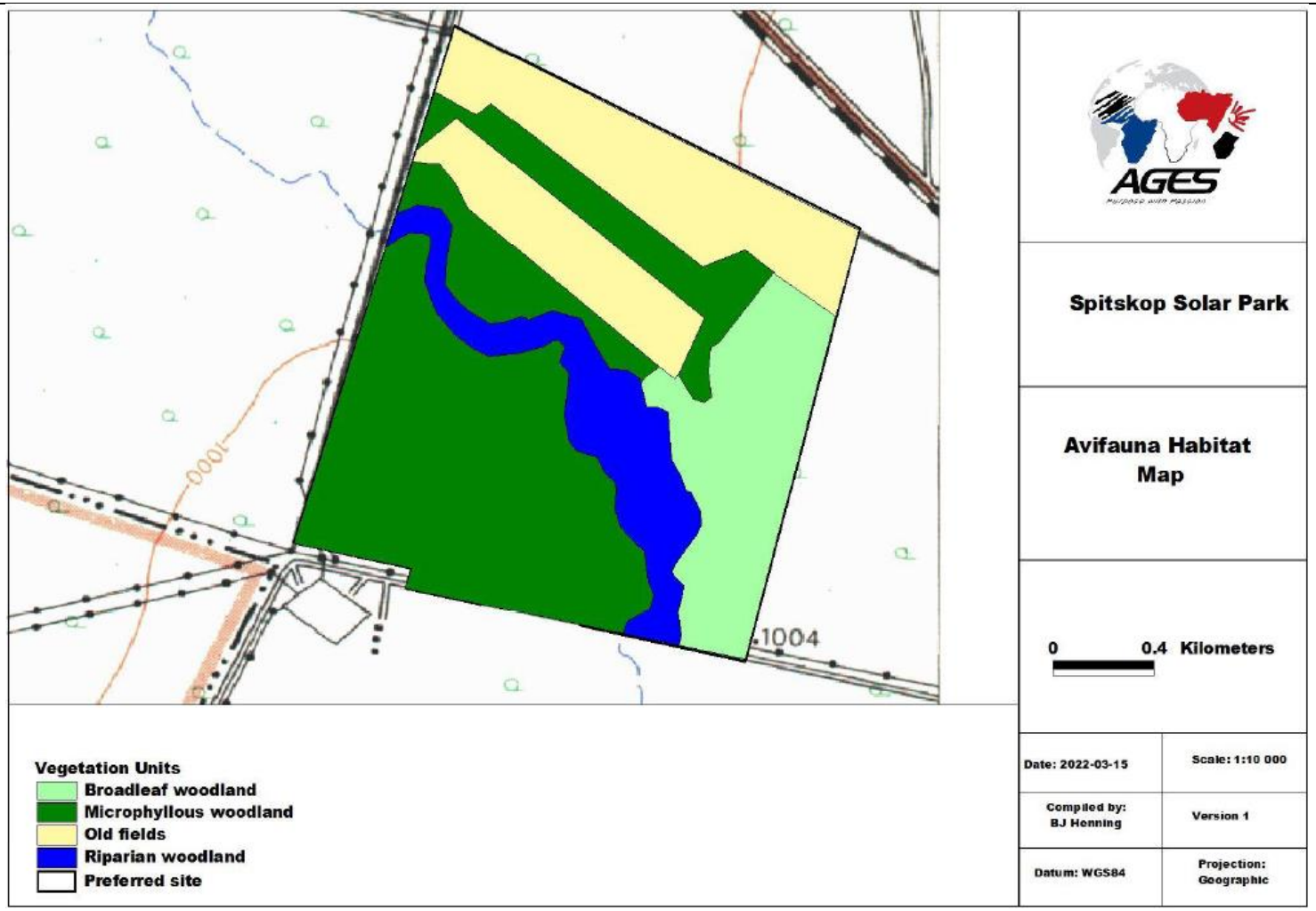

Figure 7-6. Avifauna habitat map of the proposed development area (Source: AGES 2022)

7.6.4 Species of special concern

The avifauna is currently typical of the agricultural landscape in this region, and two Species of Conservation Concern (SCC) have previously been recorded foraging in the vicinity of the study area (Table 2 of the Avian Impact Assessment Appendix F2 of the DEAIR). The avian SCC recorded (pers. obs.) foraging in the area is Short clawed lark and Red-billed oxpecker. Both species typical of the larger study area. Species such as cape vulture and white backed vulture will occur periodically in the project area when carcasses are present due to livestock mortalities.

A detailed species list according to the SABAP2 database of Birdlife SA for the avifauna is included in Appendix A for the study area, while the threatened species list for South Africa is presented in Appendix C of the Avian Specialist Study, Appendix F2 of the FEAIR. According to the existing databases and field survey the following number of birds species included in the Birdlife SA red data lists (Taylor et al. 2015) can potentially be found in the proposed development sites for the proposed solar plant site (Table 7-5).

Table 7-5. Red data list of potential avifauna for the study area (QDS 2330AD and 2330CB) (SABAP2 DATABASE)

Alphabetical Name	Regional Status	Probability of occurrence on site
Tawny Eagle	Endangered	Medium
Abdim's Stork	Near Threatened	Medium
European Roller	Near Threatened	Medium
Lanner Falcon	Vulnerable	Low
Cape Vulture	Endangered	Low – dependant on carcasses
Marabou Stork	Near Threatened	Medium
Yellow-billed Stork	Endangered	Medium
Martial Eagle	Endangered	Medium

Proximity to Important Bird Areas

The project area is located close to the Northern Turf Thornveld IBA that occurs to the north of the project area. The proposed development will not impact severely on bird habitats though in fact the site is in an overgrazed and encroached state.

The Northern Turf Thornveld IBA consists of a group of privately owned farms that forms a triangle delineated roughly by the Crocodile River in the east and the Bierspruit River in the west; the confluence of these two rivers is approximately 3 km south-west of Thabazimbi. The road running along the railway line from Bierspruit siding to Northam and on to Koedoeskop forms the southern boundary of the IBA. Characterised by flat plains on black vertic clays derived from basalt, the area is widely used for wheat, maize, sunflower and livestock farming.

This area holds the core of the remaining resident South African population of Yellow-throated Sandgrouse *Pterocles gutturalis*. The sandgrouse inhabit short, open grasslands, fallow fields and recently burnt veld, especially on black clay soils near water. Other important birds in the IBA include

Secretarybird *Sagittarius serpentarius*, Kori Bustard *Ardeotis kori*, Lanner Falcon *Falco biarmicus* and Black-winged Pratincole *Glareola nordmanni*.

The only globally threatened species is Black-winged Pratincole; regionally threatened species are Yellow-throated Sandgrouse and Lanner Falcon. Common biome-restricted species include Kurrichane Thrush *Turdus libonyanus*, White-throated Robin-Chat *Cossypha humeralis*, Burchell's Starling *Lamprotornis australis*, White-bellied Sunbird *Cinnyris talatala* and the common Kalahari Scrub Robin *Erythropygia paena*.

7.7 Wetland and Riparian Impact Assessment

No wetland type was identified on the site for the proposed solar development, while the water courses in the area are classified as rivers with riparian woodland.

The riparian map and regulated areas for the river is presented in Figure 7-7. All rivers, wetlands, and streams with their associated riparian vegetation in the project area are ecologically sensitive, forming important, limited and specialised habitats for several plant and fauna species. The species composition is unique and relatively limited in distribution and coverage. These habitats also form linear corridors linking different open spaces.

7.7.1 Floodplain River with riparian woodland

The major drainage channel of the project area represents Phufane River. The riverine woodland and floodplains would be important dry season refuge areas for many fauna species in their natural state. It is also a centre of floral diversity. Riparian areas have been identified as important dry season refuge areas for a variety of large mammal species. The impacts on the sensitive riparian ecosystems, regardless of the source, need to be restricted. Impacts on this system include erosion, habitat loss and degradation and the associated impacts on faunal and floral diversity, dewatering of marshes and wetlands, water abstraction as well as increased sedimentation (SANParks 2003). Continued impacts on the riverine ecosystems may also ultimately reduce the capacity of this system to absorb dramatic flooding events. The band of trees that occurs along the channel can be classified as riparian vegetation. This vegetation is very important for connectivity with adjacent vegetation as well as a migratory route for riparian animals. The most abundant and most conspicuous trees in the tall riparian woodland are *Vachellia karroo, Combretum erythrophyllum, Celtis africana, Ziziphus mucronata, Grewia flava* and *Gymnosporia senegalensis* that occur on the riverbanks or on the floodplains adjacent to the channel. Typical grasses include *Panicum maximum, Eragrostis rotifer* and *Setaria sphacelata.*

The major drainage channel in the western section of the project area is classified as a Floodplain River. The floodplain is not classified as a floodplain wetland, but a river with some wetland characteristics in the channel and its banks.

Most of the drainage channels on site are non-perennial. Channels are subdivided further within this level of the hierarchy into six geomorphological zones, as defined by Rowntree and Wadeson (2000). These

zones are based largely on gradient which influences flow velocity and channel characteristics such as substratum particle size that are important characteristics of riverine habitat types. The following geomorphological zones occur in the project area and described as follows (after Rowntree and Wadeson 2000):

7.7.2 Lowland River

A low-gradient alluvial fine-bed channel. It may be confined but has a fully developed meandering pattern within a distinct floodplain that develops in unconfined reaches where there is increased silt content in bed or banks. Characteristic gradient: 0.0001- 0.001.

Figure 7-7. Floodplain river and riparian woodland bisecting the project area

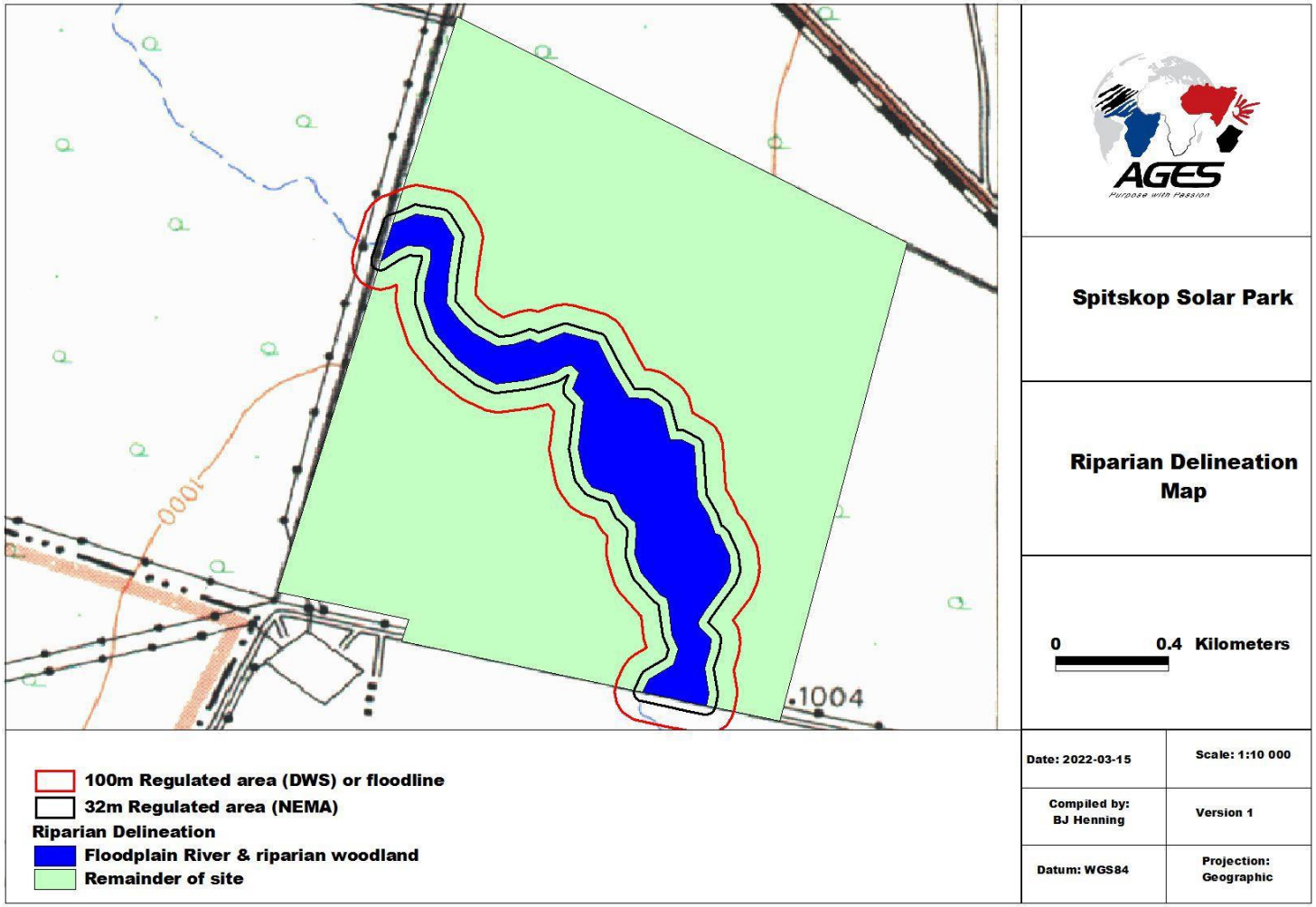

Figure 7-8. Riparian Delineation Map

Evidence was observed on site of transformation of the floristic characteristics of the site at least to some extent. Impacting activities which may have altered the expected floristic composition include alien infestation, impoundment and road crossings.

Table 7.7 Present Ecological State and Ecological Importance & Sensitivity of the wetland and riparian systems on the proposed development site

Unit	PES	EIS
Floodplain River Valleybottom wetland with channel Riparian Flat	Class C: Moderately modified	Moderate

Anthropogenic disturbance of soil and primary vegetation have altered the natural hydrological functioning of the drainage systems (wetlands and riverine areas) associated with the proposed solar development site. The reference state was probably Class B that changed to a Class C.

However, the biotic and abiotic characteristics clearly indicated that the drainage system is functional in terms of flood attenuation, erosion control, sediment trapping and biodiversity. The limited presence of facultative wetland plant species such as sedges, and the absence of temporary pools limit the ability of this wetland system to contribute to streamflow regulation. All the wetlands' components on site were found to be limiting in their ability to improve water quality by removing nitrates, phosphates, and other toxicants. The drainage system as an entity (dam, non-perennial and valley bottom wetlands) has a Class C PES (Moderately Modified).

Considering the importance as a fauna corridor as well as the red data species associated with the riverine woodland and wetlands, the area has a Moderate EIS. This HGM unit is therefore considered to be ecologically sensitive and important. The biodiversity of this riparian zone may be sensitive to flow and habitat modification, while the channel plays a significant role in moderating the quantity and quality of water entering downstream areas.

The riparian / wetland delineation for the project was done according to the criteria set by the Department of Water Affairs and Forestry (2003) and the National Wetland Classification System for South Africa (SANBI, 2009). The soils, vegetation associated with wetlands and landscape were all used as parameters in identifying the wetlands and riparian zones. The non-perennial channels can be classified as a 'Floodplain River', although this drainage channel is not a wetland in the 'true' sense of the word but should rather be described as water courses as stipulated in the National Water Act. Baseline soil information, landscape profile and vegetation were used to confirm riparian and terrestrial properties within the study area. The impacts associated with the solar development clearance site is reflected in the results of the PES assessment which indicates that the riparian zone and water course are 'Moderately Modified'. The EIS of the drainage system on site are MODERATE and are ecologically important and sensitive. The biodiversity of these wetlands may be sensitive to flow and habitat modifications. They play a role in moderating the quantity and quality of water of major rivers.

7.8 Hydrology

The proposed solar park development site is located within a section of the non-perennial Phufane River enters the site on the south-eastern boundary flowing in a westerly direction to the Brakspruit. The Brakspruit and Bierspruit have a confluence to the north of Northam. The north flowing Bierspruit is a tributary of the Crocodile River. The Phufane River falls within the Quaternary Catchment A24 E, part of the Crocodile (West) and Marico Water Management Area (WMA 3). The Phufane River is a tributary of the Crocodile River with the confluence situated to the north of the site. The Crocodile River forms part of the Limpopo River catchment.

7.9 Heritage Impact Assessment

In terms of heritage resources, the general landscape around the project area is primarily well known for its Iron Age Farmer and Colonial / Historical Period archaeology related to farming, rural expansion and warfare of the past century. No particular reference to archaeological sites or features of heritage potential were recorded during an examination of published literature thematically or geographically related to the Wildebeestlaagte properties.

An analysis of historical aerial imagery and archive maps of areas subject to this assessment suggests a landscape which has been subjected to historical farming activities possibly sterilising the area of heritage remains. This inference was confirmed during an archaeological site assessment during which no in situ heritage remains were encountered within the boundaries of the Preferred Site.

Stone Age material generally occurs along drainage lines and exposed surfaces in the landscape. During the site survey no Stone Age occurrences were documented in the proposed project Preferred Site.
A frontier zone between the east and the west, the Western Limpopo landscape holds vast amounts of Iron Age (Farmer period) remnants but no farmer period occurrences were noted in the proposed project Preferred Site.

Northam and its surroundings have a long and extensive Colonial Period settlement history. From around the first half of the 19th century, the area was frequented by explorers, missionaries and farmers who all contributed to a recent history of contact and conflict. The remnants of recent occupation and mining are scattered across the landscape but no Historical / Colonial Period occurrences were observed in the proposed project Preferred Site. In terms of the built environment, the project area has no significance, as there are no old buildings, structures, or features, old equipment, public memorial or monuments in the footprint areas.

No graves of human burial places were noted during the site investigation of the proposed project Preferred Site. In the rural areas of the Limpopo Province graves and cemeteries often occur within settlements or around homesteads but they are also randomly scattered around archaeological and historical settlements. The probability of informal human burials encountered during development should thus not be excluded. Should any unmarked human burials/remains be found during the course of construction, work in the immediate vicinity should cease and the find must immediately be reported to

the archaeologist, or the South African Heritage Resources Agency (SAHRA). Under no circumstances may burials be disturbed or removed until such time as necessary statutory procedures required for grave relocation have been met.

7.10 Visual Impact Assessment

It can be concluded that visual impacts would result from proposed solar park project. Specifically, impacts would result from streetlamps from the main access up to HV substation and where structures such as overhead power lines protrude above the vegetation line. Vegetation does however play a major role in screening the proposed intervention from adjacent and nearby sensitive viewers. The effect of the lighting at night will be the most intrusive factor but can be reduced by the correct implementation of the mitigation measures as described in Section 11. The implementation of the proposed development adjacent to the east would reduce the negative impact of lighting at night from the proposed Solar Park project. This is due to the fact that the lights of the proposed project will cumulatively add to the effect of the night lights from the Solar Park project.

7.10.1 Lighting

Light pollution should be seriously and carefully considered and kept to a minimum wherever possible as light at night travels great distances. Security lighting should only be used where absolutely necessary and carefully directed, preferably away from sensitive viewing areas. Wherever possible, lights should be directed downwards so as to avoid illuminating the sky.

7.11 Socio-Economic Assessment

The Limpopo Development Plan spells out its transition to an environmentally sustainable, climate change-resilient, low-carbon economy and just society, which will be well under way by 2030. The first phase focuses on a framework for implementing the transition to such a low-carbon economy. During this phase, the province will focus on measures to mitigate climate change and explore alternative technological solutions to reduce its carbon footprint. Key activities to broaden the provincial energy mix include support for the identification of suitable solar energy generation sites and for the production of components for solar panels. It is evident that there is policy support for solar energy generation from the Limpopo Provincial Government.

Limpopo Province currently has 3 renewable energy projects that cumulatively generate 118MW. All of them are solar energy projects and they are in commercial operation. Thabazimbi Local Municipality has one of the lowest unemployment rates in the country and in the province, although there are pockets of very high unemployment, such as in the Smashblock informal settlement not far from Northam. The Limpopo unemployment rate is in excess of 25%. Approximately 20% of households are estimated to be living in poverty, which is among the lowest in Limpopo. Once again, this excludes illegal immigrants and squatters who have recently moved into the municipal area.

The IDP indicates that the municipal population for 2021 is almost 105,000 people comprising approximately 38,700 households. Population growth is rapid at approximately 1.7% per year and is driven by employment in the mining sector. Household size is relatively small at 2.7 people, which is associated with the migrant labour system that is prevalent in areas that are dominated by mining. Given the size of the municipal area, the population density is very low at approximately 10 people per square km. Education levels in Thabazimbi Local Municipality are generally better than in the rest of Limpopo up to grade 9. From grade 10 onwards the provincial proportion is higher, except for matriculants. This could be a reflection of the recruitment policy of mines to employ matriculants who may come from other areas.

The IDP (2022) indicates a relatively low unemployment rate of 21% and a low proportion of people of the appropriate age with no schooling (only 3.7%). Local economic development (LED) is listed as the top municipal priority in the IDP, but the last LED strategy was compiled in 2009 and reviewed in 2014. Recent local economic statistics are therefore not provided. The IDP indicates that human and financial resources for development in the Municipality are severely constrained. It refers to a Local Economic Development Forum with private sector participation that will become the primary institutional structure to manage the local economic development process.

The authors of this strategy had the foresight to anticipate the need for renewable energy and recommended a sustainable development framework including solar heating.[1] Carbon credit trading was also recommended.

It is evident from the IDP (2022) that the municipality contributes significantly to gross value added of production in the Waterberg District (39%) and that mining contributes a major 56% to the district economy. Community services is the second largest sector in the district economy, with a contribution of 12%.The Thabazimbi Local Municipality's economy has shown remarkable growth of more than 22% in nominal terms in 2008, mostly in the mining sector, which is also the largest sector in the local economy by far. This growth has been largely driven by the increase in the platinum price. Significant decreases in the platinum price, as happened in 2009, could therefore have the opposite effect on economic growth

Thabazimbi and its adjacent township of Regorogile have a population of approximately 35,000 people. Together with Northam (approximately 15,000 people), these are the main service centres. Northam also has several satellite residential areas in its vicinity, some of which are informal. This includes Schilpadnest (Smashblock) and its population of approximately 18,000 people. Unemployed people are drawn to municipalities such as Thabazimbi in the hope of finding employment. Most of them reside in informal settlements.

The IDP (2022) indicates that the wastewater treatment facilities at Northam require urgent attention as current flows are exceeding the capacity of the existing oxidation ponds, thus resulting in extensive pollution. A partnership between Thabazimbi Local Municipality and Rustenburg Platinum Mines Limited was created for the construction of the wastewater treatment works.

Electricity development objectives include the upgrading of bulk electricity supply and the construction of substations where required. There is also a need to improve network reliability and sustainability.

Raising of the capital to finance the installation of solar electricity generation capacity by Vulpecula Energy represents a significant benefit for the South African economy. The most important economic benefit is likely to be the experience that will be gained with regard to solar electricity generation in Limpopo and in South Africa, considering that this forms part of a national strategic plan, but from a zero base. This experience will be essential for the roll-out of the strategy, for efficiency improvements and for the establishment of a local manufacturing supply chain for equipment requirements. The project will also make a contribution towards reducing the carbon emissions per unit of electricity generated in South Africa, albeit very small to start with. The national and local economies will benefit from civil contractor work, labour and building materials that will be required on site. On the whole, a minimum share of approximately 20% of total CAPEX (investment costs) will be sourced locally. This share is likely to increase once there will be a specific and competitive industry in the Republic of South Africa able to supply PV modules and other technological components.

The proposed project is consistent with national, provincial and municipal development. It provides an opportunity to launch the implementation of the national renewable energy generation programme, with particular reference to solar energy. The important issue emerging from the local economic development strategy is the imperative of local recruitment. Renewable energy is not specifically mentioned under the local economic development, but it includes the develop and maintenance of infrastructure in areas with economic development potential.

After approval, the project will take approximately 8 months to be built and could have a lifetime of 25-30 years. Approximately 100 people are expected to be employed during the construction period, although this number can increase to 150 for short spaces of time during peak periods. During operational phase, the power plant will require a permanent staff of approximately 25 people. That impact will be positive also in consideration of the slowing down of the recruitment rate due to mining stabilization activities.

Approximately 50% of the operation costs will have a local economic return (mostly for maintenance works by local sub-contractors), then the impact will also be positive during operation phase.

7.11.1 Operational Phase

Contribution to the Constrained National Electricity Grid
The project will contribute up to 60 MW to a constrained national grid, thereby reducing the need for load shedding with its negative consequences for economic production, growth, job creation and maintenance of equipment.

Capital Formation and Investment Attraction
Capital investment of approximately R1.2bn will be required (60 MW at R20m/MW) of which a substantial proportion is likely to be foreign capital as indicated by the Renewable Independent Power Producer Programme (REIPPPP) projects that have been procured to date.

Reduction in CO2 Emissions per Unit of Electricity Generated
CO2 emissions for 60 MW of solar energy will be reduced relative to coal fired power generation, which is the current national standard. The quantity of CO2 potentially avoided by this project will be approximately 170,000 tons per year based on the average Eskom emission factor of 1.015 tons/MWh and assuming that the PV modules will be mounted on trackers.

Lower Tariffs per Unit will Reduce Inflationary Pressure
Lower and declining electricity tariffs from solar energy compared to fossil fuel generated electricity (solar and wind energy tariffs are R0.62/kWh, compared to the coal tariff of R1.03/kWh). This will have a mitigating effect on administered prices and therefore on inflation.

Promotion of the Solar Energy Value Chain
Every new solar project that is developed in South Africa makes the establishment of an industry to support local manufacturing of components more viable. The footprint for such industry development has already been created in various industrial parks in South Africa.

Job Creation and Skills Development
Permanent job creation on the proposed project could be 30 people. More jobs will emerge within the value chain for the manufacturing of components. Albeit important, these numbers are relatively small in the context of current unemployment in Thabazimbi Municipality. An important new range of renewable energy industry skills will be acquired, which are essential for the local competitiveness of this industry.

Community Development
In terms of REIPPPP prescriptions, developers are expected to contribute 1.5% of turnover to community development in the vicinity of the project. Although this commitment has not yet been formalised, it could and should be structured in a way that will contribute meaningfully to the quality of life of a local community who could be identified, probably in Northam, and engaged in consultation with the local municipality.

Risk of Vandalism
Vandalism of property is a risk associated with high levels of poverty. This impact is potentially negative, considering the high value of solar PV panels. Mitigation measures will be required in the form of equipment design and on-site security.

7.11.2 Construction Phase

Promotion of the Solar Energy Value Chain
Almost the entire impact of the proposed project on the local solar energy industry value chain will occur before and during the construction phase, because this is when the components will be required.

Job Creation and Skills Development

Approximately 70 construction and panel installation jobs are expected to be created for a 60 MW project, for a period that is unlikely to exceed 12 months. Skills development, especially for panel installation, will contribute meaningfully to the viability of other potential solar project developments in Limpopo Province.

Crime and Social Disruption
Construction projects are associated with increased levels of crime and disruption to established local social relationships. The risk of an increase in Covid-19 infections could also arise when contractors are recruited from a different location.

Conclusion on Socio-Economic Assessment
The socio-economic impact of the proposed Spitskop Solar Project is considered positive, and the application is supported, provided that all the mitigation measures proposed by specialist consultants are implemented.

The project is consistent with development policies at the national, provincial and local government levels.

Table 7-6: Screening tool themes sensitivity

Themes	Very High sensitivity	High Sensitivity	Medium sensitivity	Low Sensitivity	Study/ Compliance	Site sensitivity
Agriculture theme	x				Appendix F1_Agricultural	High
Animal Species theme			x		Appendix F3_Ecology	High-Medium
Aquatic Biodiversity theme				x	No study Conducted	No study
Archaeological and Cultural Heritage Theme				x	Appendix F5_Heritage	Low
Avian theme				x	Appendix F2_Avifauna	Medium
Civil Aviation (Solar PV) Theme			x		No study Conducted	Low
Defence Theme				x	No study Conducted	No study
Landscape (Solar) theme	x				Appendix F8_Visual Impact Assessment	Medium
Palaeontology theme			x		Appendix F5_Heritage	Low
Plant Species theme				x	Appendix F3_Ecology	High-medium
RFI theme			x		No study Conducted	No study
Terrestrial biodiversity theme	x				Appendix F3_Ecology	High-medium (Figure 12-1)

8. ALTERNATIVES

An alternative, in relation to the proposed activity, means different means of meeting the general purpose and requirements of the activity. This can be through identifying an alternative property on which the activity can take place, the type of activity to be undertaken, a change in the design or layout of the activity, the technology used in the activity or the operational aspects of the activity. It also includes the option of not implementing the activity, called the no-go alternative.

8.1 Alternative sites for development

Two additional sites were considered during the planning phase, namely Portion 9 Wildebeestlaagte 411-KQ and Portions 4 and 5 Farm Grootkuil 409KQ.

During the site assessment, it became apparent that Portion 9 of Wildebeestlaagte 411-KQ was earmarked for residential use, and therefore not available for long-term planning for a PV park. Portions 4 and 5 of Farm Grootkuil 409KQ was already being considered as a solar PV park by another company.

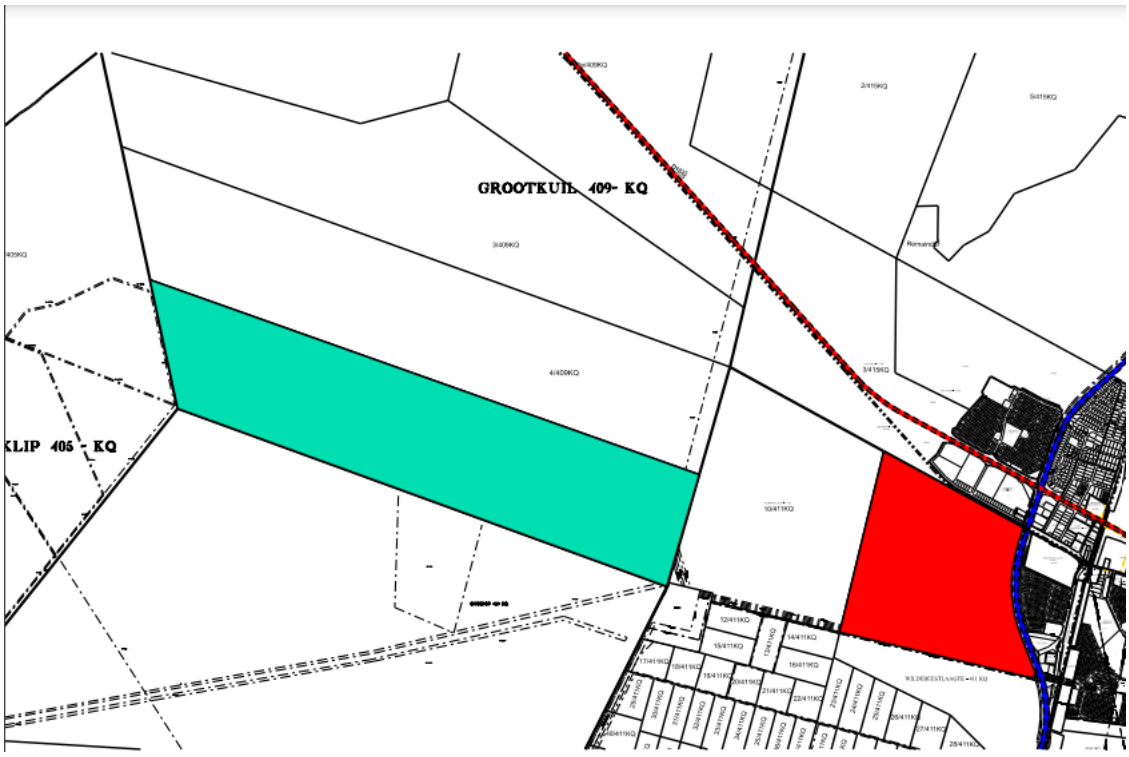

Figure 8-1. Alternative site assessments (red indicates Portion 9 of Wildebeestlaagte 411-KQ and green indicates Portions 4 and 5 Farm Grootkuil 409KQ)

8.2 Alternative layout and land use

The alternative layouts have been amended as per the specialist requirements as well as after discussions with key stakeholders such as ESKOM in order to ensure the proposed layout is optimal in terms of provision of services and connecting to existing services and future expansion services. The proposed layout will consider the existing roads, infrastructure, as well as sensitive areas, e.g. drainage lines, topography. These elements optimise the proposed layout.

8.3 No go alternative

The no-go alternative means that no renewable energy facility is constructed, and the current land use remains abandoned farming practices.

There are no activity alternatives applicable to this project, as there is an electricity supply shortage in South Africa. The project aims to feed an additional 100 MW energy into the existing Eskom Grid via the Eskom Spitskop HV substation connection.

8.4 Technology alternative

The following technology alternatives were proposed during the planning phase of the proposed development.

Table 8-1. Technology alternatives

Technology component	Description of the alternatives
PV Plant	The alternative to PV for producing energy from the sun is the thermal solution. There are different forms of this technology: linear Fresnel, parabolic trough or tower. These technologies can also be with or without thermal storage and they can use diathermic oils or, the more sophisticated ones can use water and/or molten salts. The final choice made was the PV option because these kinds of projects results: • Lower construction costs; • Lower operating and maintenance costs; • It is simpler, quicker and more experienced technology; and Lower environmental impact, considering that, amongst other factors, the PV Solution requires a minor quantity of water.
Wind Power	Another alternative to PV for producing energy from the sun is electrical energy form wind. A wind energy facility has a significant visual impact especially where it is located in a relative flat topographical area. Most important, the project site is not windy enough to be considered suitable for a wind farm. The PV option is thus still a better choice than wind energy based on the same reasons given above.
Alternatives for the Mounting System of the PV Modules	Preferred technical solutions for the proposed solar park entail PV modules mounted on fixed mounting systems (alternative option 1) or horizontal single-axis trackers (alternative option 2). The tracking solution is the best performing in terms of efficiency because its energy production is approximately 20% more if compared with fixed systems. This type of technology is characterized by higher technical complexity and higher installing and maintenance costs, if compared with the fixed mounting solution. The selected tracking system is the horizontal single-axis tracker (SAT), which doesn't differ from the fixed system, except for the presence of the tracking devices and the orientation of the rows of the PV arrays (north - south instead of west – east direction).

Technology component	Description of the alternatives
	The technology of mounting systems is under continuous evolution. Consequently, the final decision about the mounting system technology will be taken only at the commissioning date. The selection of fixed mounting system or horizontal single-axis trackers will not affect the layout of the PV power plant or imply any additional visual or environmental impacts that will necessitate specific or different mitigation measures. The development will not exceed the currently planned footprint (240 ha) and the height of the structures (PV modules and support frames) will be maximum 4.5 m above the ground level. Both fixed and horizontal single-axis tracking solutions grant the reversibility of the development in respect of the terrain's morphology, geology and hydrogeology. This means that at the end of the PV plant's lifetime, the site can easily be returned to its status prior to the establishment of the PV plant.
BESS Technology Alternatives	Batteries store electrical energy in chemical form. The range of electrochemical technologies include: a) batteries with solid electrolyte, as Lithium-ion battery; b) batteries with liquid electrolyte, as Na–S battery, Lead–Acid (PbA) battery, nickel - cadmium (Ni–Cd) battery or other types of liquid metal battery The preferred technology for the Battery Energy Storage System ("BESS") is Lithium-ion battery cells, which will be pre-assembled at the supplier factory and installed in the containers prior to delivery to the site. Lithium-ion cells technology offers the highest energy density (compared to the other cell technologies), does not suffer from memory effect and is low maintenance. Typical lithium-ion cells used for BESS hold a solid rechargeable electrolyte (the energy accumulator), therefore they don't hold any liquid or gas. The main benefit of solid ceramic electrolytes is that there is no risk of leaks, which is a serious safety issue for batteries with liquid electrolytes. A BESS does not emit any gas to the atmosphere during construction and/or normal operation. The containers of the batteries are equipped with a firefighting system conceived to effectively detect smoke and high temperatures and automatically activate the extinguishers to prevent fire. Furthermore, the external metallic surface of the cells is conceived to resist to fire. The preferred technology is therefore Lithium-ion battery cells with solid rechargeable electrolyte. Batteries with liquid electrolytes are not preferred for the risk of leakage and consequent potential impacts on environment.

9. NEED AND DESIRABILITY

The National EIA Regulations require that the Need and Desirability of a proposed project be outlined as part of the Impact Phase. The following section will describe the motivation, benefits, need and desirability of the proposed residential development as set out in General Notice 891 of 2014. The Guideline on need and desirability in terms of the EIA Regulations 2010 will be addressed by answering the questions on the specific impacts.

9.1 Key drivers and principles of need and desirability assessment

In the General Notice 891 of 2014, it is stated that, consistent with national priorities, environmental authorities must support "increased economic growth and promote social inclusion", whilst ensuring that such growth is "ecologically sustainable". Furthermore, the New Growth Path (2010) highlights that in essence the aim is to target our limited capital and capacity at activities that maximise the creation of decent work opportunities. To that end, we must use both macro and micro economic policies to create

a favourable overall environment and to support more labour-absorbing activities. The main indicators of success will be jobs (the number and quality of jobs created), growth (the rate, labour intensity and composition of economic growth), equity (lower income inequality and poverty) and environmental outcomes.

The National Development Plan 2030 (NDP) (2012) stresses that the threat to the "environment and the challenge of poverty alleviation are closely intertwined" and as such environmental policies should not be framed as a choice between the environment or economic growth.

Sustainable development is the process that is followed to achieve the goal of sustainability. Sustainable development implies the selection and implementation of a development option, which allows for appropriate and justifiable social and economic goals to be achieved, based on the meeting of basic needs and equity, without compromising the natural system on which it is based (National Strategy for Sustainable Development and Action Plan 2011 - 2014 (NSSD 1) (2011)).

Consistent with the aim and purpose of EIAs, the concept of "need and desirability" relates to, amongst others, the nature, scale and location of development being proposed, as well as the wise use of land. While essentially, the concept of "need and desirability" can be explained in terms of the general meaning of its two components in which need primarily refers to time and desirability to place, "need and desirability" are interrelated and the two components collectively can be considered in an integrated and holistic manner (GN 891 of 2014).

9.2 Motivation for the proposed project

Section 7.11 describes the current status quo of the IDPs and SDFs of the District and Local municipalities. As can be clearly seen from within the municipalities, there is a combined drive for development of the solar park sector. There is a high and urgent need for increased energy creation, linked to a sustainable utilisation of resources, taking into consideration the land use and job creation opportunities.

9.3 Solar Park proposed alternative

This proposed layout incorporates the requirements of the current area, as well as considers the strategic planning documents of the area, such as the IDP and SDF. The proposed development incorporates upgrades to roads within the surrounding area as well as service infrastructures, such as sewer and water supply.

9.4 Benefits of the proposed project

9.4.1 Employment and Economic Benefits of the Solar Park Alternative

Permanent job creation on the proposed project could be 30 people. More jobs will emerge within the value chain for the manufacturing of components. Albeit important, these numbers are relatively small in the context of current unemployment in Thabazimbi Municipality. An important new range of renewable

energy industry skills will be acquired, which are essential for the local competitiveness of this industry. This socio-economic impact is positive, but with a low significance.

9.5 Need

In providing for the Need for a project, the applicant has to explain how a development would benefit the local/regional/national community. By emphasising how communities would benefit from the development, the need for a project is emphasized. It will be dealt with by answering the questions as set out in General Notice 891 of 2014, Guideline on need and desirability in terms of the EIA Regulations 2010.

Table 9-1. summarises the key questions and thought process which has been followed during the EIA Phase to ensure the needs motivation has been adequately assessed.

Table 9-1. Needs motivation and assessment guideline

"SECURING ECOLOGICAL SUSTAINABLE DEVELOPMENT AND USE OF NATURAL RESOURCES"			
Question			**Response as informed by the EIA Phase**
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? • Threatened Ecosystems; • 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; • Critical Biodiversity Areas ("CBAs") and Ecological Support Areas ("ESAs"); • Conservation targets; • Ecological drivers of the ecosystem; • Environmental Management Framework; • Spatial Development Framework; and • Global and international responsibilities relating to the environment (e.g. RAMSAR sites, Climate Change, etc.)	• The study site overlaps with the Least threatened ecosystem as Section 52 of NEMBA (Act No. 10 of 2004). • The Proposed solar park development is located within the Savannah Biome within the Dwaalboom Thornveld vegetation type (Mucina & Rutherford, 2006). • A 32m buffer zone will be implemented around the riparian zone of the drainage channels and wetland on site. • Indigenous trees can be planted in the buffer zone of the proposed development to enhance the aesthetic value of the site and stabilize soil conditions.
	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?	• The Proposed solar park development is located within the Savannah Biome within the Dwaalboom Thornveld vegetation type (Mucina & Rutherford, 2006). • A 32m buffer zone will be implemented around the riparian zone of the drainage channels and wetland on site. • Indigenous trees can be planted in the buffer zone of the proposed development to enhance the aesthetic value of the site and stabilize soil conditions.
	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 (including offsetting) the impacts? • What measures were explored to enhance positive impacts?	• Construction work for the proposed development will always carry a risk of soil and water pollution, with large construction vehicles contributing substantially due to oil and fuel spillages. • Any excess or waste material or chemicals should be removed from the site and discarded in an environmentally friendly way. The ECO should enforce this rule rigorously. • Hazardous chemicals to be stored on an impervious surface protected from rainfall and storm water run-off.

"SECURING ECOLOGICAL SUSTAINABLE DEVELOPMENT AND USE OF NATURAL RESOURCES"			
Question			**Response as informed by the EIA Phase**
			• Spill kits should be on-hand to deal with spills immediately. • All vehicles should be inspected for oil and fuel leaks on a regular basis. Vehicle maintenance yards on site should make provision for drip trays that will be used to capture any spills. Drip trays should be emptied into a holding tank and returned to the supplier.
	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?	• Limited waste will be generated by the proposed solar park development. Dust concrete, solvents, steel fillings, fuel and other wastes are all produced during building construction. • Materials storage: store building materials under cover or contained areas. • Site cleaning: clean the repair or construction site daily. Do not use water for cleaning the site. • Leakage containment and treatment: ensure that oil, fuel or solvent leakages cannot enter the stormwater system. • Temporary filters: fit temporary inlet pit filters near wash-down areas to prevent pollutant entry into the drainage system. • Waste will be managed by the applicant and municipality, as part of their recycling efforts.
	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?	This site does not constitute any nations cultural heritage. No particular reference to archaeological sites or features of heritage potential were recorded during an examination of published literature thematically or geographically related to the site.
	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?	The project aims to utilize renewable energy. Non-renewable resources will not be utilised in this development.

"SECURING ECOLOGICAL SUSTAINABLE DEVELOPMENT AND USE OF NATURAL RESOURCES"			
Question			**Response as informed by the EIA Phase**
		• 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?	

	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?
		  • 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).
		  • 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?)
		  • Do the proposed location, type and scale of development promote a reduced dependency on resources?
			• The study site overlaps with the Least threatened ecosystem as Section 52 of National NEMBA (Act No. 10 of 2004).
			• The proposed development footprint area is in Critical Biodiversity Area 2 (CBA2), although after the initial surveys it can be concluded that it should be classified as an ESA2.
			• The context of the site locality in terms of vegetation and wetlands is included in the Wetland specialist study, in order to provide an overall assessment.
			• The proposed solar panel development will reduce the dependency on the ESKOM provided power and use green energy.

"SECURING ECOLOGICAL SUSTAINABLE DEVELOPMENT AND USE OF NATURAL RESOURCES"			
Question			**Response as informed by the EIA Phase**

	1.8	• How were a risk-averse and cautious approach applied in terms of ecological impacts?
		  • What are the limits of current knowledge (note: the gaps, uncertainties and assumptions must be clearly stated)?
		  • What is the level of risk associated with the limits of current knowledge?
		• 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 removal of indigenous trees and shrubs should be kept to a minimum necessary. Trim, rather than fell of woody species along the edges of the development site where possible. The clearing and damage of plant growth in the riparian and wetland areas should be restricted to the actual crossing where possible, and not into the sensitive adjacent areas. Where protected trees will need to be cleared or pruned, permits should be obtained from the relevant authority.
			• Peripheral impacts around the development footprint sites on the surrounding vegetation of the area should be avoided and a monitoring programme should be implemented to ensure the impacts are kept to a minimum, while the rehabilitation of the site should be prioritized after construction has been completed.
			• During construction, sensitive habitats must be avoided by construction vehicles and equipment, wherever possible, to reduce potential impacts. Only necessary damage must be caused and, for example, unnecessary driving around in the veld or bulldozing natural habitat must not take place.

	1.9	• How will the ecological impacts resulting from this development impact on people's environmental right in terms following:
		  ○ 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?
		  ○ Positive impacts: e.g. improved access to resources, improved amenity, improved air or water quality, etc. What measures were taken to enhance positive impacts?
			Negative impact: lightning at night. And this will be minimized by installing light fixtures that provide precisely directed illumination
			
			Positive impact: improve access to electricity.

	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 proposed solar development will create job opportunities during construction and operation for the local labour. Due to the small-scale economy of the are and limited industries, the solar panel farm will cause an upliftment in the economy in terms of opportunities for the direct and indirectly impacted communities/suppliers.
	1.11	Based on all of the above, how will this development positively or negatively impact on ecological integrity objectives/targets/considerations of the area?	The layout considers the sensitive drainage line transecting the site, hence it has been excluded from the proposed layout. A buffer has also been applied to the drainage line which has been incorporated into the layout.

"SECURING ECOLOGICAL SUSTAINABLE DEVELOPMENT AND USE OF NATURAL RESOURCES"			
Question			**Response as informed by the EIA Phase**
	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?	• The preferred layout considers the sensitive drainage line transecting the site, hence it has been excluded from the proposed layout. A buffer has also been applied to the drainage line which has been incorporated into the layout. • The other alternative layout does not consider the drainage line and related buffer zones.
	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?	• Negative cumulative impact: the negative cumulative impacts for this development are moderate to low. This can include speeding on the road by workers, so speed humps should be constructed, hunting of animals should be prevented, poisoning of animal to control the increase in rats and other vermin. • Positive cumulative impact: increased renewable energy.

9.6 Desirability

Desirability relates to the placement of an activity. The motivation must indicate why the location of a development in this particular area would be more desirable than establishing in another area. It will be dealt with by answering the questions as set out in GNR 326 of 2014, Guideline on need and desirability in terms of the EIA Regulations 2010.

Table 9-2 summarises the key questions and thought process to be followed during the EIA Phase to ensure the desirability of the project has been thoroughly assessed.

Table 9-2. Assessment for desirability

"PROMOTING JUSTIFIABLE ECONOMIC AND SOCIAL DEVELOPMENT"			
Question			**Response as informed by the EIA Phase**
2.	What is the socio-economic context of the area, based on, amongst other considerations, the following considerations?		
	2.1	• The IDP (and its sector plans' vision, objectives, strategies, indicators and targets) and any other strategic plans, frameworks of policies applicable to the area; • Spatial priorities and desired spatial patterns (e.g. need for integrated of segregated communities, need to upgrade informal settlements, need for densification, etc.); • Spatial characteristics (e.g. existing land uses, planned land uses, cultural landscapes, etc.); and • Municipal Economic Development Strategy ("LED Strategy").	• The IDP indicates that human and financial resources for development in the Municipality are severely constrained. • The IDP indicates that electricity development objectives include the upgrading of bulk electricity supply and the construction of substations where required. There is also a need to improve network reliability and sustainability. • The LED recommended mining and eco-tourism as the areas with opportunity. • solar energy has the potential to address the need for energy access in remote areas, create jobs and increase localisation.
	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? • Will the development complement the local socio-economic initiatives (such as local economic development (LED) initiatives), or skills development programs?	• Permanent job creation on the proposed project could be 30 people. • More jobs will emerge within the value chain for the manufacturing of components. • An important new range of renewable energy industry skills will be acquired, which are essential for the local competitiveness of this industry. • This socio-economic impact is positive, but with a low significance.
	2.3	• How will this development address the specific physical, psychological, developmental, cultural and social needs and interests of the relevant communities?	• This development will create jobs for some community members. • New skills development • Less loadshedding.
	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?	• The project will contribute up to 100 MW to a constrained national grid, thereby reducing need for loadshedding. • This will have a long term positive impact on the community as there will be reduced electricity tariffs per unit.
	2.5	• In terms of location, describe how the placement of the proposed development will: o result in the creation of residential and employment opportunities in close proximity to or integrated with each other; o reduce the need for transport of people and goods;	• This proposed development will create job opportunities. • The site is within the urban edge, therefore it is closer to people, public transport can me used for commuting to the development site. • There are no archaeological artifacts preserved in this development site.

"PROMOTING JUSTIFIABLE ECONOMIC AND SOCIAL DEVELOPMENT"			
Question			**Response as informed by the EIA Phase**
		○ 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); ○ compliment other uses in the area; ○ be in line with the planning for the area; ○ for urban related development, make use of underutilised land available with the urban edge; ○ optimise the use of existing resources and infrastructure; ○ 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); ○ discourage "urban sprawl" and contribute to compaction/densification; ○ 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; ○ encourage environmentally sustainable land development practices and processes; ○ 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.); ○ the investment in the settlement or area in question will generate the highest socio-economic returns (i.e. an area with high economic potential); ○ 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 ○ in terms of the nature, scale and location of the development promote or act as a catalyst to create a more integrated settlement?	

"PROMOTING JUSTIFIABLE ECONOMIC AND SOCIAL DEVELOPMENT"			
Question			**Response as informed by the EIA Phase**
	2.6	• How were a risk-averse and cautious approach applied in terms of socio-economic impacts? o What are the limits of current knowledge (note: the gaps, uncertainties and assumptions must be clearly stated)? o 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? o 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?	There are no risk associated with this development as renewable energy will be utilized, this developments aims to connect to the Eskom Spitskop substation which has already been developed.
	2.7	• How will the socio-economic impacts resulting from this development impact on people's environmental right in terms following: o 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? o Positive impacts. What measures were taken to enhance positive impacts?	• Positive impact: there will be less carbon emission compared to the use of fossil fuel. • Low electricity tariffs compared to fossil fuel.
	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.)?	• No ecological impact will result from socio-economic development.
	2.9	• What measures were taken to pursue the selection of the "best practicable environmental option" in terms of socio-economic considerations?	• The solar park will be close to the ESKOM substation to optimise the distance of overheard powerline.
	2.10	• What measures were taken to pursue environmental justice so that adverse environmental 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)?	• The public was informed about this development during the PPP (poster advertisement, emails and newspaper advert). • For this development, jobs will be given to the locals. • There is no need for another alternative site, is the selected one is the best practical option.

"PROMOTING JUSTIFIABLE ECONOMIC AND SOCIAL DEVELOPMENT"			
Question			**Response as informed by the EIA Phase**
		• 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 proposed solar park development will create new job opportunities, both during construction and operation.
	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?	These measures will be included in the project specific EMPr to be included in the EIAR and an independent Environmental Compliance Officer will be appointed during construction. .
	2.13	• What measures were taken to: o ensure the participation of all interested and affected parties; o provide all people with an opportunity to develop the understanding, skills and capacity necessary for achieving equitable and effective participation; o ensure participation by vulnerable and disadvantaged persons; o promote community wellbeing and empowerment through environmental education, the raising of environmental awareness, the sharing of knowledge and experience and other appropriate means; o ensure openness and transparency, and access to information in terms of the process; o 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 o ensure that the vital role of women and youth in environmental management and development were recognised and their full participation therein were be promoted?	The public participation process was conducted, the public was given 30 days to respond with their comments. Those comments and responses are included in the CRR.
	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	The main issue for this area is job creation, which will be discussed in the EIAR, based on specialist input.

"PROMOTING JUSTIFIABLE ECONOMIC AND SOCIAL DEVELOPMENT"			
Question			**Response as informed by the EIA Phase**
		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)?	
	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?	These measures will be included in the project specific EMPr.
	2.16	• Describe how the development will impact on job creation in terms of, amongst other aspects: o the number of temporary versus permanent jobs that will be created; o 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); o the distance from where labourers will have to travel; o the location of jobs opportunities versus the location of impacts (i.e. equitable distribution of costs and benefits); and o the opportunity costs in terms of job creation (e.g. a mine might create 100 jobs, but impact on 1000 residential jobs, etc.).	This project will create 150 jobs, 30 of those people employed will be permanently employed.
	2.17	• What measures were taken to ensure: o that there were intergovernmental coordination and harmonisation of policies, legislation and actions relating to the environment; and o that actual or potential conflicts of interest between organs of state were resolved through conflict resolution procedures?	All relevant parties were informed during PPP, all comments were obtained and the best possible layout was presented.
	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 proposed development will improve electricity supply to the communities but also taking cognisance of the environment, in terms of adhering to buffer recommendations.
	2.19	Are the mitigation measures proposed realistic and what long-term environmental legacy and managed burden will be left?	The proposed management measures of all specialists are included FEIAR and they are realistic, also the site specific EMPr. The EMPr also includes the long-term operational phase.

"PROMOTING JUSTIFIABLE ECONOMIC AND SOCIAL DEVELOPMENT"			
Question			**Response as informed by the EIA Phase**
	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 proposed management measures of all specialists will be included in the EIAR and site-specific EMPr. The EMPr will include the short-term construction impacts as well as the long-term operational phase.
	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 selection of the best practicable environmental option in terms of socio-economic considerations?	The best practicable environmental option was selected because it is in the urban edge, easy for the community to travel to.
	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?	• There will be increased job opportunities • Increased electricity supply.

10. PUBLIC PARTICIPATION PROCESS

10.1 Objectives

The primary objectives of the Public Participation Process (PPP) include:

- Meaningful and timeous participation of I&APs;
- Identification of issues and concerns of key stakeholders and I&AP with regards to the proposed development, i.e., focus on important issues;
- Promotion of transparency and an understanding of the proposed project and its potential environmental (social and biophysical) impacts;
- Accountability for information used for decision-making;
- To serve as a structure for liaison and communication with I&APs, and

10.2 Land owners

The landowner of Portion 173 of the Farm Wildebeestlaagte 411-KQ is Phufane Game Lodge Close Corporation (Title Deeds attached in Appendix B).

10.3 Approach

10.3.1 Identification of and Consultation with Key Stakeholders and Landowners

The first step in the PPP entails the identification of key I&APs and Stakeholders, including:

- Local and provincial government;
- Affected and neighbouring landowners; and
- Environmental Organisations.

Identification of I&APs takes place through existing databases, door to door interaction, responses to newspaper advertisements, networking and a proactive process to identify key I&APs within the study area. All I&AP information (including contact details), together with dates and details of consultations and a record of all issues raised will be recorded within a comprehensive database of affected landowners (and occupiers where relevant). This database is updated on an on-going basis throughout the project process, and will act as a record of the communication/involvement process. This database was prepared by Exigent and will be utilised to record I&APs and stakeholder responses. The database was continually updated throughout the process. Land owners and key stakeholders were given the opportunity to comment during the public registration period on the proposed residential development.

10.3.2 Advertising

In accordance with the EIA Regulations, the commencement of the EIA Process for the project was advertised in the local newspaper. An English advert was placed in the Platinum Bushvelder Local Newspaper on 26 November 2021 in the legal section on Page 06 (Appendix D2.1). In order to ensure that the widest group of I&APs were informed regarding the proposed project, site notices was placed at

three strategic points on the outer boundaries of the site. Copies of the newspaper advertisements and photos of the site notices placed on site are attached in Appendix D2.

10.3.3 Background Information Document

A BID was compiled and distributed to I&APs and relevant stakeholders providing information regarding the proposed development and well as the environmental authorisation process. The aim of the BID is to provide a brief outline of the proposed project, provide I&APs and stakeholders with a map of the study area, provide preliminary details regarding the EIA, and to explain how I&APs can become involved in the project.

10.3.4 Public and Authority review of the FEIA Reports

There is no public review period for the Final EIAR . the report is uploaded on the DFFE submission website for the Competent Authority to make a decision on the approval of the EA.

10.3.5 Issues Trail (Comments and Response Report)

Issues and concerns raised during the Draft EIAR PPP have been added to the project CRR (Appendix D4), where responses were provided by Exigent and the project team.

From this CRR, an action list was compiled detailing those actions which needs to undertake in order to address specific issues raised.

10.4 Key issues from I & AP's and Stakeholders

Following publication of the adverts, placing of the site notices and circulation of the BID, a number of comments were received from I&AP's and stakeholders with regards to the proposed housing development. A summary of these comments is contained and responded to in Table 10-1. A full set of the original comments received are contained within Appendix E3.

Table 10-1. Summary of comments per subject, received from I&AP's and stakeholders for the proposed housing development.

Date	Institution	Contact name	Issues raised	Response
31 October 2022	DEDET	M. Rodgers	The property description for the project needs clarity, the heading refers to Portion 173 of the farm Wildebeestlaagte 411 KQ, while the Specialist Reports refer to Ptn 10 of the farm Wildebeestlaagte 411	Portion 10 is the portion number of the farm prior to registration at the deeds office. Portion 173 is the number after registration at the deeds office.
			It is noted that a 32m buffer along the Phufane River that traverses the site is considered. Given the importance of the riparian vegetation for connectivity (corridor) and taking into account that the alternative locations for this application is not viable due to township expansion and competing renewable energy generation project/s (limitation of space), it could be valuable to weigh the implications of a wider buffer along the river.	The proposed 32m buffer has been extended to a staggered buffer with distances of 50-200 m to be implemented along the Phufane River (Figure 12-1). This buffer will allow for a wider buffer along the Phufane River.
31 October 2022	DFFE: Biodiversity Conservation	Mmatlala Rabothata	The proposed development footprint area is in Critical Biodiversity Area 2 (CBA2), although after the initial surveys it can be concluded that it should be classified as an ESA2. However, no development will be permitted within areas of high biodiversity sensitivity (CBA 1) as these areas play a major role in meeting the biodiversity target. Therefore, the development footprint encroaching into the CBAs with very high and high sensitivity must be moved away and be placed on heavily or modified disturbed areas or the footprint be minimized.	The Ecological sensitivity was verified by the specialist on site and reflected as ESA2. The proposed 32m buffer has been extended to a staggered buffer with distances of 50-200 m to be implemented along the Phufane River (Figure 12-1). This buffer will allow for a wider buffer along the Phufane River.
			There is a high likelihood that many of the species listed as species of conservation concern will occur within the Spitskop Solar Park area, however they are listed as Least Concerned, or Data Deficient. Preconstruction walk-through of the approved development footprint must be conducted to ensure that sensitive habitats and species are avoided.	This recommendation has been included in the FEIAR.
			• Three (3) tree species that are protected within the study are *Combretum imberbe*, *Acacia erioloba* and *Boscia albitrunca* by the National Forest Act (No 84 of 1998) have been identified, therefore, a permit from relevant authorities must be obtained for the removal or disturbance of any TOPs, Red Data listed or provincially protected species.	This recommendation has been included in the FEIAR.

Date	Institution	Contact name	Issues raised	Response
			• The flood line and riparian zone were identified as of high sensitivity. Therefore, Sensitive habitats of Very High sensitivity in close proximity to the development footprint must be avoided or demarcated as No-Go area, i.e. drainage lines. In addition, maintain appropriate buffer around the riparian zones of the drainage channels and wetlands on site.	
31 October 2022	Subsolar Energy (Pty) Ltd	Donné Krause	According to the DFFE Protected Areas Register (PAR), Portion 173 of the Farm Wildebeestlaagte 411 is declared as a Private Nature Reserve and Gazetted as the Arzona Private Nature Reserve with Gazette no. 2812, notice 17, dated 27 January 1960 (see Gazetted notice attached). Can you confirm and provide proof that the Arzona Private Nature Reserve was de-proclaimed as a Private Nature Reserve in terms of Section 24 of the National Environmental Management: Protected Areas Act (Act 57 of 2003)? The Draft EIA Report only states that the Solar Park is in close proximity to the Arzona Private Nature Reserve and the Terrestrial Biodiversity, Plant and Animal Species Impact Assessment Report does not refer to the Arzona Private Nature Reserve but only to the Northwest / Gauteng Bushveld NPAES and the Pilanesberg Provincial Nature Reserve. Clarity on this issue will be much appreciated.	Based on further investigations, it has become apparent that there are conflicting data with regards to the status of the property. Further investigations will be made into this matter, and the necessary actions will follow.

11. IMPACT ASSESSMENT

The different aspects pertaining to the environment must be considered when assessing the impact of the development on the environment.

11.1 Methodology in assessing potential impacts

The impacts of the proposed development and each alternative will be assessed according to the criteria in Table 11-1 and will include the degree to which these impacts can be reversed, may cause irreplaceable loss of resources and can be avoided, managed or mitigated.

Table 11-1 Criteria by which impacts were assessed.

ASPECT	IMPACT RATING
Status of the impact: A statement of whether the impact is positive (a benefit), negative (a cost), or neutral.	
Direct impacts	Impacts that are caused directly by the activity and generally occur at the same time and at the place of the activity. These impacts are usually associated with the construction, operation or maintenance of an activity and are generally obvious and quantifiable.
Indirect impacts	Impacts of an activity are indirect or induced changes that may occur as a result of the activity. These types of impacts include all the potential impacts that do not **manifest** immediately when the activity is undertaken or which occur at a different place as a result of the activity.
Cumulative impacts	Impacts that result from the incremental impact of the proposed activity on a common resource when added to the impacts of other past, present or reasonably foreseeable future activities. Cumulative impacts can occur from the collective impacts of individual minor actions over a period of time and can include both direct and indirect impacts.
Nature of the impact: The evaluation of the nature is impact specific. Most negative impacts will remain negative, however, after mitigation, significance should reduce: • Positive. • Negative.	

ASPECT	IMPACT RATING

Extent:

A description of whether the impact would occur on a scale limited to within the study area (local), limited to within 5 km of the study area (area); on a regional scale i.e. local Municipality and Limpopo Province; or would occur at a national or international scale.

Local	1
Area	2
Region	3
National	4
International	5

Duration:

A prediction of whether the duration of the impact would be Immediate and once-off (less than one month), more than once, but short term (less than one year), regular, medium term (1 to 5 years), Long term (6 to 15 years), Project life/permanent (> 15 years, with the impact ceasing after the operational life of the development or should be considered as permanent).

Immediate	1
Short term	2
Medium term	3
Long term	4
Project life/permanent	5

Severity (extent +duration + intensity)

Intensity: This provides an order of magnitude of whether or not the intensity (magnitude/size/frequency) of the impact would be negligible, low, medium, high or very high. This is based on the following aspects:

- an assessment of the reversibility of the impact (permanent loss of resources, or impact is reversible after project life);
- whether or not the aspect is controversial;
- an assessment of the irreplaceability of the resource loss caused by the activity (whether the project will destroy the resources which are easily replaceable, or the project will destroy resources which are irreplaceable and cannot be replaced);

- the level of alteration to the natural systems, processes or systems.

Negligible	The impact does not affect physical, biophysical or socio-economic functions and processes.	1
Low/potential harmful	The impact has limited impacts on physical, biophysical or socio-economic functions and processes.	2
Medium/slightly harmful	The impact has an effect on physical, biophysical and socio-economic functions and processes, but in such a way that these processes can still continue to function albeit in a modified fashion.	3
High/Harmful	Where the physical, bio-physical and socio-economic functions and processes are impacted on in such a way as to cause them to temporarily or permanently cease.	4
Very high/Disastrous	Where the physical, bio-physical and socio-economic functions and processes are highly impacted on in such a way as to cause them to permanently cease.	5

Incidence (frequency + probability)

Frequency: This provides a description of any repetitive, continuous or time-linked characteristics of the impact: Once Off (occurring any time during construction or operation); Intermittent (occurring from time to time, without specific periodicity); Periodic (occurring at more or less regular intervals); Continuous (without interruption).

Once Off	Once	1
Rare	1/5 to 1/10 years	2
Frequent	Once a year	3
Very frequent	Once a month	4
Continuous	≥ Once a day/ per shift	5

Probability of occurrence: A description of the chance that consequences of that selected level of severity could occur during the exposure.

Highly unlikely	The probability of the impact occurring is highly unlikely due to its design or historic experience.	1
Improbable	The probability of the impact occurring is low due to its design or historic experience.	2
Probable	There is a distinct probability of the impact occurring	3
Almost certain	It is most likely that the impact will occur	4
Definite	The impact will occur regardless of any prevention measures	5

Risk rating	The risk rating is calculated based on input from the above assessments. The incidence of occurrence is calculated by adding the Extent of the impact to the duration of the impact. The Severity of the impact is calculated based on input from the extent of the impact, the duration and the intensity.

ASPECT	IMPACT RATING
	Risk = Severity (extent +duration + intensity) x Incidence (frequency + probability) **Significance**: The significance of the risk based on the identified impacts has been expressed qualitatively as follows: ○ **low** – the impact is of little importance/insignificant, but may/may not require minimal management ○ **medium** - the impact is important, management is required to reduce negative impacts to acceptable levels. ○ **high** - the impact is of great importance, negative impacts could render development options or the entire project unacceptable if they cannot be reduced to acceptable levels and/or if they are not balanced by significant positive impacts, management of negative impacts is essential.

Low risk	0 – 50
Medium risk	51 – 100
High risk	101 – 150
Low positive	0 – 50
Medium positive	51 – 100
High positive	101 – 150

The LEGEND for colours of impact assessment table:

HIGH NEGATIVE	
MEDIUM NEGATIVE	
LOW NEGATIVE	
MEDIUM POSITIVE	
HIGH POSITIVE	

11.2 Key issues and assessment thereof

Table 11-2. Environmental issues, their negative/positive impacts as well as the proposed mitigation

ASPECT	DISCUSSION AND IMPACTS	IMPACT RATING BEFORE/AFTER MITIGATION		WAY FORWARD / MITIGATION MEASURES
		BEFORE	AFTER	
CONSTRUCTION PHASE				
SOIL The impacts associated with the proposed development on the agro-ecosystem capability will depend on the specific area where the development will take place. If the activities take place along the slightly undulating terrain the impacts will be lower with only marginal erosion risks that can be managed though proper mitigation measures. The mitigation of the overall impacts on soils (compaction, erosion) will be easier on these flatter areas. Soil erosion promotes a variety of terrestrial ecological changes associated with disturbed areas, including the establishment of alien invasive plant species, altered plant community species composition and loss of habitat for indigenous flora. Planning and design are necessary to ensure that mitigation and impact management can be effectively implemented and minimise impacts in future. The planning and design phase of the solar plant will involve the following actions: • Layout avoidance of sensitive soil types associated with soils with high erosion / compaction risk. • No specific direct impacts will occur on the soils of the area during this phase. Construction work for the proposed development will always carry a risk of soil and water pollution, with large construction vehicles contributing substantially due to oil and fuel spillages. If not promptly dealt with, spillages or accumulation of waste matter can contaminate the soil and surface or ground water, leading to potential medium/long-term impacts on fauna and flora. During the constructional phase heavy machinery and vehicles would be the main contributors to potential pollution problems.				
SOIL	Soil compaction will be caused by regular heavy vehicle movement (wheel impact) and laydown areas of stockpiles on soils during construction.	**MEDIUM**	**MEDIUM**	• Soil should be handled when dry during removal and placement to reduce the risk of compaction. • Vegetation (grass and small shrubs) should not be cleared from the site prior to construction except if vegetation requires relocation as determined through an ecology assessment). This material is to be stripped together with topsoil as it will supplement the organic and possibly seed content of the topsoil stockpile depending on the time of soil stripping (whether plants are in seed or not); and • Soil should be sampled and analysed prior to replacement during rehabilitation. If necessary, and under advisement from a suitably qualified restoration ecologist, supplemental fertilisation may be necessary. • During construction, sensitive soils with high risk of compaction (e.g., clayey soils) must be avoided by construction vehicles and equipment, wherever possible, to reduce potential impacts. Only necessary

ASPECT	DISCUSSION AND IMPACTS	IMPACT RATING BEFORE/AFTER MITIGATION		WAY FORWARD / MITIGATION MEASURES
		BEFORE	AFTER	
				damage must be caused and, for example, unnecessary driving around in the veld or bulldozing natural habitat must not take place.
	Soil erosion and sedimentation	**MEDIUM**	**LOW**	• Minimize the amount of land disturbance and develop and implement stringent erosion and dust control practices. Control dust on construction sites and access roads using water-sprayers. • Institute a storm water management plan. • Have both temporary (during construction) and permanent erosion control plans. • Temporary control plans should include: • Short-term seeding or mulching of exposed soil areas (particularly on slopes) • Limitations on access for heavy machinery and the storage of materials to avoid soil compaction. • Permanent erosion control plans should focus on the establishment of stable native vegetation communities. • Other mitigation measures needed to prevent soil erosion include: • Ensure the amount of bare soil exposed is minimized by staging earthworks in phases and leaving as much ground cover intact as possible during construction. • Protect all areas susceptible to erosion and ensure that there is no undue soil erosion resultant from activities within and adjacent to the construction camp and Work Areas. • The project should be divided into as many phases as possible, to ensure that the exposed areas prone to erosion are minimal at any specific time. • Cover disturbed soils as completely as possible, using vegetation or other materials. • Minimize the amount of land disturbance and develop and implement stringent erosion and dust control practices. • Protect sloping areas and drainage channel banks that are susceptible to erosion and ensure that there is no undue soil erosion resultant from activities within and adjacent to the construction camp and Work Areas. • Repair all erosion damage as soon as possible to allow for sufficient rehabilitation growth. • Gravel roads to the construction sites must be well drained to limit soil erosion. • Control the flow of runoff to move the water safely off the site without destructive gully formation. • Protect all areas susceptible to erosion and ensure that there is no undue soil erosion resultant from activities within and adjacent to the construction camp and Work Areas.

ASPECT	DISCUSSION AND IMPACTS	IMPACT RATING BEFORE/AFTER MITIGATION		WAY FORWARD / MITIGATION MEASURES
		BEFORE	AFTER	
	Soil pollution: Construction work of the magnitude contemplated for the proposed solar plant will always carry a substantial risk of soil pollution, with large construction vehicles contributing substantially due to oil and fuel spillages. Building waste, batching plants, sewage and domestic waste are also potential contributors to this problem.	**LOW**	**LOW**	• Chemicals to be stored on an impervious surface protected from rainfall and storm water run-off. • Spill kits should be on-hand to deal with spills immediately. • Spillages or leakages must be treated according to an applicable procedure as determined by a plan of action for the specific type of disturbance. • All construction vehicles should be inspected for oil and fuel leaks regularly and frequently. Vehicle maintenance will not be done on site except in emergency situations in which case mobile drip trays will be used to capture any spills. Drip trays should be emptied into a holding tank and returned to the supplier. • Any excess or waste material or chemicals should be removed from the site and discarded in an environmentally friendly way. The ECO should enforce this rule rigorously. • Hazardous chemicals to be stored on an impervious surface protected from rainfall and storm water run-off.
	Soil destruction is a form of soil degradation that involves the destruction of natural soil bodies and all the parameters that led to the formation of the soil. Stripping of the topsoil during construction will remove the fertile layer of the soil.	**MEDIUM**	**LOW**	• Conservation of topsoil should be prioritized on site and done as follows: • Topsoil should be handled twice only - once to strip and stockpile, and secondly to replace, level, shape and scarify. • Stockpile topsoil separately from subsoil. • Stockpile in an area that is protected from storm water runoff and wind. • Topsoil stockpiles should not exceed 2.0 m in height and should be protected by a mulch cover where possible. • Maintain topsoil stockpiles in a weed free condition. • Topsoil should not be compacted in any way, nor should any object be placed or stockpiled upon it. • Stockpile topsoil for the minimum time possible i.e., strip just before the relevant activity commences and replace as soon as it is completed.
	Loss of land capability: This impact involves the loss of land available for farming and tourism: The area where the solar plant is proposed is in an area used for game farming,	**MEDIUM**	**MEDIUM**	• Corridors should be secured around the development footprint areas to ensure the current land use (grazing and agriculture) surrounding the site can continue in a functional way after construction. • Clearly demarcate the entire development footprint prior to initial site clearance and prevent construction personnel from leaving the demarcated area. This could be done through the fencing of the entire development footprint and institute strict access control to the portions of the owner-controlled property that are to remain undisturbed as soon as possible after initial site clearance. The fence should

ASPECT	DISCUSSION AND IMPACTS	IMPACT RATING BEFORE/AFTER MITIGATION		WAY FORWARD / MITIGATION MEASURES
		BEFORE	AFTER	
	livestock grazing and some crop farming although solar plant development activities also occur in the broader area.			preferably be impermeable (for example a solid wall) to discourage invertebrates and small animals from entering the site. [Normally solid perimeter walls are not recommended to facilitate the movement of invertebrates, but in this case restriction of their movement into the area will be advantageous.] • All development activities should be restricted to specific recommended areas and strict buffer zones should be applied around the sensitive areas. The Environment Control Officer (ECO) should demarcate and control these areas. Unnecessary bulldozing through the veld should be avoided. •

TERRESTRIAL BIODIVERSITY

The proposed development should avoid sensitive areas such as wetland and riverine areas, while also allowing corridors of indigenous woodland on areas outside the development footprint to be preserved. Where sensitive areas of natural vegetation cannot be avoided, a few mitigation measures have been recommended to minimise and/or offset impacts (licence application for eradication of protected species.). Negative impacts can be minimised by strict enforcement and compliance with an Environmental Management Plan which considers the recommendations for managing impacts detailed above.

The construction phase of the development and associated infrastructure will result in loss of and damage to natural habitats if the vegetation is cleared for the development of the solar plant. Rehabilitation of some areas would be possible but there is likely to be long-term damage in large areas. Most habitat destruction will be caused during the construction phase. Vegetation communities are likely to be impacted on a small spatial scale in comparison to the extent of the vegetation communities' total area in the region.

The impact of the habitat destruction will be on the flora and fauna of the study area in the following ways:

- The construction will lead to the loss of individual plants such as grasses, forbs, trees, and shrubs that will be cleared on the footprint area. This will mostly occur during the construction phase. Due to habitat loss and construction activities animals will migrate from the construction area and animal numbers will decrease.
- Loss of threatened, near threatened and endemic taxa: The anticipated loss of some of the natural habitats that support endemic species will result in the local displacement of endemic listed flora. The anticipated loss of the natural woodland will result in the local displacement of some fauna species. In some cases, isolated populations of threatened fauna might be removed from the area, although no such populations or knowledge thereof was found in the study area. This impact could also take place because of hunting and snaring of animals in natural areas not used for the mine or its infrastructure
- Changes in the community structure. It is expected that the faunal species composition will shift, due to an anticipated loss in habitat surface area. In addition, it is predicted that more generalist species (and a loss of functional guilds) will dominate the study area. Attempts to rehabilitate will attract taxa with unspecialized and generalist life-histories. It is predicted that such taxa will persist for many years before conditions become suitable for succession to progress.

Habitat fragmentation:

- The construction of the development and associated infrastructure will result in natural movement patterns being disrupted for a limited period and, to a varying degree depending on how different species react to these barriers will result in the fragmentation of natural populations, although the impact will be minimal and restricted to the construction phase.

Increased Soil erosion and sedimentation

- The construction activities associated with the development may result in widespread soil disturbance and is usually associated with accelerated soil erosion. Soil erosion promotes a variety of terrestrial ecological changes associated with disturbed areas, including the establishment of alien invasive plant species, altered plant community species composition and loss of habitat for indigenous flora.

Soil and water pollution

ASPECT	DISCUSSION AND IMPACTS	IMPACT RATING BEFORE/AFTER MITIGATION		WAY FORWARD / MITIGATION MEASURES
		BEFORE	AFTER	
• Construction work for the proposed development will always carry a risk of soil and water pollution, with large construction vehicles contributing substantially due to oil and fuel spillages. If not promptly dealt with, spillages or accumulation of waste matter can contaminate the soil and surface or ground water, leading to potential medium/long-term impacts on fauna and flora. During the constructional phase heavy machinery and vehicles would be the main contributors to potential pollution problems. <u>Air pollution</u> The environmental impacts of wind-borne dust, gases and particulates from the construction activities associated with the proposed development are primarily related to human health and ecosystem damage. The proposed development will typically comprise the following sources and associated air quality pollutants: • Materials handling operations (truck loading & unloading, tipping, stockpiling). • Vehicle entrainment on paved and unpaved roads. • Windblown dust-fugitive emissions. One of the primary impacts on the biophysical environment is linked to emission of dusts and fumes from both the transportation system. Dust pollution will impact the most severe during the construction phase. Construction vehicles and equipment are the major contributors to the impact on air quality. Dust is generated during site clearance for the construction of infrastructure. Diesel exhaust gasses and other hydrocarbon emissions all add to the deterioration in air quality during this phase. Vehicles travelling at high speeds on dirt roads significantly aggravate the problem. Although the potential for severe fugitive dust impacts is greatest within 100 m of dust-generating activities, there is still the potential for dust to affect vegetation up to five kilometres or more downwind from the source. Dust deposited on the ground may cause changes in soil chemistry (chemical effects) and may over the long-term result in changes in plant chemistry, species composition and community structure. Sensitivities to dust deposition of the various plant species present in the area are not known. It is therefore difficult to predict which species may be susceptible. Poor air quality results in deterioration of visibility and aesthetic landscape quality of the region, particularly in winter due to atmospheric inversions. <u>Spread and establishment of alien invasive species</u> • Continued movement of vehicles on and off the site during the construction phase will result in a risk of importation of alien species. Vehicles often transport many seeds, and some may be of invader species, which may become established along the access road, especially where the area is disturbed. The construction carries by far the greatest risk of alien invasive species being imported to the site, and the high levels of habitat disturbance also provide the greatest opportunities for such species to establish themselves, since most indigenous species are less tolerant of disturbance. The biggest risk is that seeds of noxious plants may be carried onto the site along with materials that have been stockpiled elsewhere at already invaded sites. <u>Spread and establishment of alien invasive species</u> • Continued movement of vehicles on and off the site during the construction phase will result in a risk of importation of alien species. Vehicles often transport many seeds, and some may be of invader species, which may become established along the access road, especially where the area is disturbed. The construction carries by far the greatest risk of alien invasive species being imported to the site, and the high levels of habitat disturbance also provide the greatest opportunities for such species to establish themselves, since most indigenous species are less tolerant of disturbance. The biggest risk is that seeds of noxious plants may be carried onto the site along with materials that have been stockpiled elsewhere at already invaded sites. <u>Negative effect of human activities and road mortalities</u> • An increase in human activity on the site and surrounding areas is anticipated. The risk of snaring, killing, and hunting of certain faunal species is increased. If staff compounds are erected for construction workers, the risk of pollution because of litter and inadequate sanitation and the introduction of invasive fauna and flora are increased. The presence of many construction workers or regular workers during the construction phase on site over a protracted period will result in a greatly increased risk of uncontrolled fires arising from cooking fires, improperly disposed cigarettes etc.			

ASPECT	DISCUSSION AND IMPACTS	IMPACT RATING BEFORE/AFTER MITIGATION		WAY FORWARD / MITIGATION MEASURES
		BEFORE	AFTER	
• Large numbers of fauna are also killed daily on roads. They are either being crushed under the tyres of vehicles in the case of crawling species, or by colliding with the vehicle itself in the case of avifauna or flying invertebrates. The impact is intensified at night, especially for flying insects, as result of their attraction to the lights of vehicles.				
ECOLOGICAL	Habitat fragmentation	**MEDIUM**	**LOW**	• Use existing facilities (e.g., impacted areas) to the extent possible to minimize the amount of new disturbance. • Ensure protection of important resources by establishing protective buffers to exclude unintentional disturbance. All possible efforts must be made to ensure as little disturbance as possible to the sensitive features such as surrounding woodland and riparian woodland outside the project area during construction. • During construction, sensitive habitats must be avoided by construction vehicles and equipment, wherever possible, to reduce potential impacts. Only necessary damage must be caused and, for example, unnecessary driving around in the veld or bulldozing natural habitat must not take place. • Construction activities must remain within defined construction areas. No construction / disturbance will occur outside these areas. • The project should be divided into as many phases as possible, to ensure that the exposed areas prone to erosion are minimal at any specific time. • Cover disturbed soils as completely as possible, using vegetation or other materials. • Minimize the amount of land disturbance and develop and implement stringent erosion and dust control practices. • Protect sloping areas and drainage channel banks that are susceptible to erosion and ensure that there is no undue soil erosion resultant from activities within and adjacent to the construction camp and Work Areas. • Repair all erosion damage as soon as possible to allow for sufficient rehabilitation growth. • Gravel roads to the construction sites must be well drained to limit soil erosion. • Control the flow of runoff to move the water safely off the site without destructive gully formation. • Protect all areas susceptible to erosion and ensure that there is no undue soil erosion resultant from activities within and adjacent to the construction camp and Work Areas. • Any excess or waste material or chemicals should be removed from the site and discarded in an environmentally friendly way. The ECO should enforce this rule rigorously. • Hazardous chemicals to be stored on an impervious surface protected from rainfall and storm water run-off.
	Increased Soil erosion and sedimentation	**MEDIUM**	**LOW**	
	Soil and water pollution	**MEDIUM**	**LOW**	

ASPECT	DISCUSSION AND IMPACTS	IMPACT RATING BEFORE/AFTER MITIGATION		WAY FORWARD / MITIGATION MEASURES
		BEFORE	AFTER	
				• Spill kits should be on-hand to deal with spills immediately. • All vehicles should be inspected for oil and fuel leaks on a regular basis. Vehicle maintenance yards on site should make provision for drip trays that will be used to capture any spills. Drip trays should be emptied into a holding tank and returned to the supplier.
	Air pollution	**MEDIUM**	**LOW**	• A speed limit should be enforced on dirt roads (preferably 30-40km/h). • Implement standard dust control measures, including periodic spraying (frequency will depend on many factors including weather conditions, soil composition and traffic intensity and must thus be adapted on an on-going basis) of construction areas and access roads, and ensure that these are continuously monitored to ensure effective implementation.
	Spread and establishment of alien invasive species	**MEDIUM**	**LOW**	• Control involves killing the plants present, killing the seedlings which emerge, and establishing and managing an alternative plant cover to limit re-growth and re-invasion. Weeds and invader plants will be controlled in the manner prescribed for that category by the CARA or in terms of Working for Water guidelines. The control of these species should even begin prior to the construction phase considering that small populations of these species was observed during the field surveys. • Institute strict control over materials brought onto site, which should be inspected for seeds of noxious plants and steps taken to eradicate these before transport to the site. Routinely fumigate or spray all materials with appropriate low-residual herbicides prior to transport to or in a quarantine area on site. The contractor is responsible for the control of weeds and invader plants within the construction site for the duration of the construction phase. Alien invasive tree species listed by the CARA regulations should be eradicated. • Rehabilitate disturbed areas as quickly as possible to reduce the area where invasive species would be at a strong advantage and most easily able to establish. • Institute a monitoring programme to detect alien invasive species early, before they become established and, in the case of weeds, before the release of seeds. Once detected, an eradication/control programme should be implemented to ensure that the species' do not spread to surrounding natural ecosystems.
	Negative effect of human activities on fauna and flora	**MEDIUM**	**LOW**	• No staff should be accommodated on the site. If practical, construction workers should stay in one of the nearby villages and transported daily to the site. • The ECO should regularly inspect the site, including storage facilities and compounds and eradicate any invasive or exotic plants and animals.
	Road mortalities of fauna	**LOW**	**LOW**	

ASPECT	DISCUSSION AND IMPACTS	IMPACT RATING BEFORE/AFTER MITIGATION		WAY FORWARD / MITIGATION MEASURES
		BEFORE	AFTER	
				• Maintain proper firebreaks around entire development footprint. • Educate construction workers regarding risks and correct disposal of cigarettes. • More fauna is normally killed the faster vehicles travel. A speed limit should be enforced (preferably 40 km/hour). It can be considered to install speed bumps in sections where the speed limit tends to be disobeyed. (Speed limits will also lessen the probability of road accidents and their negative consequences). • Travelling at night should be avoided or limited as much as possible.

AVIFAUNA

Direct Habitat Destruction

The construction of the Photovoltaic Power Plant, substation and access road will result in loss of and damage to natural bird habitats. During the construction phase and maintenance of this infrastructure, some habitat modification and alteration inevitably takes place. However, re-growth of grass and dwarf shrubs under the panels will take place as the mounting systems are at least 1m above ground level. At the end of the lifetime of the solar plant, structures will be removed, and natural vegetation will re-establish naturally. The lower vegetation layer underneath the solar panels will have to be cleared (slashed) of excess vegetation at regular intervals to allow access to the area for maintenance, to prevent vegetation from intruding into the legally prescribed clearance gap between the ground and the solar panels to minimize the risk of fire which can result in electrical flashovers. These activities have an impact on birds breeding, foraging and roosting in or in close proximity of the servitude through modification of habitat. Rehabilitation of some of these areas would be possible but there is likely to be long-term damage in large areas.

Most habitat destruction will be caused during the construction of the solar plant. The activities listed below are typically associated with the construction and operation of solar facilities and could have direct impacts on avifauna (County of Merced 2014):

- Preparation of solar panel areas for installation, including vegetation clearing, grading, cut and fill.
- Excavation/trenching for water pipelines, cables, fibre-optic lines, and the septic system.
- Construction of piers and building foundations.
- Construction of new dirt or gravel roads and improvement of existing roads.
- Temporary stockpiling and side-casting of soil, construction materials, or other construction wastes.
- Soil compaction, dust, and water runoff from construction sites.
- Increased vehicle traffic.
- Short-term construction-related noise (from equipment) and visual disturbance.
- Degradation of water quality in drainages and other water bodies resulting from project runoff.
- Maintenance of fire breaks and roads.
- Weed removal, brush clearing, and similar land management activities related to ongoing operation of the project.

Habitat Fragmentation

Description of impact:

The development will have a relatively small impact on the natural movement patterns and fragmentation of avifauna habitats. Such impacts would however be temporary in the solar plant site.

ASPECT	DISCUSSION AND IMPACTS	IMPACT RATING BEFORE/AFTER MITIGATION		WAY FORWARD / MITIGATION MEASURES
		BEFORE	AFTER	
	<u>Collisions With Solar Panels And / Or Powerlines Associated For The Solar Plant</u> Collisions are the biggest single threat posed by transmission lines to birds in southern Africa (van Rooyen 2004). Most heavily impacted upon are bustards, storks, cranes and various species of water birds. These species are mostly heavy-bodied birds with limited manoeuvrability, which makes it difficult for them to take the necessary evasive action toavoid colliding with solar panels (van Rooyen 2004, Anderson 2001). "The collision risk posed by power lines is complex and problems are often localised. While any bird flying near a power line is at risk of collision, this risk varies greatly between different groups of birds, and depends on the interplay of a wide range of factors (APLIC 1994). Bevanger (1994) described these factors in four main groups – biological, topographical, meteorological and technical. Birds at highest risk are those that are both susceptible to collisions and frequently exposed to power lines, with waterbirds, gamebirds, rails, cranes and bustards usually the most numerous reported victims (Bevanger 1998, Rubolini et al. 2005, Jenkins et al. 2010). Topography and weather conditions affect how birds use the landscape. Power lines in sensitive bird areas (e.g., those that separate feeding and roosting areas, or cross flyways) can be very dangerous (APLIC 1994, Bevanger 1994). Lines crossing the prevailing wind conditions can pose a problem for large birds that use the wind to aid take-off and landing (Bevanger 1994). Inclement weather can disorient birds and reduce their flight altitude, and strong winds can result in birds colliding with power lines that they can see but do not have enough flight control to avoid (Brown et al. 1987, APLIC 1994). The technical aspects of power line design and siting also play a big part in collision risk. Grouping similar power lines on a common servitude or locating them along other features such as tree lines, are both approaches thought to reduce risk (Bevanger 1994). In general, low lines with short span lengths (i.e., the distance between two adjacent pylons) and flat conductor configurations are thought to be the least dangerous (Bevanger 1994, Jenkins et al. 2010). On many higher voltage lines, there is a thin earth (or ground) wire above the conductors, protecting the system from lightning strikes. Earth wires are widely accepted to cause most collisions on power lines with this configuration because they are difficult to see, and birds flaring to avoid hitting the conductors often put themselves directly in the path of these wires (Brown et al. 1987, Faanes 1987, Alonso et al. 1994a, Bevanger 1994)." Solar installations often feature large areas of reflective panelling. Any vertical, reflective surfaces may confuse approaching birds to think it is dams or other water sources with the result that the birds are killed in collisions with such surfaces. Other bird species may seek to benefit from the solar installations, using the erected structures as prominent perches, sheltered roost sites or even nesting or foraging sites. Such scenarios might be associated with fouling of critical components in the solar array, bringing local bird populations into conflict with the facility operators. Unfortunately, many of the collision sensitive species are considered threatened in southern Africa. The Red Data species vulnerable to collisions are generally long living, slow reproducing species under natural conditions. Some require very specific conditions for breeding, resulting in very few successful breeding attempts, or breeding might be restrictedto very small areas. These species have not evolved to cope with high adult mortality, with the results that consistent high adult mortality over an extensive period could have a serious effect on a population's ability to sustain itself in the long or even medium term. Many of the anthropogenic threats to these species are non-discriminatory as far as age is concerned (e.g., habitat destruction, disturbance) and therefore contribute to adult mortality, and it is not known what the cumulative effect of these impacts could be over the long term. This impact will only apply during the operational phase of the proposed development. <u>Disturbance Through Human Activities, Noise And Fires</u> Construction and maintenance activities impact on birds through disturbance, particularly during breeding activities. An increase in human activity on the site and surrounding areas is anticipated, especially during the construction phase of the solar plant. Birds will move out of the area during construction activities because of noise disturbance. The presence of many construction workers or regular workers during the construction phase on site over a protracted period will result in a greatly increased risk of uncontrolled fires which will cause birds to temporarily move out of the area, but to return to forage on these areas once the fire has ceased.			
AVIFAUNA	Direct habitat destruction	**MEDIUM**	**LOW**	The removal of vegetation should only occur on the footprint area of the development and not over the larger area. The clearing and damage of plant growth in these areas should be restricted to the footprint way leave area.

ASPECT	DISCUSSION AND IMPACTS	IMPACT RATING BEFORE/AFTER MITIGATION		WAY FORWARD / MITIGATION MEASURES
		BEFORE	AFTER	
				Clearly demarcate the entire development footprint prior to initial site clearance and prevent construction personnel from leaving the demarcated area. Monitoring should be implemented during the pre- and post-construction phase of the Solar Plant and powerlines to ensure that minimal impact is caused to the avifauna of the area. The monitoring should be conducted by a suitable avifauna specialist. Construction of the power line close to existing power lines should to a certain extent eliminate the need for new access roads and gates etc. This would reduce the level of disturbance and habitat destruction. In addition, birds in the immediate vicinity of the existing power line would already be relatively tolerant of disturbance because of maintenance activities on the already established lines. Landscape management at the site needs to consider different objectives, including • Maintaining pre-existing land uses. • Conserving and restoring natural habitats. • Managing land for priority species. • Hunting of birdlife should be prohibited on site. • Facilitating post-construction monitoring. For best results, vegetation management should be carefully planned, discussed with stakeholders, and recorded within the project's Environmental Management Plan.
	Habitat fragmentation	**MEDIUM**	**MEDIUM**	Use existing facilities (e.g., access roads) to the extent possible to minimize the amount of new disturbance. Ensure protection of important resources by establishing protective buffers to exclude unintentional disturbance. All possible efforts must be made to ensure as little disturbance as possible to sensitive bird habitats during construction. During construction, sensitive habitats must be avoided by construction vehicles and equipment, wherever possible, to reduce potential impacts. Only necessary damage must be caused and, for example, unnecessary driving around in the veld or bulldozing natural habitat must not take place. Construction activities must remain within defined construction areas and the road servitudes. No construction / disturbance will occur outside these areas.
	Disturbance through human activities, noise and fires	**MEDIUM**	**LOW**	Care should always be taken to disturb the receiving environment as little as possible. Careful control of construction workers movements must be always maintained. Staff that will stay on site should be accommodated in one location of the site to ensure that the impact will be minimal on the larger area. Construction activities must remain within defined construction areas and the road servitudes. No construction / disturbance will occur outside these areas.

ASPECT	DISCUSSION AND IMPACTS	IMPACT RATING BEFORE/AFTER MITIGATION		WAY FORWARD / MITIGATION MEASURES
		BEFORE	AFTER	
				Construction activities must be restricted to working hours Monday to Saturday, unless otherwise approved by the appropriate competent person in consultation with the affected residents. Educate workers regarding the occurrence of important resources in the area and the importance of protection. Instruct employees, contractors, and site visitors to avoid harassment and disturbance of wildlife, especially during reproductive (e.g., courtship, nesting) seasons. In addition, control pets to avoid harassment and disturbance of wildlife. Campfires at construction sites must be strictly controlled to ensure that no veld fires are caused. Noise levels will be kept within acceptable limits by: ○ Limiting of speed of haulage vehicles/tippers. ○ Compliance with appropriate noise legislation must take place.
Generally, the value and significance of archaeological and other heritage sites might be impacted on by any activity that would result immediately or in the future in the destruction, damage, excavation, alteration, removal or collection from its original position, of any archaeological material or object (as indicated in the National Heritage Resources Act (No 25 of 1999)). Thus, the destructive impacts that are possible in terms of heritage resources would tend to be direct, once-off events occurring during the initial construction period. However, in the long run, the proximity of operations in any given area could result in secondary indirect impacts. The EIA process therefore specifies impact assessment criteria which can be utilised from the perspective of a heritage specialist study which elucidates the overall extent of impacts.				
HERITAGE	Archaeology	**LOW**	**LOW**	• Short-term Site Monitoring: Monitoring of site clearing and earth moving during initial stages of the development to detect the presence of possible heritage resources in the project area. • General Site Monitoring: Regular examination of trenches and excavations for the total duration of construction.
	Built environment, Cultural Landscape, Graves / Human Burials Sites	**LOW**	**LOW**	• No mitigation necessary
VISUAL A viewshed analysis was undertaken from various vantage points around the proposed intervention area. The spatial pattern generated by the viewshed analysis is illustrated in Figure 10 'Visual Exposure' and indicates areas from which the project can potentially be seen. The viewshed analysis of the proposed components indicates a low visibility from the Spitskop koppies located to the south-west of the proposed project as well as a small area west of the proposed site. Due to the topography and vegetation the proposed intervention would be almost entirely screened.				

ASPECT	DISCUSSION AND IMPACTS	IMPACT RATING BEFORE/AFTER MITIGATION		WAY FORWARD / MITIGATION MEASURES
		BEFORE	AFTER	
Visual exposure is rated using four increments of severity, each with their respective qualification and contribution to visual impact. The visual exposure curve in Figure 10 'Visual Exposure' graphically (Appendix F8) illustrates these increments. As previously stated the area has a rustic and pastoral sense of place. This character is degraded by manmade structures such as the roads, power lines, substation and telecommunications infrastructure in close proximity to the study area. There is no other project of this nature within the vicinity of the study area. The sensitive visual receptors would include the residents of Northam and those on farmsteads as well as guests in lodges and B&B's in close proximity to the proposed intervention of the proposed site.				
VISUAL	Visibility	**LOW**	**LOW**	• Due to the topography and vegetation the proposed intervention would be almost entirely screened. • Thus, even though, the proposed intervention would be classified as being in the fore, middle and background for the residential areas, farmsteads, game lodges, B&B's and major roads closest to the proposed intervention it can be rated as having an ***insignificant*** visual exposure for these components.
	Visual Exposure	**LOW**	**LOW**	
	Visual intrusion	**LOW**	**LOW**	
	Sensitivity of Visual Receptors	**LOW**	**LOW**	
OPERATIONAL PHASE				
SOIL	Soil chemical pollution as a result of exhaust emissions, hydrocarbon spills and improper management of domestic waste.	**MEDIUM**	**LOW**	• Timeous clean-up of spills. • Proper waste management.
	Soil compaction as a result of vehicle movement, localised within road and street reserves	**MEDIUM**	**MEDIUM**	• Keep project footprint as small as possible. • Use existing roads as far as possible
	Soil erosion still possible on all uncovered soil surfaces	**MEDIUM**	**LOW**	• Harvest rainwater from roofs into rainwater tanks to reduce runoff. • Landscape open public areas in such a way as to reduce runoff. • Encourage residents to vegetate their garden spaces.
	Land capability and land use of areas covered by roads and houses will be lost/changed forever.	**MEDIUM**	**MEDIUM**	• Suburban gardens can still retain the original land use and land capability.

ASPECT	DISCUSSION AND IMPACTS	IMPACT RATING BEFORE/AFTER MITIGATION		WAY FORWARD / MITIGATION MEASURES
		BEFORE	AFTER	
AVIFAUNA	Collisions with solar panels and / or powerlines associated for the solar plant	**MEDIUM**	**LOW**	• Specialist advice should be sought in devising effective avian deterrents to minimize associated damage. • Preconstruction Monitoring needed to determine the presence of Threatened, Rare, Endemic or Range Restricted bird species. Please refer to section on previous results from avifauna studies in the area as reference, as well as the avifauna monitoring programme. • Mitigation of this risk involves the careful selection of low impact alignments for new power lines relative to bird movements and avoidance of concentrations of high-risk species. Where this cannot be avoided, the use of static or dynamic marking devices to make the lines, (the narrow earth wires at the top of the cable network), more conspicuous are needed. While various marking devices have been used globally, many remain untested in terms of reducing collisions. Those that have been only partially effective (Drewitt & Langston 2008, Jenkins et al. 2010). • Land management practices should not attract raptors or other species vulnerable to collision. Structures should be designed to reduce the availability of perching sites. • Ensure that sites are close to existing power lines, so that few new lines are required. • The impact of collision of birds is partially mitigated for by placing new infrastructure close to existing lines because the more overhead power lines and other associated infrastructure there are together, the more visible they would be to the birds in the area (Avian Power Line Interaction Committee - 1994). The high-risk sections of line should be marked with suitable anti-collision marking devices on the earth wire as per the Eskom guidelines. Since the assumption is that birds collide with overhead cables because they cannot see them, fitting the cables with devices to make them more visible to birds in flight has become the preferred mitigation option worldwide. Besides thickening, coating or colouring the often least visible thin ground wires, a wide range of potential 'line marking' devices has evolved over the years, including spheres, swinging plates, spiral vibration dampers, strips, swan flight diverters, Firefly Bird Flight Diverters, bird flappers, aerial marker spheres, ribbons, tapes, flags, fishing floats, aviation balls and crossed bands. The design and technical aspects of using devices on the power line should consider the following: o Line markers should be as large as possible and increase the visible thickness of the line by at least 20 cm, for a length of at least 10-20cm. o Spacing of devices should be not more than 5-10 m apart. o Line markers should incorporate as much contrast with relevant backgrounds as possible. o Colour is probably less important than contrast. o Movement of the device is likely to be important. o Markers that protrude vertically both above and below the cable are likely important.

ASPECT	DISCUSSION AND IMPACTS	IMPACT RATING BEFORE/AFTER MITIGATION		WAY FORWARD / MITIGATION MEASURES
		BEFORE	AFTER	
				o Since we suspect that many collisions may occur at night, devices that are nocturnally visible (through illumination, ultraviolet radiation and other means) would be advantageous. Although bearing in mind what is known about birds being attracted to illuminated objects. Line design: Although different bird species fly at different heights above the ground, there is consensus that the lower power line cables are to the ground, the better for preventing bird collision (Photograph 8). There is also consensus that less vertical separation of cables is preferred as it poses less of an 'obstacle' for birds to collide with. Horizontal separation of conductors is therefore preferred.
CUMULATIVE IMPACTS Avifauna Cumulative impacts • Ecological Assessment: Impacts on habitat resulting in loss, degradation and / or fragmentation. • Ecological Assessment: habitat is destroyed or altered by the development. Ecological Assessment: Impact on natural environmental processes and ecosystem functioning.				
ECOLOGICAL	Loss, degradation and / or fragmentation.	**MEDIUM**	**LOW**	Some of the red data and other mammal species have a low probability of occurring in the area because of the following: • The anthropogenic influences of the farms in the area will cause some fauna to migrate from the area to more natural areas with less disturbance. • Habitat not being suitable or marginal. The habitat of many of the red data species would be in the riparian woodland of the water courses and potentially also in the wetlands during the rainy season. No impact will occur on these areas. If one considers the habitat descriptions of the red data species, some of them are limited in range or threatened as a direct result of habitat loss in the southern African sub region, although many of the species in the table above are not limited by direct habitat loss due to their widespread occurrence (e.g., martial eagles have large home ranges). The area in general is quite homogenous due to the township areas to the north and east of the solar plant which resulted in the habitat becoming fragmented. The protection of surrounding habitat types in the area will be important to ensure the survival of the different animals due to each species' individual needs and requirements. Sufficient natural corridor sections should be protected around the development footprint areas to allow fauna to move freely between the different vegetation units in the larger area. The development of the housing units will influence the natural feeding and movement patterns of the existing fauna in the area, although not to a significant extent.
	Habitat destroyed or altered by the development.	**MEDIUM**	**LOW**	
	Natural environmental processes and ecosystem functioning.	**MEDIUM**	**LOW**	

ASPECT	DISCUSSION AND IMPACTS	IMPACT RATING BEFORE/AFTER MITIGATION		WAY FORWARD / MITIGATION MEASURES
		BEFORE	AFTER	
AVIFAUNA	Avifaunal Assessment: Disturbance through human activities	**MEDIUM**	**LOW**	Where trenches pose a risk to bird safety, they should be adequately cordoned off to prevent ground-living birds falling in and getting trapped and/or injured. This could be prevented by the constant excavating and backfilling of trenches during construction process. No birds may be poached during the construction of the solar plant development. Many birds are protected by law and poaching, or other interference could result in a fine or jail term. Do not feed any birds on site. The occurrence of the vulture species will be influenced by the availability of carcasses and adequate roosting and nesting sites on the property. Poisons for the control of problem animals should rather be avoided since the wrong use thereof can have disastrous consequences for the vulture species as well as other birds of prey occurring in the area. The use of poisons for the control of rats, mice or other vermin should only be used after approval from an ecologist. The habitat and feeding grounds of the water birds would be on the peripheral areas of the wetlands. Monitoring of the environmental aspects should be done over the longer term to ensure that impacts are limited to a minimum during the constructional and operational phases. Monitoring of bird mortalities at powerlines in the area and SCC are necessary to ensure that threatened species would be less affected over the longer term by the development. Information on red data species should be provided to construction workers to make them more aware of these fauna and their behaviour. **The monitoring guidelines for future montoring of the renewable energy project should be used as guideline by Birdlife SA, while a monitoring programme is described in Section 6 of this report.**
VISUAL	Landscape transformation, visual effects	**MEDIUM**	**MEDIUM**	The implementation of the proposed development adjacent to the east would reduce the negative impact of lighting at night from the proposed Solar Park project. This is due to the fact that the lights of the proposed project will cumulatively add to the effect of the night lights from the Solar Park project.

11.3 Cumulative impacts

The cumulative impacts of each of the possible impacts are also assessed hereunder.

11.3.1 Terrestrial Biodiversity

- The cumulative negative impacts of the proposed development site during future development will be moderate to low. Ongoing management of the area should take the mitigation and management actions into consideration to minimize impacts on faunal populations of the area.
- A speed limit should be imposed on the roads to minimise road kills. Speed humps should be constructed at strategic places along the access road to enforce lower speeds.
- Hunting, trapping, poisoning and shooting of animals should be prevented.
- Poisons for the control of problem animals should rather be avoided since the wrong use thereof can have disastrous consequences for the vulture birds of prey occurring in the area. The use of poisons for the control of rats, mice or other vermin should only be used after approval from an ecologist.
- Monitoring of the environmental aspects should be done over the longer term to ensure that impacts are limited to a minimum.

11.3.2 Avian

- The cumulative negative impact of the development on the fauna has the potential to be moderate. However, considering the following general mitigation and management actions taken on site during construction, the impact on avifauna populations should be low.
- Where trenches pose a risk to bird safety, they should be adequately cordoned off to prevent ground-living birds falling in and getting trapped and/or injured. This could be prevented by the constant excavating and backfilling of trenches during construction process.
- No birds may be poached during the construction of the solar plant development. Many birds are protected by law and poaching, or other interference could result in a fine or jail term.
- Do not feed any birds on site.
- The occurrence of the vulture species will be influenced by the availability of carcasses and adequate roosting and nesting sites on the property. Poisons for the control of problem animals should rather be avoided since the wrong use thereof can have disastrous consequences for the vulture species as well as other birds of prey occurring in the area. The use of poisons for the control of rats, mice or other vermin should only be used after approval from an ecologist.
- The habitat and feeding grounds of the water birds would be on the peripheral areas of the wetlands.
- Monitoring of the environmental aspects should be done over the longer term to ensure that impacts are limited to a minimum during the constructional and operational phases. Monitoring of bird mortalities at powerlines in the area and SCC are necessary to ensure that threatened species would be less affected over the longer term by the development. Information on red data species should be provided to construction workers to make them more aware of these fauna and their behaviour.
- The monitoring guidelines for future montoring of the renewable energy project should be used as guideline by Birdlife SA, while a monitoring programme is described in Section 6 of this report.

11.3.3 Visual

Cumulative landscape and visual effects (impacts) result from additional changes to the landscape or visual amenity caused by the proposed development in conjunction with other developments (associated with or separate to it), or actions that occurred in the past, present or are likely to occur in the foreseeable future. They may also affect the way in which the landscape is experienced. Cumulative effects may be positive or negative. Where they comprise a range of benefits, they may be considered to form part of the mitigation measures.

Cumulative effects can also arise from the intervisibility (visibility) of a range of developments and /or the combined effects of individual components of the proposed development occurring in different locations or over a period of time. The separate effects of such individual components or developments may not be significant, but together they may create an unacceptable degree of adverse effect on visual receptors within their combined visual envelopes. Intervisibility depends upon general topography, aspect, tree cover or other visual obstruction, elevation and distance, as this affects visual acuity, which is also influenced by weather and light conditions. (Institute of Environmental Assessment and The landscape Institute (1996)).

11.4 Overall cumulative assessment

The overall positive impact of the proposed project as well as other approved projects in the area, on electricity constraints within both the local municipal as well as the larger district area will be highly beneficial to all as a reliable source of electricity. This improvement in a reliable electricity source, is in alignment with the strategic objectives of the TLM and LDM.

The cumulative impacts of the proposed developments in relation to the previously approved developments within a 30 km radius. The Limpopo Development Plan spells out its transition to an environmentally sustainable, climate change-resilient, low-carbon economy and just society, which will be well under way by 2030. The findings of the Socio-economic Specialist Assessment indicates that the Limpopo Province currently has 3 renewable energy projects that cumulatively generate 118MW. All of them are solar energy projects and they are in commercial operation.

This project comprises of a footprint size of 316 ha. The total area of the 30 km radius (Platinum Solar Park (30 MW) and Allied Farms Solar Park (10 MW)) around the proposed projects equates to approximately 284 000 ha of similar habitat. Therefore, the combined footprints of the proposed approved developments will be approximately 2.58% of the available habitat found within the 30 km radius. The cumulative impacts as a result of the approval of the proposed developments will be low.

Table 11-3. Other solar parks within 30km of the study area

Name	MW	Distance
Platinum Solar Park	30 MW	26,9km
Allied Farms Solar Park	10 MW	25,7km

12. ENVIRONMENTAL IMPACT STATEMENT

12.1 A summary of key findings of the environmental impact assessment.

12.1.1 Planning and design phase

Planning and design are necessary to ensure that mitigation and impact management can be effectively implemented and minimise impacts in future. The planning and design phase of the solar plant will involve the following actions:

- Layout avoidance of sensitive soil types associated with soils with high erosion / compaction risk.
- No specific direct impacts will occur on the soils of the area during this phase.

The proposed development should avoid sensitive areas such as wetland and riverine areas, while also allowing corridors of indigenous woodland on areas outside the development footprint to be preserved. Where sensitive areas of natural vegetation cannot be avoided, a few mitigation measures have been recommended to minimise and/or offset impacts (licence application for eradication of protected species.). Negative impacts can be minimised by strict enforcement and compliance with an Environmental Management Plan which considers the recommendations for managing impacts detailed above.

12.1.2 Construction phase

Construction work for the proposed development will always carry a risk of soil and water pollution, with large construction vehicles contributing substantially due to oil and fuel spillages. If not promptly dealt with, spillages or accumulation of waste matter can contaminate the soil and surface or ground water, leading to potential medium/long-term impacts on fauna and flora. During the constructional phase heavy machinery and vehicles would be the main contributors to potential pollution problems.

The construction phase of the development and associated infrastructure will result in loss of and damage to natural habitats if the vegetation is cleared for the development of the solar plant. Rehabilitation of some areas would be possible but there is likely to be long-term damage in large areas. Most habitat destruction will be caused during the construction phase. Vegetation communities are likely to be impacted on a small spatial scale in comparison to the extent of the vegetation communities' total area in the region.

The impacts associated with the proposed development on the agro-ecosystem capability will be lower with only marginal erosion risks that can be managed though proper mitigation measures on the undulating part of the site. The mitigation of the overall impacts on soils (compaction, erosion) will be easier on these flatter areas. Soil erosion promotes a variety of terrestrial ecological changes associated with disturbed areas, including the establishment of alien invasive plant species, altered plant community species composition and loss of habitat for indigenous flora.

The construction will lead to the loss of individual plants such as grasses, forbs, trees, and shrubs that will be cleared on the footprint area. This will mostly occur during the construction phase. Due to habitat

loss and construction activities animals will migrate from the construction area and animal numbers will decrease.

The anticipated loss of some of the natural habitats that support endemic species will result in the local displacement of endemic listed flora. The anticipated loss of the natural woodland will result in the local displacement of some fauna species. In some cases, isolated populations of threatened fauna might be removed from the area, although no such populations or knowledge thereof was found in the study area.

It is expected that the faunal species composition will shift, due to an anticipated loss in habitat surface area. In addition, it is predicted that more generalist species (and a loss of functional guilds) will dominate the study area. Attempts to rehabilitate will attract taxa with unspecialized and generalist life-histories. It is predicted that such taxa will persist for many years before conditions become suitable for succession to progress.

The construction of the development and associated infrastructure will result in natural movement patterns being disrupted for a limited period and, to a varying degree depending on how different species react to these barriers will result in the fragmentation of natural populations, although the impact will be minimal and restricted to the construction phase.

The environmental impacts of wind-borne dust, gases and particulates from the construction activities associated with the proposed development are primarily related to human health and ecosystem damage.

Dust pollution will impact the most severe during the construction phase. Construction vehicles and equipment are the major contributors to the impact on air quality. Dust is generated during site clearance for the construction of infrastructure. Diesel exhaust gasses and other hydrocarbon emissions all add to the deterioration in air quality during this phase. Vehicles travelling at high speeds on dirt roads significantly aggravate the problem. Although the potential for severe fugitive dust impacts is greatest within 100 m of dust-generating activities, there is still the potential for dust to affect vegetation up to five kilometres or more downwind from the source. Dust deposited on the ground may cause changes in soil chemistry (chemical effects) and may over the long-term result in changes in plant chemistry, species composition and community structure. Sensitivities to dust deposition of the various plant species present in the area are not known. It is therefore difficult to predict which species may be susceptible. Poor air quality results in deterioration of visibility and aesthetic landscape quality of the region, particularly in winter due to atmospheric inversions.

Continued movement of vehicles on and off the site during the construction phase will result in a risk of importation of alien species. Vehicles often transport many seeds, and some may be of invader species, which may become established along the access road, especially where the area is disturbed. The construction carries by far the greatest risk of alien invasive species being imported to the site, and the high levels of habitat disturbance also provide the greatest opportunities for such species to establish themselves, since most indigenous species are less tolerant of disturbance. The biggest risk is that seeds

of noxious plants may be carried onto the site along with materials that have been stockpiled elsewhere at already invaded sites.

12.1.3 Operational phase

The Phufane Spruit, running through the property, will be crossed at two points. Low-level bridge crossings will be achieved using suitable corrugated iron culverts on a 1:1 year flood return period. The structures associated with the stream crossings, which will consist of (1.5m x 1.5m) culverts, will allow for the free movement of all aquatic organisms and the faunal species, amphibians and insects that might occur in the riparian zone. The vertical alignment of the roads will not present any significant challenges due to the flatness of the terrain so that no deep cuts or fills will be required, except at the stream crossing where corrugated iron culverts will be installed.

12.1.4 Decommissioning phase

The decommissioning phase is associated with activities related to the demolition of infrastructure and the rehabilitation of disturbed areas. The total rehabilitation will ensure that the total area will be a free draining covered with topsoil and grassed. The following activities are associated with the decommissioning phase:

- Existing buildings and structures demolished, rubble removed and the area levelled;
- Remaining exposed excavated areas filled and levelled using overburden recovered from stockpiles;
- Topsoil replaced using topsoil recovered from stockpiles; and
- Land and permanent waste piles prepared for re-vegetation.

Possible sources of fugitive dust emission during the closure and post-closure phase include:

- Smoothing of stockpiles by bulldozer;
- Grading of sites;
- Transport and dumping of overburden for filling;
- Infrastructure demolition;
- Infrastructure rubble piles;
- Transport and dumping of building rubble;
- Transport and dumping of topsoil; and
- Preparation of soil for re-vegetation – ploughing and addition of fertiliser, compost etc.

12.2 Key issues and assessment thereof

Table 12-1 provides an impact assessment of the environmental negative and positive risks associated with the proposed solar park development during construction, Table 12-2 includes the impacts during operational phase and Table 12-3 the cumulative impacts.

Table 12-1. Summary of impacts during the construction phase

Impact	Status	Extent	Duration	Severity	Frequency	Probability of occurrence	Significance without mitigation	Significance with mitigation
Ecological Assessment (excluding avifaunal and wetland): Habitat destruction & Fragmentation	Negative	1	5	3	2	5	63	MEDIUM	LOW
Ecological Assessment: Soil erosion and sedimentation	Negative	3	5	3	3	5	88	MEDIUM	LOW
Ecological Assessment (excluding wetland): Dust pollution	Negative	2	3	3	4	5	72	MEDIUM	LOW
Ecological Assessment: Spillages of harmful substances	Negative	3	4	3	4	2	60	MEDIUM	LOW
Ecological Assessment (excluding wetland): Spreading of alien invasive species	Negative	2	3	3	4	4	64	MEDIUM	LOW
Ecological Assessment (excluding wetland): Negative effect of human activities on fauna and flora	Negative	1	3	5	2	4	54	MEDIUM	LOW
Ecological Assessment: Road mortalities of fauna	Negative	2	3	2	2	4	42	LOW	LOW
Agricultural Assessment: Loss of high agricultural potential ground	Negative	1	3	4	3	5	64	MEDIUM	MEDIUM
Heritage Assessment: Archaeology	Negative	2	2	3	1	5	42	LOW	LOW
Heritage Assessment: Built Environment	Negative	2	2	3	1	5	42	LOW	LOW
Heritage Assessment: Cultural Landscape	Negative	2	2	3	1	5	42	LOW	LOW
Heritage Assessment: Human Burial Sites	Negative	2	2	3	1	5	42	LOW	LOW
Wetland & Riparian Impact Assessment: Dust contamination	Negative	2	2	2	3	5	48	LOW	LOW
Wetland & Riparian Impact Assessment: Import and spread of alien invasive vegetation	Negative	1	2	3	3	5	48	LOW	LOW
Wetland & Riparian Impact Assessment: Soil and Water pollution	Negative	1	2	2	3	5	40	LOW	LOW
Wetland & Riparian Impact Assessment: Soil Erosion	Negative	1	1	2	2	5	28	LOW	LOW

Impact	Status	Extent	Duration	Severity	Frequency	Probability of occurrence	Significance without mitigation	Significance with mitigation
Wetland & Riparian Impact Assessment: Habitat destruction	Negative	2	2	2	2	5	42	LOW	LOW
Visual impact	Negative	2	5	1	5	5	80	MEDIUM	MEDIUM
Avifaunal Assessment: Direct habitat destruction	Negative	1	5	5	2	5	77	MEDIUM	LOW
Avifaunal Assessment: Habitat fragmentation (birds)	Negative	2	5	5	2	5	84	MEDIUM	MEDIUM
Avifaunal Assessment: Collisions	Negative	1	4	5	1	4	50	MEDIUM	LOW
Avifaunal Assessment: Disturbances through human activities, noise and fires	Negative	2	4	5	2	5	77	MEDIUM	LOW
General: Pollution due of surface and groundwater due to chemical, oil and fuel spills	Negative	1	2	3	3	3	36	LOW	LOW
General: Traffic Control Impacts	Negative	2	2	3	2	5	49	LOW	LOW
General: Dust, noise and waste generated during construction	Negative	2	3	2	3	5	56	MEDIUM	LOW
Socio-economic Assessment - Promotion of the Solar Energy Value Chain	Positive	3	5	4	5	4	108	HIGH	HIGH
Socio-economic Assessment - Job Creation and Skills Development	Positive	2	5	4	5	5	110	HIGH	HIGH
Socio-economic Assessment - Crime and Social Disruption	Negative	2	5	3	4	3	70	MEDIUM	LOW

Table 12-2. Summary of impacts during the operational phase.

Impact	Status	Extent	Duration	Severity	Frequency	Probability of occurrence	Significance without mitigation	Significance with mitigation
Ecological Assessment: Construction of infrastructure, access roads etc.	Negative	2	2	2	3	4	42	**LOW**	**LOW**
Ecological Assessment: Road mortalities of fauna	Negative	1	3	3	3	3	42	**LOW**	**LOW**
Ecological Assessment: Spreading of alien invasive species	Negative	2	3	2	3	4	49	**LOW**	**LOW**
Heritage Assessment: Archaeology	Negative	2	2	3	1	5	42	**LOW**	**LOW**
Heritage Assessment: Built Environment	Negative	2	2	3	1	5	42	**LOW**	**LOW**
Heritage Assessment: Cultural Landscape	Negative	2	2	3	1	5	42	**LOW**	**LOW**
Heritage Assessment: Human Burial Sites	Negative	2	2	3	1	5	42	**LOW**	**LOW**
Agricultural Assessment: Loss of high agricultural potential ground	Negative	1	5	4	1	5	60	**MEDIUM**	**LOW**
Wetland & Riparian Impact Assessment: Rehabilitation of cleared land	Positive	2	5	4	4	4	88	**MEDIUM**	**HIGH**
Wetland & Riparian Impact Assessment: Soil Erosion and Sedimentation	Negative	2	3	2	1	5	42	**LOW**	**LOW**
Wetland & Riparian Impact Assessment: Soil and Water pollution	Negative	2	1	2	2	5	35	**LOW**	**LOW**
Wetland & Riparian Impact Assessment: Dust contamination	Negative	2	1	2	2	5	35	**LOW**	**LOW**
Wetland & Riparian Impact Assessment: Import and spread of alien invasive vegetation	Negative	1	3	1	1	5	30	**LOW**	**LOW**
Visual impact	Negative	2	5	1	5	5	80	**MEDIUM**	**MEDIUM**

Impact	Status	Extent	Duration	Severity	Frequency	Probability of occurrence	Significance without mitigation	Significance with mitigation
General: Traffic Control Impacts	Negative	1	5	2	1	3	32	**LOW**	**LOW**
Socio-economic Assessment - Contribution to the Constrained National Electricity Grid	Positive	3	5	4	5	5	120	**HIGH**	**HIGH**
Socio-economic Assessment - Capital Formation and Investment Attraction	Positive	3	5	4	5	5	120	**HIGH**	**HIGH**
Socio-economic Assessment - Reduction in CO2 Emissions per Unit of Electricity Generated	Positive	3	4	3	5	5	100	**HIGH**	**HIGH**
Socio-economic Assessment - Lower Tariffs per Unit will Reduce Inflationary Pressure	Positive	3	3	3	3	4	63	**MEDIUM**	**MEDIUM**
Socio-economic Assessment - Promotion of the Solar Energy Value Chain	Positive	5	5	4	4	4	112	**HIGH**	**HIGH**
Socio-economic Assessment - Job Creation and Skills Development	Positive	2	5	1	5	5	80	**MEDIUM**	**MEDIUM**
Socio-economic Assessment - Community Development	Positive	3	3	3	3	4	63	**MEDIUM**	**MEDIUM**
Socio-economic Assessment - Risk of Vandalism	Negative	2	5	1	3	3	48	**LOW**	**LOW**

Table 12-3. Cumulative impacts during the operational phase

Impact	Nature	Extent	Duration	Severity	Frequency	Probability of occurrence	Significance without mitigation	Significance with mitigation
• Cumulative impacts include all proposed and existing renewable energy projects within a 30 km radius around the study areas.								
Additional solar panel farms within 30km radius from the site	Positive	3	4	4	5	5	110	**HIGH**
Ecological Assessment: Impacts on habitat resulting in loss, degradation and / or fragmentation.	Negative	3	4	2	3	3	54	**MEDIUM**
Ecological Assessment: habitat is destroyed or altered by the development.	Negative	3	4	3	3	2	50	**MEDIUM**
Ecological Assessment: Impact on natural environmental processes and ecosystem functioning.	Negative	3	4	4	3	2	55	**MEDIUM**
Avian Assessment: Disturbance through human activities	Negative	3	3	3	5	5	90	**MEDIUM**

12.3 A map superimposing the proposed activity and its associated structures and infrastructure on environmental studies, indicating which areas should be avoided, including buffers

Following the ecological surveys, the classification of the study area into different sensitivity classes and development zones was based on information collected at various levels on different environmental characteristics. Factors which determined sensitivity classes were as follows:

- Presence, density and potential impact of development on rare, endemic and protected plant species.
- Conservation status of vegetation units.
- Soil types, soil depth and soil clay content.
- Previous land-use.
- State of the vegetation in general as indicated by indicator species.

Figure 12-1 indicates how the proposed development will impact on the areas of the study area that has been identified as sensitive by the specialists as described in Section 7 and Section 12.

The floodline and riparian zone was identified as of high sensitivity. The proposed 32m buffer has been extended to a staggered buffer with distances of 50-200 m to be implemented along the Phufane River (Figure 12-1). The Phufane Spruit, running through the property, will be crossed at two points. Low-level bridge crossings will be achieved using suitable corrugated iron culverts on a 1:1 year flood return period. The structures associated with the stream crossings, which will consist of (1.5m x 1.5m) culverts, will allow for the free movement of all aquatic organisms and the faunal species, amphibians and insects that might occur in the riparian zone.

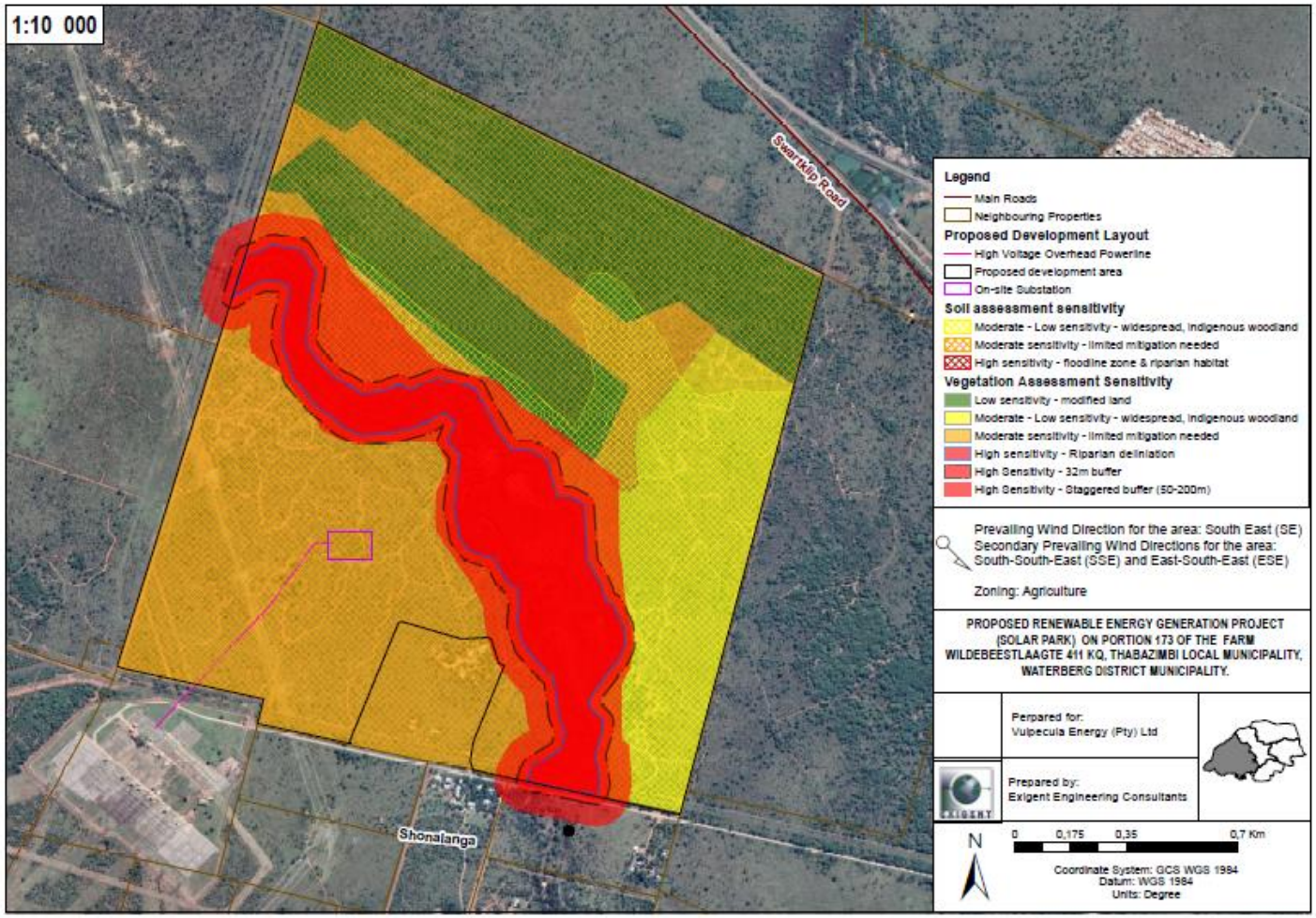

Figure 12-1. Sensitivity map

13. SPECIALIST RECOMMENDATION FOR INCLUSION INTO EMPr AND AUTHORISATION CONDITIONS

Specialists made specific recommendations which need to be considered for inclusion into the EMPR as well as potential authorisation conditions. These items were extracted from the various specialist studies and have been included below.

13.1 Agricultural Agro-ecosystem Impact Assessment

Mitigation measures are provided that would reduce these impacts from a higher to a lower significance. Furthermore, the proposed layout plan of the solar development should be consistent with the agro-ecosystem maps and recommendations stipulated in this report, and the impact on the sensitive soil forms on site should be kept to a minimum.

13.2 Terrestrial biodiversity, Plant and Animal Species Impact Assessment

- Maintaining due cognisance of the integrity and accuracy of the ecological survey, it should be stated that the ecological resources identified during the study do not necessarily represent all the ecological resources present on the property.
- To obtain a comprehensive understanding of the dynamics of communities and the status of endemic, rare or threatened species in an area, ecological studies should ideally be replicated over several seasons and over a few years. However, due to project time constraints such long-term studies are not feasible.
- Most threatened plant species are extremely seasonal and only flower during specific periods of the year,
- Most threatened faunal species are extremely secretive and difficult to survey even during thorough field surveys conducted over several seasons.
- Thus, even though it might be assumed that survey findings are representative of the ecosystem of the site for the development activities, it should be stated that the possibility exists that individual plants species might have been missed due to the nature of the terrain and size of the study area. Therefore, maintaining due cognisance of the integrity and accuracy of the ecological survey, it should be stated that the ecological resources identified during the study do not necessarily represent all the ecological resources present on the property.

13.3 Avifauna Impact Assessment

- To obtain a comprehensive understanding of the dynamics of avifauna communities and the status of endemic, rare or threatened species in an area, avifauna studies should ideally be replicated over several seasons and over a few years. However, due to project time constraints such long-term studies are not feasible.
- The large study area did not allow for the finer level of assessment that can be obtained in smaller study areas. Therefore, data collection in this study relied heavily on data from representative sections, as well as general observations and a desktop analysis.
- The focus of the study is on Red Data species, endemics and near-endemics.

- The impact of solar installations on avifauna is a new field of study, with only one scientific study published to date (McCrary et al. 1986). Strong reliance was therefore placed on the opinions of experts and the pre-cautionary principle was applied throughout.

13.4 Heritage Impact Assessment

- Desktop top findings indicated low heritage potential for the Preferred site. Site survey was only done on the Preferred site, not the alternative site. Therefore, undetected heritage receptors might be present at the Alternative Site and a detailed site walkover of this site should be conducted by a heritage specialist should this site be considered for development.
- The ECO must conduct frequent site monitoring of the initial stages of the project (vegetation clearing, earth moving and excavations) Should any subsurface palaeontological, archaeological or historical material, or burials be exposed during construction activities, all activities should be suspended and the archaeological specialist should be notified immediately.
- It should be stated that it is likely that further undetected archaeological remains might occur elsewhere in the project landscape along water sources and drainage lines, fountains and pans would often have attracted human activity in the past. Also, since Stone Age material seems to originate from below present soil surfaces in eroded areas, the larger landscape should be regarded as potentially sensitive in terms of possible subsurface deposits. Burials and historically significant structures dating to the Colonial Period occur on farms in the area and these resources should be avoided during all phases of construction and development, including the operational phases of the development.
- As Palaeontological remains occur where bedrock has been exposed, all geological features should be regarded as sensitive.

13.5 Wetland & Riparian Impact Assessment

- Clearing of vegetation should be scheduled for the drier winter months and limited to areas immediately needed for construction.
- All development activities should be restricted to the footprint areas of the proposed development. The Environment Site Officer (ESO) should demarcate and control these areas.
- The ECO should advise the construction team in all relevant matters to ensure minimum destruction and damage to the environment and specifically wetlands.
- Rehabilitation of the development area after construction have been completed should be considered a high priority and all areas rehabilitated should be audited after construction has ceased by a suitably qualified environmentalist.
- Should the development be approved by authorities, environmental monitoring of environmental aspects should be implemented during and after the construction phase of the development to ensure that minimal impact is caused to the floodline or wetlands of the area.
- Demarcate all riparian boundaries with pegs and danger tape.
- Edge effects of pre-construction and construction activities, including erosion, sedimentation and alien/weed control, need to be strictly managed in wetland areas as well as their associated buffer zones.
- The proposed 32m buffer has been extended to a staggered buffer with distances of 50-200 m to be implemented along the Phufane River.

- Only existing roads should be used to cross drainage lines, and mitigating measures should be implemented to prevent erosion of roads across drainage lines.

13.6 Visual Impact Assessment

- A Registered Professional Landscape Architect should be appointed to ensure that the proposed mitigation measures are implemented in the most optimal and environmentally enhancing way.
- With the construction of the proposed components the minimum amount of existing vegetation and topsoil should be removed. Ensure, wherever possible, all existing natural vegetation is retained and incorporated into the site rehabilitation especially in line of sight from sensitive viewers.
- Earth works should be done in such a way that only the footprint and a small 'construction buffer zone' around the proposed components should be exposed. In all other areas, the natural occurring vegetation, more importantly the indigenous vegetation should be retained.
- Dust suppression techniques should be in place at all times during the construction phase.
- Natural vegetation should be retained wherever possible and any removal of vegetation should be conducted.
- The areas around the proposed intervention should be extensively landscaped to create a visual buffer of a minimum of 20m wide. Vegetation could be used to screen views toward the proposed intervention.
- An ecological approach to rehabilitation and vegetative screening measures, as opposed a horticultural approach to landscaping should be adopted. For example communities of indigenous plants enhance bio-diversity and blend well with existing vegetation. This ecological approach to landscaping costs significantly less to maintain than conventional landscaping methods and is more sustainable. A Registered Professional Landscape Architect should be appointed for this purpose.
- Light pollution should be seriously and carefully considered and kept to a minimum wherever possible as light at night travels great distances.
- Security lighting should only be used where absolutely necessary and carefully directed, preferably away from sensitive viewing areas. Wherever possible, lights should be directed downwards so as to avoid illuminating the sky.
- Install light fixtures that provide precisely directed illumination to reduce light "spillage" beyond the immediate surrounds of the components of the proposed intervention – this is especially relevant where the there are open views from the nearby farmsteads and game lodges towards the proposed intervention.
- Minimise the amount of luminares to the minimum and connecting these lights to motion sensors can also considered in reducing light pollution

14. ASSUMPTIONS, UNCERTAINTIES AND GAPS IN KNOWLEDGE

This section lists all the assumptions and gaps in information which the specialists acknowledged in their studies.

14.1 Terrestrial Biodiversity, Plant and animal species

- Maintaining due cognisance of the integrity and accuracy of the ecological survey, it should be stated that the ecological resources identified during the study do not necessarily represent all the ecological resources present on the property.

- To obtain a comprehensive understanding of the dynamics of communities and the status of endemic, rare or threatened species in an area, ecological studies should ideally be replicated over several seasons and over a few years. However, due to project time constraints such long-term studies are not feasible.
- Most threatened plant species are extremely seasonal and only flower during specific periods of the year,
- Most threatened faunal species are extremely secretive and difficult to survey even during thorough field surveys conducted over several seasons.
- Thus, even though it might be assumed that survey findings are representative of the ecosystem of the site for the development activities, it should be stated that the possibility exists that individual plants species might have been missed due to the nature of the terrain and size of the study area. Therefore, maintaining due cognisance of the integrity and accuracy of the ecological survey, it should be stated that the ecological resources identified during the study do not necessarily represent all the ecological resources present on the property.

15. EAP OPINION ON AUTHORISATION AND MOTIVATION

The EAP is of the opinion that due process has been followed during the undertaking of this EIA and associated public participation process. The results presented in this FEIAR are based on various specialist studies which were conducted by independent specialists, as well as comments received during the public participation process to date. Further comments on the DEAIR will be considered and included in the Final EIAR.

The EIAR phase was undertaken in line with the requirements of the NEMA EIA Regulations R326. The proposed development requires environmental authorisation in terms of the NEMA Regulations (GNR 326). The information contained in this EIAR provides a comprehensive description of the need and desirability of the proposed renewable energy (solar park) generation project.

It is the professional opinion of the EAP that the proposed development does not impose any negative threat to the environment and it will benefit the country in the long run by providing renewable energy. Mitigations stipulated by the specialist must be adhered to. The EMPR containing management and mitigation measures must be implemented.

15.1 Time period of EA

The EA is required for 30 years and activities will conclude 30 years after the approval EA approval date

15.2 Licensing

As part of the Integrated IWULA, a licence application has been submitted to DWS, and further consultation with DWS is ongoing, as stipulated in Section 21 of the National Water Act (Act No. 36 of 1998):

c) impeding or diverting the flow of water in a watercourse; and
i) altering the bed, banks, course or characteristics of a watercourse.

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